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No Goodwill to show?

Dear Mr Goodwill

The fact that you failed to turn up to represent the Government at the recent Cereals event was not just “disappointing”, as the NFU has put it. It smacks of the loathsome display of self interest that currently consumes Westminster, and particularly Conservative MPs.

You chose to support party politics over the industry that’s pushing Government for clarity and certainty, and the industry you’ve been appointed to represent, without even sending a replacement. That’s not just a desertion of office, it’s a woeful betrayal of the knowledge, talent and experience this country has in its industry, and particularly within the arable sector. Arable farmers are rapidly losing confidence in your ability, in that of other ministers and in MPs in general, in shaping the Agriculture Bill currently going through Parliament, and in putting in place a system that sufficiently incentivises and regulates in line with the Government’s 25 Year Environment Plan.

It’s probably the remarkable resilience of the sector that masks the considerable challenges it currently faces and that you have been tasked with alleviating. But be in no doubt about the pressure farmers are under as you continue to remove tools from the agrochemical armoury. We don’t want to use chemicals to produce food any more than we have to, but these are the tools we use to do our job. If you take these away from us, you have to help us access technologies that will allow us to do our job better.

The problem is, you’re not even allowing that, and this is reflected in the Government’s current policy, inherited from the EU, on new plant-breeding technologies. It is deeply worrying that you view the voice of Greenpeace and of Friends of the Earth on such subjects with as much value as the view of scientists, as you indicated recently at Groundswell. This has to change.

If it doesn’t, minister, have you actually considered whether it’s possible for us to produce food to the standards you seem to expect at the price the consumer is willing to pay? Have you actually considered the consequence if UK arable farmers make a rational decision to stop producing food and apply their considerable talent elsewhere?

So it’s time to put the interests of UK Farming and of those people you represent first. How you choose to demonstrate this is up to you, but I would suggest arable farmers will be judging you, the Government and MPs on your actions over the coming months as the harvest comes in.

Why? Because in living memory, there has never been a harvest of such uncertainty in so many ways. We will look for strong leadership to show us it’s a harvest that matters, that it represents the bounty of a country that takes pride in its world-leading standards of food production. We want to be sure we have political leaders who are not afraid in trade negotiations to stand firmly behind those standards and question leaders of other nations on how they maintain theirs. We don’t have that confidence at the moment, but you and your colleagues can earn it over the coming months.

You must also act to give our talented plant scientists the confidence they need to continue their research, particularly in the area of gene-editing in which they are currently world-leaders. This research is at a point that it is critical it comes into the field to be tested. It is simply ludicrous that we have in our labs and our greenhouses world-leading plant-science innovations that we’re restricted from testing in the field — no other country outside Europe faces those restrictions. So you must promise that, as soon as we exit the EU, you will allow a derogation to allow this research to continue, unfettered by GMO regulations. This should be followed with an urgent review of the regulations themselves.

Finally, we must see evidence that Defra is truly committed to shaping an agricultural policy that will allow the arable sector to flourish. Progress towards Environmental Land Management contracts has stalled, and that’s deeply worrying. You have indicated what you won’t support, but you are sitting on 200 applications for the Tests and Trials and haven’t indicated to those who applied what you will support.

But this is not a plea for subsidy, minister, it’s a demand for direction. The arable sector is aware that the chemical era is coming to an end, that we’re in the plant-breeding era and that on the horizon lies digital. We’re already crippled as we’re being forced out of the first with no tools to enter the second, and that puts us behind the curve on the third. Act now, lead us, and you’ll find we have the inherent talent to catch up.

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Tom Allen-Stevens has a 170ha arable farm in Oxon, and will not be completing Defra’s June survey until Government shows some reason why there’s any point in doing so.

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It’s that time of year when crops are at the stage where there’s nothing more to do than let them ripen.

40kg/ha of head nitrogen has been put on the Crusoe on the understanding that the yield looked decent meaning protein might be diluted meaning a boost might be the order of the day. Following that the sprayer has left the field for the last time and the combine will be the next arrival through the field gate.

So it’s time to take stock and evaluate what went right and what went wrong. Arable farming can feel like a sequence of individual battles during a year long war as the crops churn through their growth stages. First you take on the initial challenge of the slugs and the flea beetle. Then it’s the blackgrass. Then it’s the diseases. In amongst that there are the pigeons.

When it comes to most of these enemies the munition box gets emptier and emptier. No more neonics, metaldehyde, various grassweed herbicides and soon no more chlortoluron. Sometimes it can feel like we are the seventh Cavalry at the Battle of Little Big Horn slowly getting worn down by attack after attack as we run out of bullets.

If there was one threat against which we’ve kept our defences in good order it’s the aerial threat – namely from the wood pigeon. Fortunately, no pressure group has yet sort to ban butane or propane. The technology behind the artillery barrage against the blue peril looks much as it did fifty years ago. Pump a bit of gas into a chamber, ignite with a well timed spark plug and hopefully the resulting bang keeps the foe at bay for another 30 mins. And of course, we all recognise if you can mix this up with a bit of well camouflaged twelve bore action then this keeps the defences in good order. The farmers right to take up his gun against these feathered pests is something we will never lose.

At least that was the case until the pressure group Wild Justice decided to set their forensic lawyers onto the well established system of general licences. For a brief moment in May even these seemed under threat and it looked as if we would soon be resorting to bursting balloons as we concealed ourselves in pigeon hides. But mercifully common sense has prevailed and we are back to where we were in our right to bear arms against Calumba palumbus.

But it’s a reminder that in what sometimes seems like a world run by those who don’t care for food production any more, nothing can be taken for granted. Indeed parts of the temporary general licences to protect crops from wood pigeons placed a huge question mark as to whether those who write the regulations understand what is being regulated. In the section about the need to try ‘non-lethal’ means there was an illuminating paragraph of the use of scarecrows which said:

“If using scarecrows, make it look real, dress it in your old clothes, sit it on a chair and put a gun-like stick in its hand.”

Occasionally change places with the scarecrow."

So, there you have the official advice from Whitehall. In the words of Victor Meldrew you couldn’t make it up. There was one more bit of what looked like whimsy that emerged in the General Licence saga, and that was the fact that for some reason the Egyptian goose is also on the hit list alongside the pigeons and the crows when it comes on our right to protect our livestock and crops. If there is any farmer out there that lives in fear of the Egyptian goose as they go about the noble and ancient art of growing crops then they have my every sympathy. I can hear it now from farmhouse bedroom windows across the land: “Mabel, them pesky Egyptian geese are back on the wheat on the lower meadow. Get me gun.”

I just thought I’d include a picture of our solar farm. For no good reason really – apparently this sort of thing is now called ‘virtue signalling’. 
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Those who braved the mud at Cereals this year were rewarded with plenty of food for thought as they prepare their farming businesses for an unprecedented period of political, technical and environmental change. CPM reports.

By Lucy de la Pasture and Tom Allen-Stevens

Rob Edwards says applying biologicals is based on the behaviour of the pest, whereas chemical pesticides are applied according to the growth stage of the crop.

The farmed environment is key to making a difference."

Nuggets of gold amongst the mud

Those who braved the mud at Cereals this year were rewarded with plenty of food for thought as they prepare their farming businesses for an unprecedented period of political, technical and environmental change.

Mother Nature usually finds a way of restoring balance and that’s just what she did as monsoon conditions struck Lincs just in time for Cereals. The liquified mud was more reminiscent of scenes from Glastonbury as even seasoned members of the farming community got caught out with their footwear.

But that’s not where the parallel ends. While AHDB hosted the ‘pyramid stage’ at the centre of the event, tucked away on opposite fringes of showground was where it was really happening. This was where those who would once have been regarded as farming’s ‘geeks and hippies’ headed in a pilgrimage to hear the ground-breaking speakers in the Innovation and Technology and Conservation Agriculture theatres.

Introducing one of the biggest growth areas in the industry was Prof Rob Edwards of University of Newcastle in his capacity as chair of the Farmer Scientist Network of Yorkshire Agricultural Society. He introduced a farmer-led research project, carried out by biopesticide strategist Dr Roma Gwynn of Rationale and funded by the European Innovation Partnership, investigating the use of biologicals for pest and disease control.

Public concern

Rob posed the question, ‘when are we going to end industrial pesticide spraying?’ It’s a question he says needs answering because of the increasing public concern about the environment and health, but also because of the diminishing number of actives as the precautionary principle is applied and increasing instances of resistance to pesticides.

“There’s been a huge shift to biological agents, with an increase in 300% in the past decade and more new registrations than for chemical agents.”

Rob described the real benefit in biologicals is that they have multiple modes of action. “They can mimic plant responses; produce phytoalexins (inhibit growth of diseases) and phytohormones, stimulate defence responses and even physically kill the target.

“Plants have microbiomes, internally and externally. It’s a community that’s intimately associated with plant health and can be changed by biologicals, such as Bacillus subtilis and B. amyloliquefaciens, to elicit plant defence responses.”

Replicated trials carried out at three sites, Stockbridge Technology Centre in Yorks, Newcastle University’s Cockle Park and Nafferton farms in Northumberland, looked at three different strategies on Leeds and Skyfall winter wheat in 2018.

The IPM protocol was a microbial seed treatment using traditional fungicide timings — conventional chemistry was applied if disease pressure was high and a biological applied if needed when disease pressure was low.

The biological protocol was a microbial seed treatment followed by biopesticides only at standard timings, if needed. The...
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third protocol employed a chemical seed treatment followed by conventional fungicides at standard timings. The results showed all treatment protocols gave similar yields with no significant differences in quality data. But 2018 wasn’t a high disease incidence year, he added.

“Adopting an IPM strategy is more complex and applications can be more frequent because they’re based on how the pest is behaving and not the crop. IPM will require both a change in farming practice and an increase in knowledge to implement.”

“But the adoption of an IPM strategy has the advantage that it can increase abiotic stress tolerance, all cultivars will respond and there’s less environmental impact. To sum up, biological where possible, chemical where needed.” he concluded.

Sarah Baker of Greater Lincolnshire Nature Partnership (GLNLP) presented some simple ways growers can increase wild pollinators on the farm.

“Pollinators contribute £690 million to the economy but we’re seeing a decline in large number of species. The farmed environment is key to making a difference,” she said.

**Missing minister puts dent in arable confidence**

Farming minister Robert Goodwill has been roundly criticised for failing to turn up to Cereals to show support for arable farmers. Amid fears from farming leaders that the Agriculture Bill has stalled, leaving the sector in limbo, there are now calls for Defra to “push the pause button” on the transition to a new support system until it can provide some clarity and direction.

The first day of Cereals coincided with a move by opposition parties in Parliament to take a no-deal Brexit off the negotiating table. This caused the minister to abandon plans to visit the Lincs-based event to get to Westminster to vote against the motion. But with the prospect of a no deal seen as “catastrophic” by many in the farming industry, this in itself was viewed as another snub to the arable sector.

“It’s totally disappointing that Robert Goodwill hasn’t appeared,” said NFU president Minette Batters. “And it’s outrageous that he hasn’t even sent a Defra official, just at a time when farmers desperately need certainty and clarity of thinking.”

The most immediate concern is over what tariffs arable commodities will face as a consequence of Brexit. “For us, trade policy is every bit as important as agricultural policy. The arable voice is one that hasn’t been heard nearly loud enough, and yet it underpins every sector in food and farming,” she continued.

“The most important aspect to get right is the level playing field, and it’s shameful we haven’t seen that approach [from Government].”

But Minette was clear about the leading role she sees UK arable farmers playing. “Climate change is the challenge of our time — I want to pitch farming as part of the solution.”

The NFU made the proactive step, announced at Oxford Farming Conference, of a target for UK Farming to reach net zero by 2040. That had “opened every door” to a whole range of influential organisations and government bodies who now want to work with farmers towards delivering this, said Minette.

“We have the opportunity to shape that change, and we need to grasp it with both hands. The real risk is that we export our standards and our production abroad. We can lead net zero if there is a willing government to work with the industry.”

But this is just where the NFU has “grave concerns”, combinable crops board chairman Tom Bradshaw told CPM. “The timeline of delivery of the Agriculture Bill and Environmental Land Management (ELM) contracts seems to be way behind. Its questionable whether it’s possible for Defra to deliver the transition under the current timeline.

The first round of Test and Trials for the new ELMs was supposed to start in April, but there are fears the correct framework hasn’t yet been put in place to manage them, and there’s a question mark over funding. Meanwhile applicants for the second round of proposals, lodged before April, have not yet heard if these have been successful.

Adding to the uncertainty, Tom said the ministerial no-show at Cereals undermined the status the government holds for UK arable farmers. “Having a minister who’s unable to represent pressing issues for the sector at a major agricultural event because he feels he has to vote for his own political party doesn’t give grounds for confidence in how he’ll direct agricultural policy.”

The NFU’s Your Harvest campaign is urging farmers to encourage their MPs to come onto farms as the harvest comes in and show them the true value of combinable crops to society. “We are the backbone of the agricultural industry providing the raw ingredients for our livestock and also the UK’s largest manufacturing industry — food and drink. We currently face huge uncertainty from many areas including Brexit but also pesticide regulation. There has never been a more important time to get your MP on farm and sell the positives,” said Tom.

AHDB chairman Peter Kendall also spoke of the “madness” that’s gripped Westminster, and the “craziness of the Conservative leadership campaign in which farming is being totally ignored in the political debate”.

“Climate change is massively impacting on agricultural systems around the world. The detachment of politics from how we feed a UK population of 65 million is important for us to address. But among this madness and uncertainty, the biggest risk is to put on hold the decision making. The industry and individual businesses should focus on how to prepare for what’s coming,” he said.

Peter Kendall criticised the craziness of the Conservative leadership campaign.
Blackgrass is evolving resistance to glyphosate, according to scientists conducting a study as part of the Blackgrass Resistance Initiative (BGRI). Samples of blackgrass taken from across the UK showed a “huge variability” in their sensitivity to glyphosate, according to Dr David Comont of Rothamsted Research who led the study. “The good news is that we’re not finding proper resistance at the moment. The bad news is that we don’t know how long that will continue to be the case,” he said.

Working with the University of Sheffield, the Rothamsted team collected blackgrass seed from 132 farmers’ fields across 11 English counties, from Herts to Yorks, as well as collecting extensive data sets on historical field management, including glyphosate use.

More than 16,000 seedlings were grown from these seeds in glasshouses, and the effectiveness of glyphosate in controlling plants from each local population was assessed. “At the full field rate of 540g/ha, good effective control was achieved. But at 475g/ha, there was a lot of variability,” reported David.

Seed from survivors were then grown for another two years, and sensitivity was found to reduce further, showing it’s a heritable trait, he said. The team also took plants from nine of the populations to produce 400 new seed lines with known genetic pedigrees, that were also tested for their responses to glyphosate.

“We wanted to be sure there is a genetic heritable component, and there is. This is a prerequisite for pesticide resistance evolution. What’s more, blackgrass populations with greater historic exposure to glyphosate are now the populations least sensitive to this chemical.”

Published in the journal New Phytologist, the peer-reviewed study has broken new ground as it’s identified signs of resistance evolution before it becomes a problem in the field. “This means farmers who follow glyphosate-stewardship guidelines can prevent reduced sensitivity evolving into a full-blown resistance problem,” noted David.

**Flufenacet findings**

Bayer revealed more detail on its flufenacet-resistance studies at Cereals. “We carry out routine testing of around 250 samples sent in every year,” said the firm’s Dr Gordon Anderson-Taylor. “Usually, just two or three of these samples are ryegrass, but last year 12 were sent in, and four of these showed up resistance to flufenacet. This is the first time we’ve picked it up,” he noted.

“In blackgrass, there is variation in efficacy, but all UK populations tested are above the threshold of 90% control at 240g/ha.”

“It’s unclear why ryegrass has evolved resistance to the chemistry, while blackgrass hasn’t,” said Gordon. “Perhaps ryegrass is better at developing the resistance mechanisms.”

Bayer’s new flufenacet-based herbicide with added metribuzin is nearing the end of the regulatory process, and the firm’s Ben Coombs is optimistic it will come to market this autumn. “It offers a 10% uplift in control, compared with Liberat,” he said. The formulation with aclonafen is expected to arrive next autumn.
Income for payment foregone — they may be best treated as a new enterprise.

He urges farmers to take a critical look at their borrowings as the uncertainty of Brexit looms. “There have been increases in costs not reflected in on-farm yields, so are you getting a reward for your investment?” A period of consolidation may be necessary for some farms that could have over-reached themselves, he suggests.

The immediate concern is what happens on Brexit deadline day of 31 Oct, reckons Andersons’ Richard King. “It’s slap bang in the middle of the grain-trading season, but we don’t know where tariffs will be set. That puts quite a bit of uncertainty into the market with traders not wanting to commit.”

The big worry is if all restrictions come off maize, which could lead to a flood of feed-grain imports. “These could even be GM, depending on whether the UK follows EU restrictions. We believe policy will revolve around keeping food prices low, which would be a significant problem for arable farmers — you can’t dress it up any other way.”

A treat of traits come forward in RL CANDIDATES

DSV’s new British-bred Group 4 hard wheat Theodore was on show at cereals. The company started breeding wheats in the UK from its site near Banbury, Oxon, just 10 years ago, and Theodore, along with stable mate Toby, is the first to come to market. An AHDB Candidate variety, Theodore is a cross of Stigg with Tuxedo and has a very early maturity.

But you won’t find it on the RL Candidate list as “strikingly clean”, Theodore’s performed well during the past two dry years, maintaining green leaf area says Mike, while it’s also demonstrated it can cope well with wet soils. It performs best in the West, and has good lodging resistance, he added.

DSV has also introduced its first ever ‘quad-layer’ oilseed rape varieties, with stacked traits claimed to bring them enhanced disease resistance and physical properties. Their introduction follows on from AHDB Candidates Dazzler and Darling, both triple-layer varieties.

Drawing attention on the KWS stand was its new Group 4 hard feed RL Candidate KWS Kinetic. With the highest treated yield of the candidate varieties, it also has the highest specific weight. See article on p16 for more.

Joining Kinetic is another hard feed RL Candidate KWS Parkin. A cross of Reflection with Costello, there’s a treated yield of 103% of controls with strongest performance in the West and North. Short and stiff-strawed, it’s notable for its very early maturity.

New in the two-row winter barleys is RL Candidate KWS Hawkling. At 107% of controls it’s the highest yielding candidate in trials and has a specific weight of 70.2kg/hl. It performs best in the East and West with a maturity equal to KWS DK Exsteel, but doesn’t quite have the top-end yield of its stable mate. Exsteel is on the AHDB RL for the North, with a phoma score of 8 and LLS of 7.

Focus on borrowings as uncertainty looms

According to farm business consultants Andersons, arable profitability looks fairly static at present, with good prospects for 2019 harvest. “It’s what 2020 and beyond will bring, with changes to the subsidy regime, that may be of most concern,” says the firm’s James Mayhew.

That’s when direct payments will start to decline and support will shift into the as-yet-undefined public money for public goods, he notes. “What will you replace your £226/ha with? It’s likely there’ll be a different structure to the new ELMs that will incur costs, rather than just income for payment foregone — they may be best treated as a new enterprise.”

He urges farmers to take a critical look at their borrowings as the uncertainty of Brexit looms. “There have been increases in costs not reflected in on-farm yields, so are you getting a reward for your investment?” A period of consolidation may be necessary for some farms that could have over-reached themselves, he suggests.

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Onwell, said breeder David Harrap.

Leading the OSR pack from Dekalb are DK Extar and DK Exstar. “DK Extar is the most disease-resistance product we’ve ever bred,” claimed breeder Matthew Clarke.

It has an 8 for both phoma and light leaf spot, with a 9 for lodging resistance, along with Dekalb’s other key traits of vigorous establishment and pod-shatter resistance.

But you won’t find it on the RL Candidate list following a mix-up over seeds. “We supplied the wrong seeds for the RL trials last autumn.” With “no weaknesses”, it’s shorter and stiffer than DK Exsteel, but doesn’t quite have the top-end yield of its stable mate. Exsteel is on the AHDB RL for the North, with a phoma score of 8 and LLS of 7.
Belkar (picloram + halauxifen-methyl) gives oilseed rape growers the option to switch from preventative to reactive autumn weed control strategies, said Corteva Agriscience’s John Sellars.

“Growers can wait until the crop is out of the ground giving themselves time to assess the visible weed pressure plus the impact of pests. Targeting cleavers, cranesbill, poppy, shepherd’s purse and fumitory, Belkar offers an alternative to traditional approaches which rely on pre-emergence control.”

The herbicide is the newest member of the Arylex Active family and John expects Belkar to become the traditional approach to weed control in oilseed rape.

“Growers are happy to invest if they know they are going to have an output. Moving to a post-emergence regime means growers don’t decide on their herbicide spend until they know a crop is there.”

Arylex Active has been in cereal herbicides since 2015 with the ability to control most key competitive weeds without affecting brassicas, making it an obvious fit for the oilseed rape market.

There are three treatment options which Corteva says have performed best in trials. At two true-leaves an application at 0.25 l/ha will take out the weeds which have germinated alongside the crop and, in some circumstances, that will be enough broadleaf control before an application of Astrokerb (propyzamide + aminopyralid) or similar later on.

In high weed pressure situations where a second germination is visible, growers have the option of a second 0.25 l/ha two to four weeks after the first application. In low pressure situations growers can wait until six true leaves of the crop and apply 0.5 l/ha which will take care of the weeds going into the autumn.

ERRATUM
At the Cereals event, Corteva Agriscience presented its new active substance, Inatreq, but the event was not intended as its launch, as suggested on p66 of the summer shows preview in CPM June issue. CPM would like to apologise for any confusion caused.

Belkar will give growers the flexibility to apply a broadleaf herbicide once the crop has established.
Farmers who deliver improvements to their soils are unlikely to receive support under the new Environmental Land Management (ELM) contracts. Farming minister Robert Goodwill, speaking at the Groundswell event in Herts last month, said good soil health is not viewed by Government as one of the “outcomes” it’s looking to support.

“At this stage I wouldn’t envisage that paying for soil health was necessarily a public good,” he said in an interview at the event with journalist Baroness Rosie Boycott. “But the things that flow from that are just the sorts of things I think people would want to pay for.”

The minister didn’t specify exactly what sort of outcomes the Government would reward through ELMs, although he did indicate improvements in organic matter may improve a soil’s capacity as a carbon sink and improvements in soil structure could help drainage problems, for example.

He said he was hoping to transition to a system of paying public money for public goods that organisations such as Greenpeace and Friends of the Earth would support. “I’m optimistic that as we move through the transition from 2021 to 2027, people will see the results and they will be on the side of the farmers and want to help them deliver that through their taxes.”

Exactly what schemes will be supported will come from the ELM Tests and Trials — the minister indicated that 48 of these from the first round of applications are “ready to sign off” but hadn’t started, while another 200 applicants are waiting to hear if their suggestions will also be included in the programme.

“I’m optimistic they will make financial sense for the farmer — the money should not just be compensation for income forgone and investment made, but also give them a profit margin on doing that.”

Efforts to improve soil health would not necessarily result in ELM payments, said Robert Goodwill — the Government’s looking for outcomes.

But he indicated the Agriculture Bill was making slow progress through Parliament, and Brexit remains the priority. “Before we can deliver our policy, we need to leave the EU,” he said.

Cereals 2019

Efforts to improve soil health would not necessarily result in ELM payments, said Robert Goodwill — the Government’s looking for outcomes.

But he indicated the Agriculture Bill was making slow progress through Parliament, and Brexit remains the priority. “Before we can deliver our policy, we need to leave the EU,” he said.

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Simple management tweaks can help build pollinator numbers on the farm.

Mark Dodds and Andrew Newby from KWS receive the NIAB Centenary Cereals Cup for Robigus from NIAB chairman Jim Godfrey. The variety featured on the HGCA Recommended List between 2003 and 2011, while around half the current varieties have Robigus in their parentage. Originally bred in the Netherlands by Wiersum Zelder, it was selected by CPB Twyford, now KWS. A cross between two breeding lines, it brought in novel yield and agronomic traits from wild emmer wheat.

seeking to work on together with the farming community, according to Tim Stephens of Wessex Water. It’s a problem that’s on the rise, partially because the take-up of nitrogen fertilisers is an inefficient process and partially a legacy issue, with nitrates slowly working their way down into the groundwater, he explained.

“We’re likely to see an increase in NVZ restrictions, particularly where water is abstracted from boreholes. It’s a direction of travel that’s indicated in the new Agriculture Bill,” he said.

The water company focus is on informing growers about their water quality, catchment management and fine-tuning of nutrient management with advice focused beyond compliance to help them achieve water quality. Their aim is to help growers access more specialist advice and incentivise change with financial support and capital grants.

Dorset farmer, John Martin, farms in a water safeguard zone with ground running down to the Milbourne St Andrew borehole. He’s undertaken a 5-year plan with Wessex water to reduce his soil mineral nitrogen by limiting nitrogen applications to 150kgN/ha/annum, growing over-winter green cover and building soil organic matter.

He’s achieving this by growing a non-legume winter cover crop and cropping the land in continuous spring barley which has enabled him to reduce his inputs to 125kgN/ha.
You don’t really have to give it very much attention for it to power away and perform for you.

Among the many candidates lined up to join the Group 4 hard wheat market is one high performer that seems to look after itself. CPM visits an Oxon farm business making a conscious move back into hard feed.

By Tom Allen-Stevens

As you turn up at the farm office of the Hildred Partnership near Wallingford, Oxon, you can’t help but notice the crop of oilseed rape on the slope facing you that’s been hit hard by cabbage stem flea beetle.

“It’s there to remind me never to grow the crop again,” says Guy Hildred. “It was the one field that appeared to grow away from CSFB last autumn, so we decided not to pull it up. But that was a mistake.”

Contrast that with a nearby field of KWS Kinetic winter wheat, drilled on 17 Oct, that faced a similar dilemma at the start of the year, after it was hit hard by crows over the winter. “In places you could barely see the crop in the rows, and we very nearly abandoned it. But it took off in March, and now you can hardly tell the difference between it and our other field that wasn’t affected.”

It’s part of a seed crop of the new Group 4 winter wheat variety that currently leads the AHDB Candidate line-up (see panel on p18. Hildred Partnership has around 200ha of winter wheat grown for C2 seed in the ground for harvest 2019, with the KWS Kinetic sitting alongside KWS Barrell, RGT Gravity and Costello.

Conscious move
“We’re making a conscious move back to Group 4 varieties, having grown quality wheats for seed over a number of years,” says Guy. “There’s nothing wrong with them, but the milling premium is no longer sufficient. It’s best to focus purely on the yield, getting the wheat harvested and filling up the barn.”

With land that varies from gravel to chalk, and not a single water course across its 800ha, yields for the farm range from 7-11t/ha. The rest of the wheat area is also hard Group 4, while winter barley is also grown for seed. The business has an anaerobic digester, pumping out 2.1MW of gas to grid, fed with maize and rye, while poppies form the only other non-cereal break in the rotation.

The partnership is part of HBH (Farming), a joint-venture concern with a number of other partner businesses. HBH arable farm manager Mike Goodenough now takes day-to-day responsibility for the management of Guy’s wheats, and with a nutrition programme that revolves around the digestate from the AD unit, that can be a challenge, he says.

“The biggest issue with the digestate is the haulage — the timing of the application isn’t decided by when the crop’s ready, but by when the digestate has to be spread.”

That’s carried out by local contractor Charlie Baker with a tanker spreader fitted with a 30m boom. The application is usually made to the wheat in April, and at a rate of 30m³/ha, the effect on the crop must be factored in, says Mike.

“It’s easy to put the wrong amount on and it will react with the soil in a different way — the available N might be 65kg/ha, it might be 70kg/ha, depending on the temperature. The nice thing about the Kinetic is that it behaves very similarly to other KWS feed varieties — you don’t really have to give it very much attention for it to power away and perform for you.”

Generally first wheats are direct drilled with the 6m Horsch Sprinter after maize, while the second wheats may well be ploughed. Otherwise the cultivation for most crops is a 3.5m Simba Solo followed by a

The field of KWS Kinetic that was hit hard by crows is set to perform as well as the nearby field that was unaffected.
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Digestate is a key source of nutrients for the crop, but the timing of the application is decided by when it has to be spread, rather than when the crop’s ready.

6m Horsch Joker to make the seedbed if needed.

“The aim is for an established population of 355 seeds/m², and we’ll go as low as 100kg/ha or as high as 150kg/ha to achieve this. The prime time for drilling would be first week of Oct, although we’d go later where blackgrass is an issue. The Kinetic came up ahead of the rest,” says Mike.

Kinetic is the ‘one to watch’ among the hard Group 4s

While some growers have moved away from the Group 4 hard feed market, there’s every reason to take another look, believes Agrovista head of seeds Tom Nickerson.

“We’ve seen one or two game-changing quality wheats that yield well which have tempted growers towards milling varieties. But gone are the days when farmers looked for feed wheats that were purely high input, high output. What we’re seeing on the AHDB Recommended List, and especially among the candidates, is a new generation of hard Group 4s that offer good agronomics and appropriate grain quality, as well as the high yields growers expect,” he says.

These are the ones now taking market share, and offer additional benefits for those growers who can use their good grain quality in local premium markets, he adds.

Among the RL candidates, it’s KWS Kinetic that currently leads the pack. So what’s Tom’s take on the variety? “It’s certainly one to watch,” he says. “There’s a limited tonnage available for 2019 sowings, but my feeling is that it’s one for 2020, by which time we’ll have a full set of data on it, and growers will be able to make a more informed choice.”

KWS Kerrin, meanwhile, delivers on the yield and has plenty of data to inform the grower looking to move into these wheats, he notes. “Kerrin’s shown it can yield consistently, so it’s my pick for this autumn. What Kinetic offers in addition is a considerable step-up in specific weight. It also has a maturity rating that will bring it to harvest a day or two ahead of most other hard Group 4s. So perhaps one to line up for next autumn.”

KWS took the unusual step of releasing seed of Kinetic for multiplication before it completed National List trials, notes Will Compson, KWS cereal and sales manager. “This means growers will have access to seed for commercial production this autumn,” he notes.

“KWS Kinetic combines a high treated and untreated yield, good disease resistance and the best combination of protein, Hagberg falling number and specific weight of any candidate variety.”

A cross between Reflection and KWS Silverstone, Kinetic has orange wheat blossom midge resistance and has performed strongly in all regions, adds Will, although its highest yields have come in the East and West.

“At 105% of controls, its treated yield is at the top of the group, but it will be its stiff straw, early maturity and high specific weight that will capture grower interest — so it not only yields, but these are bankable yields.”

Senior wheat breeder Mark Dodds notes that the dry-down evaluation carried out by KWS puts Kinetic on a par with Skyfall in terms of earliness. “It comes down to 15% moisture five days earlier than Gleam or RGT Gravity and has an untreated yield similar to KWS Siskin.”

In the spring, concerned that the crow-damaged piece might not take kindly to the digestate, it was given a larger-than-normal dose of N in Feb to help it recover, then ammonium sulphate before its main dose of N as ammonium nitrate in late March, with a total of 160kgN/ha applied. The fuller crop of Kinetic received the usual programme for a feed wheat crop to meet its expected yield (see panel on p19), including the standard dressing of digestate at the T0 timing, with Adexar used at both T1 and T2. “We’ll give it a cheap and cheerful tebuconazole at T3,” he adds. “Chlormequat was applied at both T0 and T1. This isn’t the strongest ground and Kinetic seems very stiff-strawed, even where it grew fast after the crow damage.”

There’s now very little difference between the two fields, both are free of disease and Mike expects them to perform well at harvest. “We have two Claas Lexion 770 combines with 12m headers and the seed crop always gets priority. But if the Kinetic holds its Hagberg like KWS Trinity and with a

With Reflection in its parentage, Kinetic has an erect growth habit (left), while it’s been no trouble to keep the crop free of disease from flag to foot (right).

Nevertheless, seed availability is likely to be tight for autumn 2019, so product development manager John Miles suggests KWS Kerrin as the Group 4 hard feed variety of choice if Kinetic’s not available.

“They are quite different — Kinetic is an upgrade of Reflection, inheriting its high yield, short, stiff straw and earliness, but bringing its disease resistance from Silverstone,” he explains.

“Kerrin has KWS Santiago in its parentage. The yield isn’t quite at the same level as Kinetic, but you get the consistency growers enjoyed in Santiago. It’s also very flexible in terms of when you can drill it — whenever the seed turns up, you can put it in the ground and it’ll perform.”

Moderately stiff, disease-wise Kerrin may need watching for yellow rust, especially in eastern counties, notes John, but its strength is brown rust. “It has the strongest brown rust score of the leading Group 4 varieties on the RL,” he adds.
As Britain exits the EU, wheat growers will be preparing their enterprise for a market with less protection, but potentially open to the opportunities of a wider world. Finding the right market, and the variety to fulfil it, will be crucial for those looking to get ahead.

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

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Kinetic has the high yields growers have come to expect of Group 4 varieties with considerably improved grain quality.

Mike Goodenough (left) and Guy Hildred are making a conscious move back to Group 4 varieties, having grown quality wheats for seed over a number of years.

Hildred Partnership’s programme for high-yielding wheat, 2017

<table>
<thead>
<tr>
<th>Date</th>
<th>Product</th>
<th>Rate (/ha)</th>
<th>Price (/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-Oct</td>
<td>KWS Lili</td>
<td>140kg</td>
<td>105*</td>
</tr>
<tr>
<td></td>
<td>Herbicides</td>
<td></td>
<td>75</td>
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<tr>
<td></td>
<td>Insecticides</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Fertiliser</td>
<td></td>
<td>160</td>
</tr>
<tr>
<td>17-Feb</td>
<td>Urea 46% N</td>
<td>100kg</td>
<td></td>
</tr>
<tr>
<td>18-Apr</td>
<td>Digestate</td>
<td>31m³</td>
<td></td>
</tr>
<tr>
<td>19-Apr</td>
<td>Urea 46%N</td>
<td>213kg</td>
<td></td>
</tr>
<tr>
<td>10-Apr</td>
<td>T1 – Keystone + CTL</td>
<td>0.8 +1.0 litre</td>
<td>90</td>
</tr>
<tr>
<td>05-May</td>
<td>T2 – Adexar + CTL</td>
<td>1.25 + 1.0 litre</td>
<td></td>
</tr>
<tr>
<td>02-Jun</td>
<td>T3 – Toledo + Comet</td>
<td>0.45 + 0.25 litres</td>
<td></td>
</tr>
<tr>
<td>10-Apr</td>
<td>T1 – Chlormequat</td>
<td>0.8 litres</td>
<td>1</td>
</tr>
<tr>
<td>Standard</td>
<td>TOTAL VARIABLE COSTS</td>
<td></td>
<td>433</td>
</tr>
<tr>
<td>05-Aug</td>
<td>Harvest</td>
<td>10.5t</td>
<td>1659**</td>
</tr>
<tr>
<td>GROSS MARGIN</td>
<td>1226</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Digestate – total applied: 80kgN/ha, 26kg SO3/ha, 127kg K2O/ha, 47kg P2O5/ha; CTL – chlorothalonil; Keystone – epoxiconazole+ isopyrazam; Adexar – fluxapyroxad+ epoxiconazole; Toledo – tebuconazole; Comet – pyraclostrobin; *price for C1 seed; **based on ex-farm price of £158/t

KWS Group 4 wheat leaders at a glance

<table>
<thead>
<tr>
<th>Variety</th>
<th>KWS Kinetic</th>
<th>KWS Kerrin</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHDB Winter Wheat List Source for data*</td>
<td>Candidate 2019/20</td>
<td>Recommended 2019/20</td>
</tr>
<tr>
<td>Yield mean of controls (t/ha)</td>
<td>10.4</td>
<td>11.2</td>
</tr>
<tr>
<td>UK treated yield (% control)</td>
<td>105.1</td>
<td>103.7</td>
</tr>
<tr>
<td>UK untreated yield (% treated control)</td>
<td>86.3</td>
<td>81.3</td>
</tr>
<tr>
<td>Hagberg falling number (sec)</td>
<td>279</td>
<td>150</td>
</tr>
<tr>
<td>Specific weight (kg/hl)</td>
<td>788</td>
<td>765</td>
</tr>
<tr>
<td>Resistance to lodging with PGR</td>
<td>-</td>
<td>6.9</td>
</tr>
<tr>
<td>Lodging % (treated)</td>
<td>6.9</td>
<td>1.9</td>
</tr>
<tr>
<td>Height without PGR (cm)</td>
<td>833</td>
<td>83.7</td>
</tr>
<tr>
<td>Maturity (days+/- JB Diego)</td>
<td>0</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Disease resistance

<table>
<thead>
<tr>
<th>Disease resistance</th>
<th>KWS Kinetic</th>
<th>KWS Kerrin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mildew</td>
<td>6.1</td>
<td>6.7</td>
</tr>
<tr>
<td>Yellow rust</td>
<td>6.4</td>
<td>7.0</td>
</tr>
<tr>
<td>Brown rust</td>
<td>6.2</td>
<td>6.8</td>
</tr>
<tr>
<td>Septoria tritici</td>
<td>5.8</td>
<td>5.0</td>
</tr>
<tr>
<td>Eyespot</td>
<td>-</td>
<td>4.7</td>
</tr>
<tr>
<td>Fusarium ear blight</td>
<td>-</td>
<td>5.8</td>
</tr>
<tr>
<td>OWBM</td>
<td>R</td>
<td>R</td>
</tr>
</tbody>
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*Note: Yield data are not comparable as varieties were assessed in different trials using different controls.
Rethinking OSR?

It’s been a torrid season for oilseed rape with many growers questioning its place in their rotation. But should it be discarded on the back of an exceptional season or can the crop be managed better? CPM finds out.

By Lucy de la Pasture

Technical OSR planning

A series of unusual weather events created a perfect storm for cabbage stem flea beetle (CSFB), says Dr Sacha White, senior research entomologist at ADAS Boxworth in Cambs. A very dry summer which extended well into the autumn meant many oilseed rape crops had a difficult time establishing due to lack of moisture and adult flea beetle damage.

“Another warm winter meant that adults were able to continue egg laying for longer than usual, which resulted in record numbers of larvae and additional crop losses this spring,” he says.

CSFB has become OSR’s number one enemy since the loss of neonicotinoid seed treatments, with 5% of the national crop lost in 2014/15 and 9% in 2016/17. This year AICC estimate that 11% will be lost on the basis of a survey conducted last winter, equivalent to £79 million. But it’s likely that this is an underestimate as larval numbers continued to increase into the spring and crops were still being written-off as late as April, suggests Sacha.

Pyrethroid resistance

In recent times the solution to nearly every agronomy problem has been to rely on a pesticide as a first line of defence, but with increasing resistance to pyrethroid insecticides this is no longer a strategy that will work.

“Pyrethroids used to get control of CSFB adults and larvae if they were well-timed, but resistance was first detected in 2014 and is becoming widespread. We don’t yet know if the larvae are resistant as well as the adults, but we suspect that they are,” he says.

In spite of this, pyrethroid applications have tripled from 2010 to 2016 but applying them may be counter-productive, Sacha points out. “Making more than one pyrethroid application is just selecting for resistance and killing the natural enemies of CSFB, such as ground beetles which play a very important role in eating eggs over the winter period.”

So without any effective chemistry to save the day, what can growers do to mitigate the effects of CSFB? Sacha believes there is no single solution but by adopting a number of cultural control options with the optimum agronomic approach then damage can be limited. It’s similar to the approach growers have adopted to blackgrass, where a combination of different methods can add up to give the desired level of overall control.

Modelling carried out as part of the AHDB-funded IPM project, suggests that the only consistent agronomic approach that affects CSFB pressure is the date of drilling. The advice used to be to drill OSR earlier so that the crop established before the main period of CSFB migration (usually late-Aug) but in recent years it’s the larvae which have become the biggest threat.

“A survey of 1100 sites over 14 years showed a clear trend in larval reduction by drilling later. Newly planted crops avoid the main adult migration, so CSFB arrive later in crops. This results in later egg hatching and a slower rate of development of both larvae and eggs as temperatures cool off in the autumn. We’ve seen the effect carry through to spring populations.

“We need to better understand OSR variety selection as some are much better suited than others for later drilling,” he adds.

There’s also a disease consideration ▶
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when looking at drilling date, adds Dr Faye Ritchie, plant pathologist at ADAS Boxworth. “On balance, later drilling decreases the risk of light leaf spot and club root while earlier drilling decreases the risk of phoma leaf spot/stem canker. “Leaf size is an important factor when it comes to phoma, the larger the leaf then the longer it takes the fungus to spread through the leaf and petiole and then into the stem. Late sown, small crops are at a higher risk,” she says.

Light leaf spot is a very different disease and its airborne ascospores, which cause the primary infection in OSR crops, can be released from July onwards. This means earlier drilled crops are exposed to higher levels of inoculum. By late Oct there’s a

**Countering flea beetle pressures**

OSR varieties that develop more rapidly in the autumn and earlier in the spring can substantially reduce damage from cabbage stem flea beetle larvae as well as adults, according to the latest research from agronomy specialists Agrii.

Used alongside the most appropriate seedbed management, drilling practice, early nutrition and insecticide treatment, they offer growers a good way of countering the recent upsurge in the pest, in the view of technical specialists, Jim Carswell and David Leaper.

They point out that, just like blackgrass and septoria, a thoroughly integrated approach to agronomy can help manage the flea beetle threat and ensure OSR retains its place as the first-choice break in most winter cereal rotations.

“We have undertaken almost 40 specific flea beetle management trials since 2009,” says R&D manager, Jim. “These have explored a whole range of approaches to dealing with the pest — from sacrificial field boundaries to companion cropping and various ways of disguising the emerging crop as well as improving its establishment and early resilience.

“It’s crystal clear from this work that no single approach offers the consistency of the seed treatments we no longer have. Anything that gets in the way of early crop growth — like last autumn’s serious lack of moisture — can significantly increase flea beetle impact. So the focus has to be on the key elements of agronomy that prove most effective in ensuring rapid and reliable establishment and autumn development.”

Drilling in the first 10 days of Aug to achieve a robust canopy ahead of the main late Aug/early Sept flea beetle migration has proved its worth in maximising early crop survival in Agrii’s experience.

But early drilled crops tend to carry greater larval burdens than those drilled in early Sept. The downside of later-drilled crops is that they can develop less rapidly, making them more vulnerable to attack.

“Whenever you drill, the most important thing is to drill into moisture. In the six weeks between the start of Aug and mid-Sept there will almost always be a time when your ground is carrying sufficient moisture. Regardless of calendar date, that is the time to drill,” says Jim.

“Almost regardless of drilling date, I also favour fast-developing varieties,” adds seed technical manager, David. “They give the crop the best chance of growing away from any setbacks. If conditions allow, they may put on a little too much autumn growth. But we can always give them a timely check as well as a useful rooting boost with an early PGR.

“We also know from our trial work how valuable such varieties can be in minimising the larval damage which put paid to so many crops this spring. Current trials across more than 40 varieties on four sites significantly affected by flea beetle, have indicated a clear association between the level of beetle damage and speed of crop development.

“We’ve long found the fastest developing varieties in the autumn are better at growing away from adult grazing. These trials show the earliest to grow away in the spring — most notably DK Expedition, DK Exclaim, DK Exsteel, Inv1035 and Ambassador — also suffer the least stunting and main stem loss. Again this seems to be due to their superior ability to compensate through earlier canopy development.”

As far as cultivation is concerned, there’s good field evidence that crops established under no-till and reduced tillage systems generally suffer less from flea beetle. Better moisture conservation is likely to be important here, says Jim.

At the same time, the Agrii work suggests that longer cereal stubbles, an even spread of chopped straw and chaff across the surface and the least soil movement at drilling are valuable in disguising the green-on-brown visual attraction of the emerging crop to adult beetles.

“Good seed-to-soil contact at drilling, lack of compaction to limit root development and a soil pH which doesn’t limit nutrient availability are vital for the best establishment,” he adds.

“Treating the seed with Take-off PGA or the new biological dressing, Integral Pro, can further improve rooting and early canopy development at a very modest cost. But the single most beneficial aid to establishment we find is a well-balanced seedbed fertiliser” he says.

“Resistance means insecticides aren’t performing as well as they used to,” Jim agrees. “Even so, they remain vital to crop survival, with our trials showing valuable advantages from a quality pyrethroid such as Cleancrop Argent (lambda-cyhalothrin) as well as adjuvants that improve uptake and coverage. Anecdotally, it may be preferable to spray at night for the best targeting. “Including garlic and other solutions with strong odours in the spray tank may also be useful to mask the smell of OSR that is attractive to adult beetles. Again, though, we don’t yet have sufficient scientific evidence here.”

Companion cropping is another area of agronomy where Agrii has growing evidence of flea beetle management value. But only with the right companions and providing they are established sufficiently well.

“You need to have a mix that fools the beetles but isn’t too competitive with the crop,” explains David. “Over the past three seasons, we’ve had great success with carefully selected varieties of buckwheat and vetch that are established strongly in cereal stubbles and readily eliminated by early frosts or herbicide treatment.

“In several cases, this companion cropping has allowed our agronomists to establish excellent OSR crops with minimal insecticide use while neighbouring crops were completely lost to beetle infestation. “Crucifers like white mustard and turnip rape have proved diversionary when grown with Clearfield varieties and easy to eliminate in the system. But they are best avoided in our experience because they can be much too competitive with the crop,” he advises.

“We find faster-developing Clearfield varieties like DK Impressario CL can also have a clear edge for their tolerance to ALS inhibitor residues when grown in reduced tillage systems where these herbicides have been used; especially if late-spring applied in a dry season.”

**OSR planning**

Jim Carswell (left) and David Leaper have been looking at a number of approaches to reduce CSFB damage.
Faye Ritchie says the effect on diseases needs to be considered when drilling early or later than normal.

Light leaf spot has a polycyclic lifecycle and is more difficult to control. “Using varieties with a high resistance rating delays the epidemic, with big differences in disease levels seen in trials between varieties with an AHDB Recommended List resistance rating of 7 and those with a lower rating of 5.

“Fungicides generally only control 50-60% of a light leaf spot epidemic but can still provide a cost-effective yield response,” she adds.

Genetic trait
ADAS have looked at the attractiveness and palatability of different varieties to CSFB and have so far found no significant differences, but this may not correspond to work being carried out elsewhere. A point in case is research at John Innes Centre is looking to find a genetic trait that may ultimately be used to confer resistance in new OSR varieties, points out Sacha.

“We’ll also be looking at whether some varieties are better able to tolerate damage than others in the IPM project,” he adds.

Vigour has been suggested as a useful characteristic to help crops grow away from flea beetle damage and Sacha agrees that this is true. As well as autumn vigour, the ability to grow away quickly in the spring could be as important, he says.

Dr Carol Norris, agronomic services manager for BASF which has the InVigor range of hybrid OSR varieties in its portfolio, highlights work carried out in 2013/14 by Dr Pete Berry and Liz Hudson of ADAS. It gave an insight into the impact vigorous hybrids can have on drilling date and yield, with some varieties having an apparent tolerance to delayed sowing date, she says.

“I’m often challenged as to whether hybrids really are more vigorous than open-pollinated varieties. The answer is generally ‘yes, they are’, but hybrids vary in their vigour.

“Some hybrid breeding programmes have clearly developed heterotic pools which maximise the hybrid effect, which is why we tend to see the InVigor varieties standing out in the autumn for vigour next to some other hybrid varieties.”

Carol is advocating a move to a later drilling for OSR as a means of limiting CSFB damage, and she believes choosing the right hybrid variety can help balance the establishment risk with potential gross output.

“What we suggest growers should be doing is looking at whether they are prepared to compromise their establishment for the chance of a couple of % in gross output. Choosing a variety such as InV1035, with high early vigour lowers the establishment risk and can still produce a high output,” she explains.

Increasing seed rate is of no benefit where CSFB larvae are concerned, explains Sacha. “We looked at seed rates of 10-120 seeds/m^2 and found no difference in the larval population/plant between seed
rates. This suggests there’s no benefit to be had from ramping up the seed rate in terms of larval load and a positive disadvantage in that there are more larvae/m² where there are more plants/m², which also means higher pest return for future years.”

Cultural approaches to limiting CSFB are also being evaluated by ADAS and ‘trap cropping’ and ‘defoliation’ are both showing promise.

The trap cropping trials have made use of the OSR volunteers that emerge after harvest so that adult CSFB will fly in and feed on them when they begin to emerge in early Aug, before the new crop has been planted.

“Once the adults have flown into the trap crop, they start to lose wing muscle so become less able to migrate. By delaying burning off OSR volunteers until late Sept, it should be possible to reduce the number of adults that will affect the newly planted crop,” explains Sacha.

Results so far have given significant reductions of adults throughout the whole trial, even after the OSR volunteers were controlled, and there’s been a corresponding reduction in the population of larvae in crops, he highlights.

**Trap crop**

“We’ve seen benefits in four of the six paired fields (OSR vol/new crop) with up to 89% fewer adults, 74% less adult damage, 39% more plants, and 67% less larvae. The trap crop effectively breaks pest life-cycle.”

Taking a broader view, Sacha points out that we still need to understand the factors that reduce effectiveness, such as the area of volunteer OSR area left as the trap crop and the drilling date of the new crop.

Faye has a few concerns about leaving OSR stubbles for longer on the surface because they act as a source of airborne spores to infect neighbouring crops and volunteers as a green bridge for some diseases.

“A balance needs to be reached when it comes to controlling diseases where inoculum can build up on stubbles and volunteers, such as phoma stem canker and light leaf spot. Clubroot is another risk and leaving uncontrolled volunteers long enough will potentially allow the disease to go through another cycle,” she says.

Another cultural approach that has moved from trial plots this season into commercial fields under the Innovative Farmers Field Lab initiative is defoliation.

“The Field Lab is looking at the effects of defoliation on eight farms in 12 fields. In plot trials there were significant reductions in larvae (31-55%) when the crop was mown off, with the highest yields when defoliation took place in Dec. The Field Lab growers are looking at different methods, including grazing by sheep, and initial assessments

**Summary of drilling dates and disease risk**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Drill (to decrease risk)</th>
<th>Why?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phoma leaf spot/stem canker</td>
<td>Earlier</td>
<td>Larger leaf size</td>
</tr>
<tr>
<td>Light leaf spot</td>
<td>Later</td>
<td>Less build-up of disease</td>
</tr>
<tr>
<td>Clubroot</td>
<td>Later</td>
<td>Lower soil temperatures</td>
</tr>
</tbody>
</table>

*Source: ADAS, 2019*
show that all but one of the sites that were defoliated have fewer larvae than undefoliated plots," he explains.

Ultimately when considering the prospects of OSR for next season, Sacha believes the season needs to be kept in perspective and it’s not a forgone conclusion that the next OSR crop will be under the same pressure as the one that will soon be harvested.

“Larvae aren’t invincible — this season everything has worked in their favour. Weather may not prove so favourable next time around.”

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**Trap Cropping 2017/18**

Results show the impact of volunteer OSR on numbers of adult CSFB. Source: ADAS, 2019

**Defoliation Field Lab results**

There was up to 77% reduction in larvae where crops were defoliated compared to untreated, with a mean reduction of 40%. Source: ADAS, 2019

**Speed of spring development**

Results show CSFB larval damage v speed of development in the spring. Source: Agri, 2019
Frustrated by the performance of winter barley and no longer able to grow oilseed rape, Colin Mitchell, farm manager at Meikleour Estate in Perthshire, has been searching for a new crop to extend the farm’s rotation. Although not the complete answer, hybrid rye is proving to be a rewarding discovery.

“Farmers in Scotland need an alternative to wheat,” he says. “It is becoming harder to keep clean of foliar diseases that limit yield, and this is making it expensive to grow. The obvious choices aren’t that attractive.”

The Meikleour Estate covers about 800 hectares and its fertile loam soils support a diverse range of crops including potatoes, energy beet and carrots, cereals perform as a disease break for higher value crops but must still pay their way.

Spring barley, winter wheat, winter barley and winter oats are already grown on the farm, but performance is variable, and the latter is vulnerable to frost damage.

Oilseed rape too is no longer a practical option due to severe clubroot problems and a desire to reduce disease risk from sclerotinia in high value root crops.

Like many farmers in Scotland, Colin Mitchell’s interest in hybrid rye was aroused after he was approached by a neighbour in need of feed stock for an anaerobic digester.

“We took a conservative approach; our 25 ha was modest in comparison with what some others were putting in. For many, it was the most profitable crop on their farms, and it can be, but you must properly account for the potash removed. This can be as much as 285kg/ha with a 50t/ha (AD) crop,” says Mr Mitchell.

This brief experience was enough to capture his interest and he began to investigate other possible markets for the crop.

“It grew well, and I was impressed by its performance, but because we want the straw to cover the carrots, we decided we’d rather grow it for grain. Straw is important to us; we use about 50t/ha to protect the carrots against frost, which equates to 4000 Hesston bales each year. Hybrid rye produces about 25% more straw than winter wheat so there is obvious appeal.”

He contacted Scottish Agronomy to discuss which varieties were best suited to grain production and soon learned that there was much to consider.

“Rye is susceptible to ergot, but the development of PollenPlus varieties has done much to remove this risk.”

Growing rye for grain however, meant first finding a buyer for it.

“A favourable amino acid profile means it is particularly well suited to pigs so that was our first thought, it wasn’t to be unfortunately. Eventually, we found a market for human consumption through a local merchant. This, however, is a limited market so I’m still working on other outlets.”

As his confidence with the crop has grown, so has the sown area and this year covers 110ha.

“In 2016 the crop yielded an average 7.7t/ha though this was on some of the farm’s least productive soils. The best-performing field managed 8.3t/ha. This made us start to take it seriously as the best crop we’ve ever had in that field previously was spring oats which managed about 6t/ha. In 2017 it achieved the same average but then in 2018 it gave 8t/ha with the best field at 10.48t/ha.”

This compares with a three-year wheat average yield for the same period of 8.3t/ha. In the drought of 2018 wheat at Meikleour managed just 7.54t/ha and cost roughly £100/ha more in variable costs.

“It appears to be the one crop where real progress is being made year-on-year to improve agronomic characteristics, such as disease and lodging resistance. This year I’m...
growing KWS Edmondo and have entered a field in the ADAS YEN competition."

"For us, it yields on a par with first wheats, but is cheaper to grow because it needs less nitrogen fertiliser and fungicide. It has already replaced some winter barley and I'm starting to think it could replace second wheat too."

The market for human consumption is limited, while other outlets need developing before the crop is likely to appeal beyond AD growers, concedes Colin Mitchell.

"The big opportunity is in pig feed. Rye is a staple of a pig finishing rations across Germany and Denmark. More interest from feed compounders or pig producers milling their own feed would encourage me to grow more.

"There is a small, but valuable market for rye as a distilling grain. Bourbon is an increasingly popular drink and Scotland has the distilling infrastructure to produce it so why not grow rye in Scotland for distilling in Scotland? Perhaps, someone will have the confidence to give it a go," he says.

At 10t/ha hybrid rye out-does wheat

Annoyed by the under-performance of winter malting barley, David Lord decided to investigate hybrid rye after a discussion with a neighbour. It's now four years later and the area grown has expanded to 40 hectares as demand has increased.

It was the low water requirement – at 300 litres per tonne of grain produced its moisture needs are typically 25% lower than that of wheat or barley – and early maturity that appealed in the first instance.

"I was looking for a crop to fit the light land rotation of potatoes, wheat, peas/onions, and wheat. Rye had good drought tolerance and the straw is useful for the cattle enterprise though we are careful to follow it with potatoes to replace the phosphate taken off (with the straw) and control the volunteers.

"We budget for yields of about 8.5t/ha, but it often exceeds this. In good years it does 10t/ha or more and as our contract sees us paid the same as feed wheat it often produces a better gross margin because it is cheaper to grow," he says.

It has since become an established crop and his 350-400 tonnes annual production is sold locally to a specialist food ingredients business.

"It does better than wheat on the same ground and is earlier to mature, but later than oilseed rape, so helps ensure a smooth harvest," he says.

Ergot is the curse of rye, but since moving to a fully hybrid variety this has become less of a concern.

"We moved to KWS Bono a few years ago partly for the higher yield potential, but also because the higher quantities of pollen these PollenPlus varieties produce means there is a far lower risk of ergot infection occurring," he says.

"It's not completely risk-free, but with milling wheat on the farm too we need to be proactive and PollenPlus varieties have helped greatly."

Crop management

Sowing is much the same as any other cereal and Mr Lord will either drill it conventionally after cultivations or direct into stubble depending on the workload at the time, the field and weed burden to be considered.

"It's certainly easy to grow. We sow it in early October, normally apply two fungicides, though it has had only one in 2019, as mildew and brown rust are the main disease pressures, and a single application of Chlormequat to keep it from lodging. About 150kg N/ha is applied in two splits and that's it.

"It matures evenly which makes combining easy and stores better in bins as it doesn’t heap that well. This suits the customer as they can take it as and when they need it," he says.

Continental pig producers improve performance with hybrid rye

Just as the arable sector faces its own challenges with loss of active ingredients and pressure to find a more sustainable rotation, the pig sector is undergoing its own challenges.
KWS own view is that the UK pig sector is well placed to drive up its own quality standards, which are already enhanced by our Red Tractor assurance.

Pig producers will be all too aware of the need to reduce antibiotic use – to which the UK is probably ahead of other European countries, whilst enhancing gut health at the same time.

Similarly there is increased focus on lowering ammonia emissions from pig production principally through using lower protein feed.

Finally, the major ongoing issue is increased welfare in the production system, eliminating tail biting, aggression in sows and finishers and reducing gut ulceration are all key concerns for any pig farmer.

Breeder investment

Given the loss of CTL, growing pressure on ramularia and septoria control – growing hybrid rye has come at the perfect time for UK arable farmers.

Given it’s a totally separate species with added benefits in terms of take-all, straw yield, earliness to harvest and big savings in nitrogen use.

Rye is also well known as being very drought tolerant.

“Our remit is to expand the market away from the traditional AD feedstock and the relatively limited Ryvita contract, into novel flours and grain and malt whisky and beer – we’re already seeing this take place in Ireland and Scotland.

“Our biggest efforts right now are to target rye’s natural home in the feed market for dry sows and finishing pigs.

Some might suggest rye could displace oilseed rape, but our view at KWS is it may help broaden the rotation and help OSR establishment”.

By leaving the stubble height taller

KWS has recently published a fully upgraded rye brochure – with the latest information on agronomy and end uses – including a brand new sections on rye flour, alcohol applications and the benefits of rye to the pig sector.

For more information please email john.burgess@kws.com

What could rye offer that wheat or barley don’t do already?

UK producers only have to look to our Danish counterparts for clear proof as to the benefits of rye.

In Denmark, Germany, Russia, Poland and Spain, rye is an established component of pig rations as it leads to less aggression, lower ammonia emissions and added benefits in gut health, without compromising growth rates or finishing costs.

It is also attracting interest among pig producers and feed compounders in North America for the same reasons it is already widely used in continental Europe.

Research has identified several positive benefits from feeding rye:

- Positive behavioural effects via satiety inducement (especially in finishers and dry sows)
- Reduced gut ulceration and positive promotion of hind gut and colon health;
- Low non-essential nitrogen and reduced faecal losses resulting in lower ammonia emissions
- Higher straw yield for environmental enrichment
- Similar copper and zinc mineral content to wheat, barley and oats, but higher Vitamin E content
- Inherently high fructan and phytase levels both of which aid gut health and phosphorous metabolism with rye, there are indications of better masking effects from flea beetle attack, whilst growers would not suffer from any loss in straw as a cash income, as rye has a straw yield of around 4-5t/ha alone.

KWS key growth markets for rye include some of Europe’s most intensive pig producing regions

Graphic source: Statistical portrait of pig production in Europe (sows by region) EUROSTAT, 2014
It’s a problem that’s probably been evolving for decades.

The erucic acid problem

Finding a solution to a problem is almost impossible when the cause hasn’t been established. CPM takes a look at the latest research into elevated erucic acid in rapeseed and how this has resulted in new advice to growers. By Lucy de la Pasture

Albert Einstein once said, ‘If I had an hour to solve a problem, I’d spend 55 minutes thinking about the problem and five minutes thinking about solutions.’ For the OSR industry the problem has been unexpectedly high levels of erucic in seed going to the crush, but the true source of the problem remained a mystery — a situation which meant the solution was far from clear.

So AHDB commissioned NIAB to find out the answer to the million-dollar question: where are these elevated levels of erucic acid in OSR loads actually coming from?

Double-low varieties of oilseed have an erucic acid content which is inherently in the region of 0.1%, well below the current limit of 5%. Even though the percentage of loads coming in with high erucic acid has been low, it’s a situation that has become magnified by a proposed lowering of the legal limit for erucic acid to just 2%, posing potential problems for crushers and OSR growers alike, explains AHDB’s manager for quality and safety research, Dhan Bhandari.

Finger pointing

“There was a lot of finger pointing going on in the supply chain but with no hard proof, it was impossible to pinpoint the most likely source of contamination. Possible causes included contamination from high-erucic acid (HEAR) seed in accidental mix-ups on farm or at merchants’ stores, incomplete cleaning of seed, and wild cruciferous seeds with a naturally high erucic acid content, such as mustard and charlock,” he comments.

“Other possibilities included cross-pollination between double-low varieties and either wild crucifers or volunteer OSR plants, and the presence of HEAR volunteers in the crop, which were widely grown before the introduction of double-lows, as well as more recently for industrial usage and renewable fuels,” says Dhan.

“The researchers at NIAB have expertise in erucic acid and have been carrying out the testing on certified OSR seed for years,” he adds.

Leading the research was oilseed and pulse specialist Simon Kightley, who explains the 2% limit for erucic acid in seed isn’t new.

“It’s been in the Federation of Oils, Seeds and Fats Association (FOSFA) contract for rapeseed for many years, in line with the 2% limit for National Listing of low erucic acid varieties when they were introduced in the 1970s,” he says.

“In the absence of sufficiently sensitive testing equipment at intake, the limit had always been applied with a degree of tolerance. More recently (2015-2017), spikes in the erucic acid content of extracted oil and the introduction of improved near-infrared spectrophotometers (NIRS) created awareness of a problem that had previously gone unnoticed,” comments Simon.

The erucic acid problem remains small, with currently around 1.5% of loads being penalised or rejected in the UK, but it’s significant, says Simon.

“Even after mixing in with the general heap in communal stores, the problem was
beginning to show. It only takes one fully high-erucic acid seed with a level of 50% in 50 seeds to raise the level to 1%. Two or three seeds and you’re going to be over the limit.”

And this is what Simon and his team looked at in the research. In the forensic investigation, a set of 50 samples from commercial OSR crops was taken during harvest 2017 and provided the core of the study; which looked at the different testing methodology and the presence of any high-erucic weed seeds in the samples. A further subset of 12 samples was then looked at in detail, with examination of 50 individual seeds to identify whether any cross-pollination or volunteer contamination was occurring.

The initial analysis of samples showed a variation in erucic acid contents which highlighted farm-saved seed as being at the highest risk of testing high, with Clearfield and hybrids varieties at the other end of the spectrum, testing well within erucic acid limits.

“The results identified a small risk from erucic acid presence in sown seed, particularly farm-saved seed, and this gives rise to the advice that seed for sowing should be tested for elevated erucic acid and rejected if it’s more than 1%, although hybrid seed appears to be very clean in this respect,” explains Simon.

“As well as testing any seed intended for home-saving, it’s important to stress the importance of seeing a test result for any bought seed,” he adds.

But it was the study of samples looking at Research shows that OSR volunteers are the main source of raised erucic acid levels in rapeseed.

![Graph](image)

The graph shows the erucic acid content of harvested crop categorized by seed production type. The data is as follows:

<table>
<thead>
<tr>
<th>Seed Production Type</th>
<th>Number</th>
<th>Mean</th>
<th>Maximum</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm saved seed</td>
<td>16</td>
<td>5.85</td>
<td>35.80</td>
<td>0.13</td>
</tr>
<tr>
<td>Farm saved seed excluding outlier</td>
<td>15</td>
<td>3.86</td>
<td>12.08</td>
<td>0.13</td>
</tr>
<tr>
<td>Certified conventional variety</td>
<td>8</td>
<td>4.55</td>
<td>19.88</td>
<td>0.23</td>
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<tr>
<td>Conventional varieties excluding outlier</td>
<td>7</td>
<td>2.63</td>
<td>6.96</td>
<td>0.23</td>
</tr>
<tr>
<td>Mixed conventional and Clearfield hybrid</td>
<td>1</td>
<td>1.06</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Certified Clearfield hybrids</td>
<td>4</td>
<td>0.09</td>
<td>0.12</td>
<td>0.05</td>
</tr>
<tr>
<td>Certified hybrids</td>
<td>2</td>
<td>0.13</td>
<td>0.14</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Categorised by seed production type, for 15 samples of certified oilseed rape grown from different variety types and of 16 crops from farm-saved seed (% erucic acid).

Source: AHDB Project report No 602

Progress in reducing erucic acid must continue

Even though the UK’s largest rapeseed crusher has reported an improving situation in comparison to previous years, OSR growers are being urged to continue the progress made in reducing levels of erucic acid.

High levels of erucic acid is bad news all round, believes Martin Farrow, general manager of ADM Erith. For growers it could lead to deductions or outright rejections which in turn leads to supply issues for crushers, he explains.

“While the legal limit on erucic acid in rapeseed oil products across Europe is currently set at a maximum of 5%, there are EU proposals to reduce this to 2%, which brings it in line with FOSFA contracts and the industry in general.

“Growers who have concerns about their levels will be reassured to know that ADM Erith Crush has no plans to apply claims to deliveries of rapeseed which have less than 4.99% erucic acid content. It’s encouraging that we’ve seen a reduction in the number of loads over 2% in comparison to last year,” he comments.

Although Martin’s comments provide some reassurance to OSR growers’ concerns, Owen Cligg of United Oilseeds says it’s important that the progress in reducing erucic acid levels continues and the work funded by AHDB will be really helpful for growers in understanding the problem better.

“Background levels have generally been on an upward trend over the past five years but there’s now evidence of a decline, possibly because of more awareness of the issue and growers taking action,” he says.

The research carried out by NIAB advises growers should ensure that any seed — purchased or farm-saved — has been tested and shown not to pose a risk by exceeding erucic acid levels for seed.

Owen reinforces the report’s conclusions, saying the best cultural practices to minimise volunteer OSR in crops is crucial where any background threat exists. He also advises that samples from every load transported to crushers should be retained for reference in the event of disputed test results.

He subscribes to the view that volunteer OSR cross-pollination has contributed to the issue and an increase in the planted area of Clearfield OSR has helped combat the problem. So-called ‘weed seed’ and higher erucic rape (HEAR) varieties grown for industrial use are also possible causes.

United Oilseeds has implemented testing of all loads destined for storage to ensure an accurate picture of erucic acid levels is understood before loads are delivered to the crush, he adds.
Keeping representative samples from each field can help identify where problems arise and provides the opportunity to retest in case of dispute.

every single seed that started to explain what may be happening in UK crops as far as erucic acid is concerned. “The results showed that in all 12 samples, contaminant seeds with varying levels of erucic acid elevation were identified, and it was clear it was these that were responsible rather than a drift in the erucic acid content of the crop as a whole,” explains Simon.

“Most of the seed were at or below the limit of detectability of 0.1% erucic acid content. This gave a very clear indication that the low-erucic acid trait itself is very stable. The contaminated seeds came from high-erucic volunteers or from crossing between volunteers and the sown crop, possibly over repeated rotations,” he says.

These varied in proportions between the samples studied but were found at levels up to 50%. Simon says the result of the study points to the most likely cause being that crops have bred and cross-bred with volunteers from high-erucic acid OSR crops which have resurfaced, often many years after they were originally grown as a crop.

“Growers should be aware of these from their farm records and will have to learn to live with them but exercise very tight agronomy to restrict their numbers,” he suggests. “The move to very low target populations makes this harder because there’s a greater influence from any volunteers that become part of the crop.”

But looking back further in time, it’s possible to see that the volunteer problem isn’t all down to the past few rotations, it’s a problem that’s probably been evolving for decades, believes Simon.

**Dominant trait**

“Before the low-erucic acid varieties were introduced, a lot of the early varieties were around 40% erucic acid. Seeds from these will have come up every time OSR has been grown in a field and, with the high-erucic trait being dominant, will have perpetuated themselves and crossed into the low-erucic crop,” he explains.

The other source of contamination was the period of industrial cropping, on set-aside, from about 1994 to 2002, points out Simon. “Quite a lot of high-erucic rape was grown as industrial contracts at that time and my feeling is that it wasn’t always recorded as such.”

One of the expected sources of high erucic acid from wild brassica weed seeds was found not to be responsible for elevated erucic acid in this research, but Simon highlights they could pose serious potential threats if uncontrolled.

“Of the few charlock seeds that we found and tested, the erucic acid came out at about 42%. Controlling brassica weeds is often difficult in mild winters, when the few available herbicides can’t be used until the crop is sufficiently waxed-up, after frost, to give it sufficient protection.

“This year we found to our cost at one of our Norfolk sites, that runch (Raphanus raphanistrum) is far less sensitive than charlock (Sinapis arvensis) to Cleranda (imazamox+ metazachlor) and needs taking out a lot earlier, at around the 2-leaf stage.”

**Risk points for high erucic acid**

- **Seed source** – ask for a written declaration of erucic acid content for certified seed and send any home-saved seed for testing. Keep a sealed sample of any seed used in case of later dispute.
- **Pre-planting** – assess risk from farm cropping history (ideally 15 years). Volunteer OSR poses the greatest risk so delay any cultivations for one month after harvest so any seed buried has dormancy and spray off any emerged OSR volunteers and weeds with a non-selective herbicide.
- **Established crops (weeds and volunteers)** – consider wider row spacing for inter-row hoeing or use Clearfield varieties.
- **Harvest** – adopt strategies to minimise seed shedding from pod shatter and segregate all double-low rapeseed from any HEAR or home-saved seed. Keep representative samples from each field.
- **Contracts** – retaining representative samples provides the opportunity to retest in case of any disputes and to identify fields with specific problems.

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**Research roundup**

AHDB Project No 21130055, ‘Investigation of high levels of erucic acid in consignments of double-zero oilseed rape varieties’ was carried out by NIAB in partnership with Campden BRI and ran from March 2018 to Feb 2019 at a cost of £46,000.

**Guidelines to minimise the risk of erucic acid in double-low oilseed rape** are available at ahdb.org.uk/erucic-acid and have been produced in association with Agricultural Industries Confederation (AIC); British Society of Plant Breeders (BSPB), National Association of Agricultural Contractors (NAAC); National Farmers Union (NFU); NIAB TAG; Official Seed Testing Station (at NIAB) and Seed Crushers and Oil Processors Association (SCOPA).
It’s crunch time for OSR.

Almost a third of growers have reduced the area they’ve cropped to winter oilseed rape in recent years, and a further third plan to reduce this further or stop growing the crop altogether. This is among the findings of a recent survey undertaken by CPM and BASF to understand planting intentions following one of the most difficult growing seasons of recent years.

The respondents represented around 84,000ha of UK arable cropping, of which around 11,000ha are currently growing OSR. But only around half of the respondents are planning to maintain their cropped area (see chart on p33), with 23% intending to reduce the amount of OSR grown and 8% exiting the crop. Just 6% of respondents are planning to increase their OSR area.

“It’s crunch time for OSR,” notes BASF OSR technical manager Clare Tucker. “A lot of growers are broadening their rotations, and while some are walking away from the crop, the survey shows most want to stick with it, with the probable aim of getting a better result. Just how much is established this autumn will still largely depend on how crops do at harvest, however.”

CFSB damage

The survey gives an indication of just how much OSR growers are losing, and what’s causing these losses (see chart on p33). Most lose up to a quarter of their crop through cabbage stem flea beetle (adult or larvae), pigeons or as the result of a poor/dry seedbed. Adult CSFB damage is seen as causing the most damage, with this increasing, and a significant number of growers lost up to half their crop to the pest in autumn 2019. But larval damage is also rising significantly, while growers struggled with dry seedbeds in the autumns of 2016 and 2018.

“It’s the combination of the two factors at establishment that’s noteworthy,” says Clare. “A crop drilled in dry conditions will really struggle to grow away from CSFB.”

ADAS entomologist Dr Steve Ellis agrees. “Studies we’ve carried out show that OSR really is very robust and even small plants can withstand significant damage from adult CSFB without affecting yield. But this does rely on the plant having enough moisture to grow away — this is critical.”

The effect of larval damage may have been underestimated in the past, he adds. “I’ve always considered damage from adults to be the most significant cause of losses. But there’s evidence from grower reports that this year larval damage is equally significant, and may even be more damaging.”

Suffolk-based agronomist with Prime Agriculture, Marion Self, agrees that larval damage is on the rise. “In previous years, growers in my area have tolerated the moderate amount of damage they’ve seen. But this year, there’s been a significant increase and quite a few crops across Suffolk and Cambs look as though they’ll disappoint. A better understanding of this aspect will be crucial for next year — most growers want to stick with the crop, but want to be able to grow it better.”

She also echoes comments on dry seedbeds. “You must have your eye on the weather forecast before drilling. Seedbed conditions with adequate moisture and good seed-to-soil contact are absolutely crucial to give the best chance of good establishment.
“A crop in a dry seedbed may well pull through, and one in good growing conditions can withstand a heavier CSFB infestation. But if you have both, that has a huge impact. Although, if you’re going to lose the crop, it’s best to lose it early — that way you can at least drill something else and the cost won’t have been too high.”

So this puts the focus on drilling date. The survey shows late Aug as the most popular timing, with 46% of growers choosing this window (see chart on p34). Earlier in the month (27%) is preferred to leaving it until Sept (16%). Looking ahead, 22% of growers plan to drill earlier this autumn, with just 5% intending to go later.

**Popular timing**

“Mid to late Aug is the most popular timing,” says Clare. “But larval damage is also related to date, and crops drilled early are potentially most at risk. A more strategic approach, such as staggering the establishment date, may work better than simply drilling early.”

Marion reckons mid Aug is still the best timing, with the hope of avoiding the main migration period of the end of Aug. “The cut-off date for most growers is around 10 Sept, but I’ve seen crops established after that date that have gone on to perform well. You can miss the CSFB epidemic altogether by drilling late, but this carries too much risk from unfavourable establishment conditions, pest damage by slugs and pigeons and other winter losses.”

Another important factor is fertility, she continues. “An application of poultry manure gives a good boost, although seedbed fertiliser, ideally placed with the seed, can also help the crop get established. Care should be taken to stay within NVZ guidelines, however.”

Steve believes we still don’t know enough about the migration of CSFB to be able to guide drilling date. “In most seasons, migration occurs towards the end of Aug, but we don’t know what triggers it, nor enough yet about what draws beetles into the new crop — it’s not as predictable as with pollen beetle, for example.”

Adults hatch during the summer and stay in the crop until harvest, when they move into field edges and hedgerows. “We know that brassica odour draws them, and that once they migrate into a new crop, they will stay in it. We also know that the impact of the pest and pest pressure is dependent on temperature.

“There’s some evidence that leaving volunteers to germinate in OSR stubble can give you a successful trap crop, but this doesn’t work in all cases, and we’re not sure yet what stage of the plant is most attractive to beetles — they may ignore a thick crop of established volunteers in favour of young cotyledons.

“They appear to be less drawn towards direct-drilled crops, however, and that may be related to the length of the cereal stubble.”

Although you can’t predict how CSFB adults will behave, Steve does think varietal choice will influence how your crop is able to tolerate damage. “A crop with vigour will grow away from damage, especially if sowing later.”

Respondents in the survey appear to be leaning towards...
**OSR intentions survey**

**Drilling date intentions**

Drilling date for 2018/19

![Drilling date intentions chart](image)

**Intended date for 2019/20**

![Intended date chart](image)

**Winter OSR types**

![Winter OSR types chart](image)

> hybrids, rather than conventional varieties, to deliver the vigour to pull the crop through (see chart left). In total, 59% of the OSR area declared is currently cropped with hybrid varieties, with this figure rising slightly to 61% this autumn, according to respondents’ intentions.

> “InVigor varieties fit really well in the later drilling slot,” notes Clare. “The comments made in the survey indicate that many growers are drilling earlier and using higher seed rates of farm-saved seed to counter the effect of CSFB. But our feeling is that doesn’t necessarily reduce pest pressure, and can actually increase larval damage. The best tactic is to stick to sensible seed rates.”

**Move to hybrid**

But Marion’s surprised that growers appear to be moving towards hybrid varieties.

> “My impression is there are more open-pollinated varieties and farm-saved seed grown at a higher seed rate. The lower plant populations usually established with hybrids result in less plants to spread around the pressure from CSFB.

> “If planting a conventional crop, it’s still important to be guided by agronomic principles of establishing the right crop canopy, so you should never drill too much seed. But a good strategy against CSFB would be a robust rate of a conventional variety.

> “Equally, vigour is important, both in autumn and spring, and better information on which varieties deliver this, whether hybrid or conventional, would be really helpful.”

In trials, ADAS has found that larval populations per m² are greater in crops drilled at higher seed rates, says Steve, although larvae per plant are similar. “But there’s still a lot to learn about this pest. Not enough work has been done on integrated pest management as historically growers have been able to rely on pyrethroids and neonicotinoids to keep adult populations below threshold levels for larval damage.”

There is evidence to show that defoliating a well established crop helps, he notes. “The larvae are removed with the chopped stems and don’t re-infest the crop. A well established crop will then grow away in spring, and if the defoliation is timed right, yield won’t be affected.

> “You could argue that pigeon damage could have the same beneficial effect, although patchiness is a problem — you want to go into the spring with an even crop.”

One aspect that appeared to go relatively smoothly last autumn was weed control, with over 80% of respondents satisfied with their weed control programme. Charlock, cranesbill, cleavers and mayweed were identified as the main culprits, alongside blackgrass. A small number (less than 4%) admitted to receiving a penalty for erucic acid contamination from the 2018 harvest.

> “The national figure for erucic acid exceedances is actually around 13%,” notes Clare. “The threshold is coming down to just 2%, and you don’t need many volunteers to contaminate a sample.”

Marion believes this may catch out quite a few growers.

> “Many don’t realise quite how close they are to triggering an exceedance, so this may become more of an issue.”
The weed spectrum highlights those that are prevalent in her part of the world. “You can see it makes sense for some to move to Clearfield varieties. That way, you don’t have to spend up front on pre-emergence herbicides, but can wait to see if your crop establishes.”

The area grown to Clearfield varieties is set to rise from 19% to 22%, according to the survey. The top two benefits identified are management of brassica weeds and of volunteers, with post-emergence weed control coming in a close third (see chart right).

There’s a good choice of Clearfield varieties on offer, notes Clare. “All of them are tolerant of any sulfonylurea residues left in the soil from previous crops and so will grow away unimpeded. Some varieties also have strong autumn vigour as a specific characteristic.”

Both Cleranda (imazamox+ metazachlor) and Cleravo (imazamox+ quinmerac) offer effective control of a wide weed spectrum, controlling broadleaf weeds and volunteer cereals, she adds. “Cleranda will provide a bit more residual activity given its metazachlor component.”

Target timing on the weeds is 1-4 true leaves during Sept or Oct. “It’s the only answer to some tricky weeds such as runch. But this quickly develops a resilient tap root so ideally it needs spraying at 2-3 true leaves. Both herbicides can be used in sequence with Kerb (propyzamide) or Astrokerb (with aminopyralid) to cover blackgrass control.”

OSR intentions survey

**Perceived benefits of the Clearfield system**

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management of brassica weeds</td>
<td>Highest</td>
</tr>
<tr>
<td>Management of volunteers to remove</td>
<td></td>
</tr>
<tr>
<td>potential sources of brassica acid</td>
<td></td>
</tr>
<tr>
<td>Post-emergence weed control (wait &amp; see</td>
<td></td>
</tr>
<tr>
<td>approach)</td>
<td></td>
</tr>
<tr>
<td>Autumn vigour</td>
<td></td>
</tr>
<tr>
<td>Management of volunteers for optimum</td>
<td></td>
</tr>
<tr>
<td>canopy</td>
<td></td>
</tr>
<tr>
<td>Tolerance to SI herbicides used in previous</td>
<td></td>
</tr>
<tr>
<td>crop</td>
<td>Lowest</td>
</tr>
</tbody>
</table>

**Winner announcement**

Congratulations to our lucky winner, Alex Borth from Lincs, who responded to the CPM/BASF survey on growing oilseed rape and has won the fabulous prize of a GoPro HERO 7 plus accessory pack.

Alex responded to the survey and completed the tie-breaker question, explaining the secret to good weed control. While there was a wide selection of strong answers, Alex’s response: “Integrated approach, attention to detail, knowing field history and use of pre-em as a base to program,” stood out to judges as a comprehensive and informed line of attack.

The aim of the survey was to explore growers’ attitude and approach to growing oilseed rape in search of the best strategy to producing a successful crop. To take part in the next survey, make sure we have your correct details by emailing angus@cpm-magazine.co.uk.

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The future lies in layers

Genetics are coming to the fore in oilseed rape breeding. CPM talks to breeders DSV to discover the traits hybrid varieties now offer and how these are useful to growers as the crop faces new challenges.

By Lucy de la Pasture

Hybrid oilseed rape varieties initially gained popularity with UK growers because of their improved vigour over conventional varieties, which in the field led to greater establishment reliability and higher yields.

As the regulatory climate has changed and pesticide resistance has become commonplace, growers have looked more and more to plant breeders to provide genetic solutions to agronomic problems to reduce their reliance on pesticides. This is where hybrids have the distinct advantage because new traits can be introduced in a fraction of the time it takes using the ‘trial and error’ approach of conventional breeding.

Dr Alexander Döring, international OSR product manager at plant breeder DSV, explains the progress made in hybrid breeding and Mike Mann, managing director of DSV UK highlights, how these combinations of traits will benefit OSR producers.

What traits are available in OSR

Modern hybrids have come a long way from the tall, high yielding varieties that were first introduced several decades ago. Difficulties in establishment and variabilities in OSR yield have always been two of the main drivers in plant breeding but losses in the armoury of plant protection products and resistance have become increasingly influential.

Recognising this, DSV introduced key characteristics into all their new hybrid OSR varieties to ensure they were well equipped for the post-neonicotinoid (PNN) era. The characteristics identified to give PNN varieties the edge are a superior primary response (vigour in the first 40 days), enhanced solar capture, performance stability and optimum pod presentation.

With these four characteristics as a foundation, varieties are now being produced with other genetic traits ‘layered’ on top. As new varieties are coming through the number of layers is becoming more complex, with the first quad-layered varieties soon to reach the market.

Some of the key traits currently available to plant breeders are resistance to phoma stem canker and light leaf spot, TuYV resistance, tolerance to verticillium wilt, pod shatter resistance, club root resistance and ALS-tolerance in Clearfield varieties.

Alexander Döring says breeding for disease resistance and agronomic traits that limit the reliance on pesticides has really come of age.
Layered genetics help save costs and ease management

With 950ha of OSR in the ground, the opportunity to cut inputs and achieve greater consistency of production has real appeal to Linics grower, Andrew Harker of H. R. Bourn and Sons.

He’s currently growing double-layer variety Temptation, which he reports is looking good, and in the autumn Andrew plans to add the triple-layer variety Darling into the mix.

When it comes to OSR, establishment is key, he believes, so the high early vigour at the heart of the new layered varieties is important to him.

“Our land is spread across 40 miles and we’ve got a real range of soil types within that — from light, sandy soil to heavy clay and everything in between. It means the varieties we choose have to establish reliably in a range of conditions.

“Flea beetle is an issue here but the lack of water after drilling was a bigger problem last year. Slugs can be an issue as well, so we want something that has the vigour to get growing right away and the strength to keep going to fend off disease and pest threats,” comments Andrew.

“Spring vigour is also important, so we get good canopy development and pod fill as the season develops.”

Genetic resilience is becoming increasingly significant now varieties have to cope with a wider range of growing conditions than ever before, Andrew believes.

“This year we were able to start our spring drilling in Feb, whereas last year it wasn’t until April because it was so cold. We also seem to have more ‘blocks’ of very different weather, so you have to make full use of available windows. This can make timings of applications difficult as well as testing a variety’s ability to cope with different stresses.

“So as well as cost-savings from reduced inputs, layered varieties should make day-to-day management easier,” he adds.

Pod shatter resistance as part of the layered approach has real benefits, he believes. “With such a large area to harvest, pod shatter resistance is a good insurance policy for us. We really don’t want to lose any yield through shedding before we can harvest the crop.”

In terms of disease control, Andrew views the stem canker and light leaf spot resistances in the triple-layered varieties as welcome, but he believes the TuYV element is probably even more important.

“TuYV seems to be one of those hidden diseases that you don’t really see but it’s there in the background, just nipping away at your yields without you knowing about it. It’s another key insurance policy which I think will become even more important in the future.

“We’re all going to have reduce our dependence on chemistry not just resistance added to the mix and there are currently two new quad-layered varieties now entering the UK testing system.

The first is a high output hybrid OSR, featuring multi-gene phoma stem canker, TuYV, pod shatter and clubroot resistances.

With clubroot an increasing problem in the Borders and Scotland this will be a variety particularly relevant to the North of the country, although it is clear that the disease is becoming an issue in other parts of the UK.

What about Clearfield?
A similar approach to breeding is being taken in the Clearfield programme, with additional traits ▶
Two new triple-layer varieties, Darling and Dazzler, both have TuYV resistance and are currently on the AHDB candidate list.

- being stacked in new varieties. Phoenix CL is the first DSV Clearfield variety to include pod shatter resistance and new variety, Plurax CL, takes this a step further featuring a strong tolerance to verticillium wilt as an additional layer.

How do these varieties perform?

<table>
<thead>
<tr>
<th>DSV layer varieties at a glance</th>
<th>Name</th>
<th>Type</th>
<th>Features</th>
<th>Gross output</th>
<th>Oil content</th>
<th>Vigour profile</th>
<th>Lodging resistance</th>
<th>Verticillium wilt tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temptation</td>
<td>Double-layer</td>
<td>multi-gene</td>
<td>phoma stem canker and light leaf spot</td>
<td>101%</td>
<td>46.0%</td>
<td>outstanding growth in both autumn and spring</td>
<td>8</td>
<td>medium/good</td>
</tr>
<tr>
<td>Darling</td>
<td>Triple-layer</td>
<td>Rim7 +</td>
<td>phoma stem canker TuYV resistance Pod shatter resistance</td>
<td>100%</td>
<td>45.9%</td>
<td>high in both autumn and spring</td>
<td>7</td>
<td>very good/good</td>
</tr>
<tr>
<td>Dazzler</td>
<td>Triple-layer</td>
<td>Rim7 +</td>
<td>phoma stem canker TuYV resistance Pod shatter resistance</td>
<td>104%</td>
<td>46.0%</td>
<td>exceptional early vigour with strong spring growth</td>
<td>7</td>
<td>medium/good</td>
</tr>
</tbody>
</table>

Source: Data on Temptation from AHDB 2019/20 Recommended List and on Darling and Dazzler from AHDB 2019/20 Candidate List.

DSV’s new layered varieties are a great example of how the requirements of growers, the opportunities offered by advanced technology and the vision of forward-looking companies can align themselves to respond to the challenges posed by modern agriculture and the environment in which it operates.

The way we farm is changing and fast. Whether it’s revocation of chemistry, impact of climate change, environmental considerations or the best way to protect our soils, everything is up for debate.

In such a future the key words of resilience and reliability become increasingly important as these give growers greater security and safety in terms of their overall production and business viability.

The opportunity to grow strong healthy crops, less reliant on inputs and management intervention is a real game-changer for crop producers and this is precisely why high performance “layered” varieties will become increasingly important in the challenging future we all face.
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Lessons learned are hard won

No one doubts it’s been a challenging year for oilseed rape. Openfield, however, has applied its resources to pull out positive lessons to draw from it. CPM gets exclusive insight.

By Tom Allen-Stevens

Whether you grow oilseed rape for next harvest may depend on how badly you were burnt by the crop this year. Lee Bennett, Openfield’s head of seeds business, is keen to see that growers dress the wound properly and put their scars into perspective when considering what to put into the ground for harvest 2020.

“How deep is the wound?” he asks. “Some growers were singed, while others suffered first degree burns. But even in the absence of cabbage stem flea beetle last autumn, many crops were put into a seedbed with insufficient moisture. Some of the deepest wounds were suffered by those who had a good crop before Christmas, just to see it destroyed by CSFB larvae in the spring — could this have been avoided?”

Lee freely admits that OSR is a crop in which he has a strong interest and he’s also keen to share the knowledge and resources Openfield has with the 6000 farmers in total with whom the co-op does business. As the largest farmer-owned co-operative, referred to as a partnership, it sees itself as having a unique outlook on the industry, and a responsibility to its 4000 farmer members that goes beyond maximising shareholder value.

Well informed opinion

To Lee, that translates into providing an honest, but well informed opinion. “I’m not going to dress a pig up as a cow — I say it as I see it. But anything we do is well researched and technical before it’s commercial,” he continues.

“This year in particular, farmers will be facing a tough choice on OSR. The ultimate decision about whether to grow the crop will be up to them, but where we can help is to bring the knowledge and resource we have to ensure it’s a well informed choice. For those who stick with the crop, we can help with product choice and guidance, combined with a grower’s experience, to bring the best results next harvest.”

Lee prefers to start by looking at the overall market for OSR, combining knowledge from the seed-sales team with that of Openfield’s grain-marketing team. Senior OSR trader John Thorpe pegs the OSR area for 2019 harvest down 10%, compared with last year, at 505,000ha.

“That gives us a production of around 1.7M tonnes. Assuming domestic demand remains constant, there’ll be a deficit of 300,000t. The question is where that will come from,” he says.

“The EU crop is also estimated to fall, and globally everything in oilseeds is changing as a result of the ongoing trade war between China and the US. The EU will be looking to import 5M tonnes, and inward supplies from some countries are limited by GM issues.”

The volatility of sterling and continued uncertainty over Brexit further cloud the picture. “Chances are, the market for new crop will be tight, so one thing you can say about rapeseed is that it won’t struggle to find a home.”

The same can’t be said of OSR alternatives, with the market for both beans and oats fairly finite and easily pushed into
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oversupply. "Niche crops are called niche for a reason — the produce can be difficult to market, although if you’re determined to switch out of OSR, talk to us first about where the best opportunities lie,” advises John.

But it makes well established OSR the best chance of success with a break crop this autumn, and to achieve that, Lee points first to crop fundamentals. “Moisture is the absolute number one priority for your crop — seed has to be put into a soil with sufficient moisture, and that is likely to dictate the day on which you drill.”

For CSFB, it’s important to know your enemy, he says. “The larvae emerge as juvenile adults towards the end of June into the existing crop and after a spell of time spent grazing, they will then enter a period of enforced dormancy called aestivation. This is an essential phase in their lifecycle and is unaffected by any environmental conditions. “Around the third week of Aug, they’ll reappear as full adults, ready to eat and looking to mate, and they’ll travel up to three miles to do so. This is when they migrate into crops, attracted by the volatiles emitted from the OSR plants’ glucosinolates — it’s like a moth to a flame. Once they find a new home, they won’t fly again, as their flight muscles atrophy, or wither away. Just how active they are depends mainly on how warm it is.”

**Up to 1000 eggs**
Females can lay up to 1000 eggs in a season, placed in the soil, and the larvae that hatch can travel up to 50cm to find a host plant. “Planting in early Aug reduces the effect of damage from the adults, because the plants are big enough to withstand it, but that’s where the highest larval populations are most likely to be. So you’ll have a lovely crop before Christmas, only to see it wiped out later,” notes Lee. Late Aug, when most OSR is drilled, coincides exactly with CSFB migration. “The difficulty we had last year was that it was dry with a cooling seedbed, which is why many crops planted then were hammered by adults. “So the beginning of Sept, for much of the UK, is looking like the safest bet. But that still very much depends on moisture — don’t plant if it’s too dry. And the cut-off date for most is mid-Sept.”

Lee regards trap and companion crops with a healthy degree of scepticism. “Some species of mustard have been shown to be beneficial, but it grows faster than OSR, so make sure you can take the companion plants out — Clearfield is the most reliable route.
Just what role do seed coatings perform? It’s an area that’s becoming more complex, but could be increasingly important to ensure the OSR crop gets off to a good start.

The difficulty is knowing which, if any, to go with, notes Lee. “We’ve had all and sundry knocking at the door promoting the benefits of biologicals and biostimulants. So we thought the best course of action was to commission some independent trials to tease out the benefits.”

These have been carried out by Dr Steve Rossall at the University of Nottingham. “Growers are struggling with less actives available and resistance management, emphasising the need for enhanced plant vigour. Weather extremes are also now more commonplace, so good crop establishment has become vital,” he says.

Many of the seed coatings claimed to help are classed as biostimulants, he notes. “But just what are these? You could consider them a new group of crop production chemicals, different from pesticides and fertilisers. However, some work and others don’t — some of the claims are bold, and the industry needs standard assays by which to assess them, to back up these claims.”

Steve’s involved in a joint BBSRC and industry-funded research programme that aims to bring some clarity, and he also carried out the work for Openfield, putting 19 commercially available seed coatings through a series of rigorous tests.

“We sowed Aardvark OSR seed in plugs and then transferred these at the two-leaf stage into a hydroponic medium that allowed ready assessment of root growth. We also looked at speed of germination at low temperature, and tolerance to drought stress after withdrawal of water in a field soil-pot experiment.”

And the conclusion? “There are real statistical differences between the products. In fact, four or five stand out as ‘premier league’ and do an outstanding job in helping rapid germination, early root development and drought tolerance,” says Steve.

In the root-growth trials, for example, the maximum response was a whopping 65% over untreated, where plants were growing under optimum conditions. “This isn’t just down to plant volatiles it produces, and the more adults you’ll bring in. The only benefit of planting plenty of cheap seed is potentially the cost.”

By far the better route is to look for a crop with get-up-and-go, and that usually means a hybrid, Lee points out. “Vigour should come first, second and third on your list of priorities, and ideally you’re looking for a variety that shows vigour twice — in the autumn to get ahead of the adults and in the spring to grow away from larval damage.

“Success with hybrids is quite a lot higher than conventional — as well as growing faster, they put on bigger cotyledons and leaves.” There’s only one scenario that you wouldn’t want the vigour, he adds, and that’s if you were planning to sow at the beginning of Aug — even then you’d still look for spring vigour.

After that, the traits on offer come down to personal preference, or “blonds and brunettes”, as Lee terms it. “Fungicides now nutrition — some of these products are doing something more fundamental, and science is only just beginning to unravel what it is,” he notes.

The trials have been an eye-opener for Lee. “It’s confirmed some of our suspicions and highlighted where we should be going in this area.” There are two new products Openfield will be launching this autumn, he adds.
Better buying, better selling

A reduced OSR area and crop failure puts the likely production figure around 300,000t below the domestic demand.

- have limited effect on light leaf spot, so a variety with a high disease rating may be a priority. On phoma, RLM7 gives you major gene resistance, but not all have multigenic resistance, too — it’s essential to have both.”

Standing power comes next on his list of favoured traits, especially for those on fertile sites. Pod shatter resistance gives you a variety that “waits for you” at harvest time, and more and more varieties are now offering resistance to turnip yellow virus (TuYV).

“We’ve done a lot of testing on virus levels in current crops, and while the results would normally be around 20-40%, this year we’re seeing crops that are 100% infected all too regularly, across a broad area of England. TuYV tolerance is fast becoming a must-have trait.”

But somewhere way down on the priority list comes yield. “If you don’t have the traits and behaviours that will deliver a resilient crop, you won’t have a crop at all, so outright yield becomes a secondary requirement,” says Lee.

Perhaps of more relevance are Clearfield varieties, which exhibit tolerance to sulfonylurea herbicides. “They’re known as the charlock killers, but there are so many other reasons why you might choose to take the Clearfield route. One of the main ones is that you can delay your herbicide spend until your crop has emerged.”

And in many ways, that’s the quandary with OSR, and for Lee, makes it a crop worth keeping in the rotation. “I’ve seen crops that have grown back from nothing and deliver a decent yield, as well as promising canopies that have disappointed. Think carefully about what you want the crop to achieve, and make the most of the advice available, and you’ll find it’s a crop that will continue to deliver,” he concludes.
Just as oilseed rape is losing the last of its established seed treatments a new option, Integral Pro, will be available this autumn. CPM finds out how the UK’s first biological seed treatment in OSR works and what to expect from it.

By Lucy de la Pasture

This autumn heralds the arrival of a new era in crop protection with the approval of the first biological seed treatment, registered by BASF for use on winter oilseed rape seed. Integral Pro contains Bacillus amyloliquefaciens (BAA) and will be widely available at a time when the two established fungicide seed treatments are being phased out under the regulatory framework.

BASF’s head of seeds, Adrian Cottey, describes Integral Pro as an interesting product which has arrived at just the right time.

“In the past we were blessed with the neonicotinoid seed treatments which formed the basis of OSR seed treatment for years. More recently, the reliance has been on fungicide seed treatments but thiram, the last registered fungicide seed treatment, is now in its final autumn of use,” he says.

“When thiram has gone, that leaves a situation where there are no currently registered insecticide or fungicide seed treatments for OSR. It’s a time when we’re truly looking down the barrel of the gun for crop establishment,” he adds.

Approval process

Fortunately Integral Pro has gone through the approval process in time to fill the gap, but Adrian believes the biological will still have a place when other new seed treatments eventually come through the innovation pipeline.

“So what exactly can Integral Pro be expected to do? “It’s best described as a biofungicide,” he says. “So it has the potential to replace the seed treatments we’re losing but it also does a little bit more.”

Adrian’s very clear that as a biological, it would be unrealistic to expect 100% control but when compared with thiram seed treatment in trials, it’s been pretty equivalent in all cases.

BAA is a gram-positive bacterium that’s active in the rhizosphere and is commonly found in soil ecosystems worldwide. Its growth begins underneath the outermost cells of primary plant roots at the points where lateral roots grow and then spreads along the root surface.

“This creates a protective physical layer (biofilm) around the root, which is the first mechanism to help stop fungal infection as the BAA outcompetes other seed-borne microbes, such as Phoma sp. and Alternaria sp.,” explains Adrian.

The biological seed treatment also brings with it some natural fungicidal chemistry, namely iturin and surfactin.

BAA acts as an elicitor and triggers the plant to defend itself.

Adrian Cottey says Integral Pro will offer benefits to growers that will be complementary to other seed treatments as they come through the innovation pipeline.
The first biological Bacillus sp. product, Alinit, was marketed in 1897 by a German company which is now Bayer and was found to raise cereal yields by 40%.

Bacillus amyloliqufaciens (BAA) is a gram-positive, aerobic, endospore-forming bacteria.

BAA forms biofilms and supports plant growth as well as suppress plant pathogens in the rhizosphere.

BAA strains synthesise a range of secondary metabolites (not required for the plant’s primary functions of growth, developments and reproduction).

These secondary metabolites have antimicrobial activity or enhance growth.

BAA triggers induced systemic resistance in plants, stimulating their own defences to resist infection.

BAA at a glance

Legalities of Lumiposa

With the loss of neonicotinoid seed treatments the options to protect against flea beetle damage are limited, or non-existent where pyrethroid resistance is a problem.

No seed treatments are licensed in the UK for protection against flea beetle, but Lumiposa (cyantraniliprole), a systemic seed treatment from Corteva Agriscience has been developed to protect OSR seedlings up to the two-leaf stage against cabbage stem flea beetle, cabbage root fly and turnip sawfly.

A spokesperson for Corteva doesn’t expect Lumiposa to receive a UK registration (that permits application to seed in the UK) until at least 2020, but it was first approved in the EU in 2017 and is authorised for application to winter OSR in some EU countries including Poland, Hungary, Romania, Slovakia and Ireland.

That means that even though OSR seed can’t have Lumiposa applied to it within the UK, it is permitted under EU legislation for treated winter OSR seed to be imported from countries which hold an approval and sold within the EU28.

Corteva says Lumiposa “isn’t a silver bullet” but is a valuable addition to the crop protection toolkit for UK growers if it’s used as part of an integrated strategy to manage cabbage stem flea beetle.

Advice from the NFU to growers is that as Corteva have no guardianship of the imported treated seed, any UK growers who purchase imported seed and have enquiries about its performance will need to contact the seed merchant who supplied the seed.

The biggest effect was on the slowest emerging variety when compared with untreated seed.
New biostimulant seed treatments

New biostimulant seed treatments JumpStart WT and ProStablish WT from Bayer could help growers increase cereal yields by improving nutrient and water uptake through better rooting, says Claire Matthewman, campaign manager for seed treatments.

“Getting cereal crops off to the best possible start is a key first step in setting yield potential. Single purpose seed treatments, such as Redigo Pro (prothioconazole + tebuconazole), are an essential protection against damaging soil- and seed-borne diseases, such as loose smut, bunt and leaf stripe.”

But Bayer, through its collaboration with Novozymes, an established leader in agricultural biological solutions, has also been researching ways of helping crops establish a more effective rooting system using biostimulant seed treatments, she explains.

“The combination of JumpStart and ProStablish makes phosphate more available to be taken up by roots and easier for the crop to access.”

One area of key interest is how to improve phosphate availability. Phosphate becomes bound to cations, such as calcium, iron, manganese or aluminium, in the soil depending on soil pH, while availability to plants also reduces in lower soil temperatures and soil moistures.

“In some situations, up to 90% of phosphate fertiliser can be unavailable to crops in the year it is applied,” says Claire.

The active ingredient in the new product, JumpStart, is the naturally occurring soil fungus Penicillium bilaiae, which produces organic compounds that break the bonds between phosphates and the cations, so phosphate can be taken up by the plant.

“Effectively we are jump-starting the crop by helping to make phosphate more available,” she explains. “But at the same time we also need to address the issue that phosphate doesn’t move in the soil, so roots are only able to take up phosphate in the immediate root zone.”

That’s where the second biostimulant product, ProStablish, comes in, which is co-applied with JumpStart and a single purpose seed treatment.

“ProStablish is a messenger or signal compound, which stimulates mycorrhizae fungi to germinate and colonise roots,” explains Claire.

Inside the roots the mycorrhizae form structures that help transfer nutrients, including phosphate, to the plant, while outside of the root they encourage the formation of networks of hyphae that increase the effective root area, allowing plants to take up nutrients from outside the root’s physical range.

“By applying the combination of JumpStart and ProStablish, it makes phosphate more available to be taken up by the roots and easier for the crop to access it, which results in both better nutrient and water uptake and a more effective root system.”

In trials across Europe, results have revealed a 3% yield improvement from ProStablish and JumpStart co-applied with a single purpose seed treatment (SPD), over the SPD alone, she says.

“In the UK we’ve seen similar results in a smaller number of trials and have also observed positive effects on rooting,” adds Claire.

Both products will be available for application this autumn through Frontier. Cost will be at a small premium over the cost of a single purpose seed treatment.
Many factors that contribute to overall crop performance — like temperature and rainfall — are out of growers’ hands. But one area they do have reasonable control over is how well — or poorly — a crop is established. Soil structure, mechanical operations and robust varieties all feature as aspects to consider to get the best from a cereal crop.

Even so, they are still often faced with the threat of disease during the critical establishment stage.

Using farm-saved seed in a bid to cut costs may increase the risk further from potentially unknown disease levels, warn experts. To combat this, the industry has seen new seed treatments come onto the market which promise a number of benefits — from increased root mass to protection against a range of seed-borne diseases — but are growers making best use of them?

With this in mind, a recent survey carried out by CPM and Syngenta explored exactly what farmers’ buying habits are when it comes to deciding on the type of seed to use. Interestingly, the survey revealed a fairly even split between those in favour of using farm-saved seed and those who prefer the safety of certified seed, at 43% and 57% respectively.

Key drivers
So what exactly are the key drivers behind this split? According to the results, 56% of growers opt for certified seed for both quality and safety reasons, whereas those using farm-saved seed do so on the grounds of reduced costs and ease.

“There are pluses and minuses for using both types of seed,” explains Jonathan Ronksley, field technical manager at Syngenta. “From my point of view, the best option in terms of ensuring quality and managing risk is to buy certified seed. By doing so you’re more likely to guarantee the cleanest source of seed, and it’s tested for good establishment.”

An advantage of farm-saved seed is that it’s often deemed as ‘free’. Grown by the farmer, there is no physical, fixed expenditure as with purchased seed, apart from the royalty. However, to give a fair comparison of which is the most economically viable option, it’s important to consider the associated costs of farm-saved seed.

“When you buy seed from a merchant, there is a very clear, set figure for that seed, which is not always seen when using home-grown produce,” explains Jonathan. “To make it a fair comparison, it’s a good idea to consider the real cost. For example, if you’re taking tonnes of seed out of the barn to drill, you’re losing the value of what the grain is worth.

“There is then also the additional cost of testing and treating farm-saved seed –– and a farm saved seed payment –– so it all

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“There is then also the additional cost of testing and treating farm-saved seed –– and a farm saved seed payment — so it all
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drilling is important, he adds. “Make sure you get it tested to see if it’s a sensible option for drilling and use a fungicidal seed dressing to minimise future complications.”

While testing offers an insight into disease risk from pathogens that can be isolated, previous disease incidence and severity can also provide useful information for decision making, explains Rumiana Ray, University of Nottingham. “A good starting point is to know what the previous problems were with last year’s crop. Look at the cost of testing for disease in comparison with the cost of seed treatment. If an issue is likely it may be more cost-effective for small seed lots to be treated anyway.”

**Key diseases**

Some of the key diseases to be concerned about are fusarium and microdochium seedling blight which can significantly impact on establishment and ultimately yield, Jonathan explains. Ear diseases like smut and bunt don’t appear until ear emergence and can have severe consequences.

Identifying fusarium and microdochium seedling blights can be difficult, so it comes as no surprise that 59% of growers noted that they wouldn’t be confident identifying them in a crop of wheat. “The symptoms are reduced emergence, wilting and seedling death leading to establishment loss, but unless there’s a heavy incidence of disease, it can be quite difficult to diagnose — particularly if other pathogens are present,” explains Rumiana. “Therefore, we need to look at other factors if we decide not to test to help with our decision making.

“The risk of infection is more likely if you had a previous cereal crop with high fusarium head blight disease severity, and the weather can also have a significant impact. This year, there has been a lot of rainfall close to flowering, but it has also been relatively cool so we could end up with fusarium head blight caused by Microdochium spp. Out of the two Microdochium spp., M. nivale is most aggressive in causing seedling blight or affecting seed viability.”

If this is the case this year and growers see a lot of fusarium head blight symptoms — and are planning on using

**Vibrance Duo – everything you need to know**

Registered for use on winter wheat, winter tritcale, winter rye and spring oats, Vibrance Duo from Syngenta is the UK’s first seed treatment to use brand new SDHI fungicide, sedaxane. Combined with fludioxonil, the dressing controls a wide range of key diseases like fusarium, microdochium, seedling blights including microdochium, Septoria nodorum smut and bunt. The dressing aids speed of emergence and with the added benefit of improved root development leads to stronger, healthier better-established crops, according to Syngenta.

“Farmers are always keen to see a return on investment quoted in pounds, but sometimes there are additional benefits that can’t always be quantified, and that’s the case with Vibrance Duo,” says Chris. “The seed treatment goes above and beyond the work of an SPD and aids deep rooting and the speed of establishment — particularly in stressful situations.

“Through both Syngenta’s work and our own farmers’ trials, it has proven to do exactly what it says. When this is translated into yield figures, it does show a comfortable return on investment.”

**Sussing out smut**

Although a bad case of loose smut could be disastrous, and literature suggests could very likely wipe out a crop of barley, the survey revealed that 16% of growers had seen it themselves over the past two years. So should we be concerned about this yield-robbing disease? “Loose smut has actually been getting worse,” explains Jonathan.

“Syngenta has been sampling for resistance and has found a sensitivity shift towards triazole-based seed treatments. We are continuing to monitor this for now, but in the meantime they remain the most effective option so it’s vital that farmers make use of the products available to them to reduce the further spread of smut.”
farm-saved seed next year — Rumiana recommends testing, cleaning and treating the seed to minimise issues with quality and disease.

Seed dressings and treatments certainly appear to be popular, with the vast majority of growers (82%) planning to use a single-purpose fungicide seed dressing (SPD) this autumn — but what effect will this have?

When asked about the purpose of an SPD, 75% of growers use it to protect against seed-borne diseases, while 58% believe it lays the foundations to maximise crop yield and quality. Just over half (55%) link the use of an SPD to reducing the impact of some soil-borne pathogens and a further 19% believe it can enhance the speed of crop establishment.

"It's clear that growers are aware of what SPDs do and all the factors listed really are the key benefits," explains Chris Guest, head of seed at ADM Agriculture. "They can make a real difference in terms of protecting the seed, particularly at the key establishment stage. If we go back to the old days, pre-neonics, farmers were using seed treatments as the first line of defence."

Protection against seed-borne diseases and soil-borne pathogens are arguably two of the biggest benefits of using an SPD, with proven control of a wide variety of issues including Fusarium seedling blight, Microdochium seedling blight, loose smut and bunt.
If growers can find a seed treatment that will cover them against key pathogens that will hamper establishment then it’s a good idea to invest, says Rumiana.

Of the growers not planning to use an SPD this autumn, 37% were testing grain instead. “If growers are using clean seed, then they might not be thinking about using an SPD. It’s good to do a seed test, but you can’t 100% rely on it, so seed dressings offer another level of protection,” says Jonathan.

“Accurate test results heavily rely on good, representative sampling and all diseases are not necessarily tested for. As well as this, even if the seed is clean, there is still a risk of issues from soil-borne diseases if the soil is infected.”

Of course, seed dressing comes at a cost, so it’s no surprise that 10% of growers who weren’t planning on using an SPD this autumn said they couldn’t justify the return on investment. “Looking at the economics, an SPD is actually one of the cheapest insurance policies you can buy in terms of protecting crops,” warns Jonathan.

**Value for money**

“Seed dressings are good value for money and provide excellent control levels. While you won’t suffer from disease every year, it can lead to devastating yield losses when you do. For those who aren’t already planning on using some kind of protective product, I can’t stress enough how critical it is to control soil- and seed-borne diseases.”

Deter was a long-standing tool in the armoury for arable producers, but since its loss it seems some growers are unsure about a suitable alternative. The survey revealed that 37% of growers who don’t plan on or are unsure about using an SPD this autumn are unsure of the best choice. “Deter has become such a standard part of crop protection that many growers have forgotten there was a single-purpose element in it,” explains Chris.

While there’s no insecticidal seed treatment alternative for issues like BYDV, other seed dressings will still provide many benefits. “Products like Vibrance Duo (fludioxonil + sedaxane) from Syngenta are a premium [price] over an SPD but the establishment and rooting benefits are so phenomenal that it makes sense to use it as a single purpose dressing,” he adds.

“I’d advise it [Vibrance Duo] as a standard application — much in the same way as Deter was previously advised.”

Rumiana adds: “If growers can find a seed treatment that will cover them against key pathogens that will hamper establishment — as well as protection against diseases like, smuts, bunts and Septoria seedling blight — then I think it’s a very good idea to invest.

“Particularly in situations with frequent cereal rotations or minimum cultivations where the risk of soil borne disease is also greater, seed treatments are very useful.”

As with everything in crop production, timing is key, so we asked growers if they plan on using a fungicide SPD at all drilling times. More than half of growers (65%) said yes, while 6% suggested they’d only be doing so when delaying drilling against 8% who will only use it when not in a...
Congratulations to our five lucky winners A J Butler, Dorset; Iain Robertson, Dorset; Ian Lutely, Cambs; Helen Parkin, Devon and John Fenton, East Yorks, who responded to the CPM/Syngenta survey on cereal establishment and have each won the fabulous prize of a £50 Amazon voucher.

All winners responded to the survey and completed the tie-breaker question, explaining in less than 20 words the key benefits of fungicide seed treatments. Answers were varied, but all five winners impressed the judges with their knowledge of how treatments can aid disease control, protect against establishment issues and help to maximise yield.

Increased risk

While infections can occur at any point, with many growers heading towards delayed drilling for grassweed control and aphid avoidance, there is potentially an increased risk of disease. According to the survey, 33% of growers believe that crop establishment risk from diseases like microdochium and fusarium is higher in a delayed drilling situation, while 44% believe it's lower.

“I think there is a slight lack of understanding as to whether disease risk is higher when you’re drilling later,” explains Jonathan. “If you’re delaying drilling, crops are likely to take longer to establish. Diseases such as microdochium are more favoured by the cool weather which delays crop development, so it’s important to keep that in mind and use a strong, reliable seed treatment to ensure this doesn’t affect establishment.”

Rumiana agrees: “If you have cool, delayed drilling conditions then you are more likely to experience slow emergence that favours Microdochium seedling blight in turn affecting crop growth.”

Vibrance Duo can have a major impact on rooting depth as shown here (right) on a Skyfall certified seed plant, compared with an application of SPD Redigo Pro (left)
Blackgrass under pressure

In recent years, Cambs grower Paul Drinkwater has been one of many in the area who have struggled to keep blackgrass in check in some fields. CPM visits and joins the Task Force engaged to help him put a plan in place.

By Tom Allen-Stevens

Looking across Paul Drinkwater’s field of Skyfall winter wheat, you can’t deny it’s on track to yield, but there are some worrying patches of blackgrass.

“I guess I’ve been managing the seed return but not stopping it,” he says. “The thing is, I go to all the open days and hear about all manner of good systems for sorting out your blackgrass. But it’s easy to end up with no system at all, because you worry that if you start mixing and matching these ideas it’s a recipe for disaster.”

The 30ha field at Abbots Ripton, near Huntingdon, Cambs, forms part of 3500ha managed by Paul for Abbots Ripton Farming Company and Lavenham Farms. The soil type across this block is a consistent Hanslope series boulder clay — easily capable of yielding 12t/ha of wheat, but equally prone to harbouring a heavy blackgrass burden.

“I have photos going back over 40 years, and the blackgrass hasn’t moved. It’s just the severity of the weed patches that’s grown or reduced over that time,” says Paul.

“But chemistry’s always kept it in check. When I came into farming, that was when isoproturon (IPU) arrived — it was marvellous stuff, and herbicides just moved on from there. Atlantis (iodosulfuron+ mesosulfuron) was so effective you didn’t even have to think about blackgrass management.”

Gradually crept up
Tests have shown his blackgrass now has high levels of target site resistance, however. “It’s gradually crept up on us, and we’ve had successes as well as bad failures. But if Bayer was to come out with a new herbicide, I know we’d make it almost ineffective in around five years. So we’ve gone back to proper farming — making good use of the rotation and drilling dates while relying less on chemistry.”

It’s a good start, but Paul himself recognises it’s a long way from an integrated strategy that will keep the grassweed sustainably under control. So his is one of two farms that have become the focus of Bayer’s Blackgrass Task Force. Joining him is Ben Coombs, Bayer herbicide campaign manager, NIAB TAG’s John Cussans and Philip Wright of Wright Resolutions. The aim is to provide some recommendations, specific to the field situation, which will help manage its blackgrass burden.

“It’s pretty well understood now how to drastically reduce blackgrass, and there’s a whole stack of trials that can give you a ‘recipe’ for sorting out a problem,” says Ben. “But the challenge lies in translating that into a successful on-farm strategy — few commercial farms have a blackgrass team to run a trial.”

So a suitable approach is one that can apply trials-based advice on a field scale. 

Tests have revealed the blackgrass has high target site resistance and there are patches in the field where the population is worryingly high.
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Grégoire Besson Discordon to prepare the ground, plunging down to 200mm with a chisel tine that boiled the soil, allied to relatively deep working discs which increased the mixing through the profile –– totally the wrong thing to do in a bad blackgrass situation, according to Philip. “That gets a one or two out of ten. The aim should be to stop the soil horizons mixing roguable levels, and this certainly isn’t one of them.”

The Task Force agrees that commercially the best option at this stage is to let the seed fall and deal with it after harvest, although spraying off bad areas should be considered in following crops.

Cultivations
Traditionally Paul has used a

he says, in a way that can be practically managed and monitored over a number of seasons. “The key principles for the Task Force are that we’ll come to recommendations, rather than obligations, with the farmer making the decisions. These focus fields are commercial — we’re not trying to turn them into a trials site. But this is a team effort — everyone contributes to an approach, which we’re hoping will suit all.”

The Task Force has chosen Stephen Moss’ 5for5 approach as the framework (see diagram top right). This initiative aims to encourage growers to adopt five different control strategies, only one of which is based on herbicides, and maintain a planned, integrated approach at the individual field level for at least five years.

The field in question is 30ha that came out of oilseed rape into wheat, drilled on 24 Oct at 400 seeds/m², reports Paul. “It’s not one of our worst for blackgrass, but we didn’t get good control with the Kerb (propyzamide) in the OSR two years ago, and the resulting seed return was a bit of a wake-up call.”

Last autumn’s stale seedbed was followed with a pre-emergence stack of 0.6 l/ha of Liberator (flufenacet+ diflufenican), 4 l/ha of Defy (prosulfocarb), with 0.12 l/ha of Hurricane to bring up the DFF. “The Avadex (triallate) was delayed, applied just as the crop emerged on 14 Nov. But we got a good result from 0.33 l/ha Monolith (mesosulfuron+ propanoxycarbazon) applied at the beginning of Feb.”

So what are the recommendations from Bayer’s Blackgrass Task Force?

Stop seeding
Paul may be pleased with what the chemistry’s achieved, but it’s not good enough for John, who’s been studying the plant and head count assessments (see panel right). “There’s an average of five plants/m² which can be a problem. That’s certainly the case in the patches with more than 10 plants/m²,” he says.

“What’s interesting about the counts is the varying number of heads per plant — a large number of plants doesn’t always equate to a high population of blackgrass heads. But at an average across the field of 47 heads/m², there will be a large seed burden to manage.”

There are still options to prevent seed shedding this year — it’s not too late to spray out patches or rogue, or even take the field as wholecrop for an anaerobic digester, for example. But Paul dismisses these suggestions. “If I was to patch spray, I would have done so back in Feb before I’d spent too much on the crop. What’s more, this is a decent crop — the yield may be knocked back by a tonne or two in the patches, but these areas are still set to bring in 8-10t/ha, which I won’t get if I spray them out. As for roguing, there are few fields in Cambs with a burden at roguable levels, and this certainly isn’t one of them.”

The Task Force agrees that commercially the best option at this stage is to let the seed fall and deal with it after harvest, although spraying off bad areas should be considered in following crops.

Cultivations
Traditionally Paul has used a

Abbots Ripton blackgrass plant and head counts


The 5for5 approach for beating blackgrass

Source: Bayer, 2019. Each bar in the chart corresponds to an assessment point in the field. The darker the colour of the markers, the higher the number.
and a Horsch Sprinter. “The key aspect with a Väderstad Rapid, a Pöttinger Terrasem if we get another dry summer.”

Paul’s decided to put the field into spring cultivating and can leave it until Sept or Oct to grow the crop, but proved that’s not the way to do it. “We’re so used to shifting plenty of soil it’s ingrained. But doing as little as we can to get it away with and spraying off the chitted blackgrass just once before drilling is what we now favour. I like to get cultivations done early because you don’t know what the weather will bring.”

Here John sounds a note of caution. “Sometimes the best course of action after harvest is just to leave the surface untouched, especially if it’s dry. Much of the blackgrass seed just dies on the surface or is predated, although it’s difficult to tell as you can’t see it.”

He agrees with Philip that shallow cultivations keep the blackgrass in the surface where it can be controlled. “Only cultivate when there’s enough moisture to make a good seedbed, and if making more than one pass, a sound principle is to reduce intensity,” he advises.

**Sowing date**

Paul’s decided to put the field into spring barley. “We used to think these soils wouldn’t grow the crop, but proved that’s not the case. It means we’ll be in no hurry to cultivate and can leave it until Sept or Oct if we get another dry summer.”

The farm has a choice of three 6m drills — a Väderstad Rapid, a Pöttinger Terrasem and a Horsch Sprinter. “The key aspect with spring drilling is minimum disturbance — you don’t want to wake the blackgrass,” says Philip.

“So probably the Rapid with the toolbar lifted out would be best. If you want tines, the Sprinter, replacing the Duett coulters with minimum disturbance banding openers.” These are due to be replaced with Borgault VOS openers.

**Competition**

There’s a plan to drill a 36m wide strip of cover crops, covering around 4ha of the field. This is to see if it has any effect on improving the competitiveness of the following spring barley crop. “I’ve read all sorts of claims for cover crops and never been convinced, but now I’ve a good reason to give them a try,” says Paul.

Phacelia, black oats and vetch are planned for the mix, drilled soon after harvest, unless it’s too dry. Philip has concerns for the cover, however. “Although the roots will do some good, covering these soils with a thick canopy over the winter won’t help them self-structure, so keep an eye on how the crop grows. If it’s vigorous, spray it off around Christmas or consider mob-grazing with sheep.”

John agrees. “A cover crop is a fantastic way to get a spring crop off to a good start with minimum disturbance, provided you get the technique and management right.”

**Herbicides**

Shoot samples of blackgrass have been taken to test for herbicide resistance, which have confirmed a high level of both ACCase and ALS target site resistance and a low level of ALS metabolic resistance, notes Ben.

“The tests indicate a reasonable proportion of susceptible individuals in the population, however, which may explain why Paul is still getting an adequate level of control with Monolith. The important thing, though, is to prevent surviving plants going to seed as that’s how resistance builds.”

Paul plans to knock out any blackgrass that emerges over the autumn and winter with just one robust application of glyphosate before drilling. With fewer options when it comes to chemistry for a spring crop, compared with one established in the autumn, this will be followed with a 0.3 l/ha pre-em base of Liberator. Small plots with other herbicides stacked on top are going to be trialled within the field.

“There is an optimum level of herbicide with spring barley,” notes John. “Put on too much and it hits the crop, which can then do more harm than good in terms of competition. The trials will help us determine that balance.”

Paul’s more concerned about moisture levels. “The danger with a spring crop is when it goes dry after drilling. But we have a plan set up and it’s a question of following through with the components, keeping it flexible enough to adapt to whatever challenges the season may throw at us.”

**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 split-field comparisons of the Xpro range of fungicides, and over time has developed into a much wider set of field-scale trials. Each year the farmers meet to discuss results, listen to guest speakers and debate winter wheat management issues.

Bayer’s Blackgrass Task Force project is the latest initiative under the Partners in Performance umbrella, taking two fields with differing blackgrass challenges and working with a team of experts to manage the field over a longer-term period. The objective is to see whether industry research can successfully be applied to a commercial field.

For arable farmers to continue to be profitable with support payments forecast to reduce, tackling challenges, such as blackgrass, requires the whole industry to work together to share and implement 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.
Grassweed control starts in July

July is the most important month of the year for grassweed control, according to Roundup technical manager, Barrie Hunt who co-ordinates the national Grassweed Action management resource. And what’s more, it may involve absolutely no fieldwork, with the possible exception of pre-harvest oilseed rape spraying.

In Barrie’s experience, July is a month that’s critical to the success of every element of the entire year’s cultural and chemical control programme.

“Fundamental to keeping on top of problem weeds like blackgrass, bromes and Italian ryegrass in the most sustainable way is knowing exactly what infestations you have and where they are,” he says.

“June and July are the only months when you can really tell this, especially in cereals where the distinctive weed heads stand out above the crop for all to see! It certainly isn’t comfortable having your agronomic failures on such public display.

“But unlike OSR, which can hide a multitude of sins beneath its canopy, weed seed heads above the cereal crop canopy provide the ideal opportunity to plan ahead and target management for the best and most cost-effective control,” he comments.

“We know that different weed species need different approaches but so do different levels of infestation — whether on a whole field or individual area basis.”

So what exactly does Barrie recommend? “Essentially it’s a matter of getting out into your cereal crops and doing two things — identifying the precise weed species present and mapping where they are,” he says.

**Better field view**

Mapping the infestations is best done from the tractor cab because it gives you a far better field view, he suggests. Barrie believes accurate mapping of weed infestations is the only real way of monitoring how successful — or otherwise — your grassweed controls are.

“Not all fields will require the same intensity of grassweed management,” he reasons. “So traffic light coding each field every season on the basis of its weed risk means you can concentrate the most rigorous controls on the worst-affected ground, where they are most needed.

“Red-coded fields are almost certainly best ear-marked for rotational ploughing, delayed winter cereal sowing or spring cropping, together with the most robust pre-planting, pre-em and post-em herbicide programmes,” he says.

“On the other hand, fields with less pressing problems may be drilled earlier in the autumn and with less intensive pre and post-em herbicide programmes for valuable savings in both cost and hassle.

“The apparent absence of grassweeds in a single season should not automatically result in a green coding. Instead, it’s important to consider the history of each field in your planning.”

The accurate mapping of weed problems across individual fields has become infinitely more practical and valuable with the digital tools increasingly available to growers. This allows fields to be zoned and sprayed for their specific weed burdens — either using a
Grassweed Action is a special on-line resource providing arable managers across the country with a structured approach to regaining control over their most damaging grassweeds based on the best available intelligence.

Developed with national weed authority, Dr Stephen Moss, it provides well-researched, practical frameworks for regaining control over blackgrass, Italian ryegrass, bromes, wild-oats and couch, that can be implemented by growers and their advisers in ways which best suit their own farm conditions and circumstances.

The free-to-use resource available at www.monsanto-ag.co.uk/grassweed-action includes a knowledge hub providing the best current understanding of each weed and a newsroom offering the latest control intelligence and advice.

Targeted action

Grassweed Action is a special on-line resource providing arable managers across the country with a structured approach to regaining control over their most damaging grassweeds based on the best available intelligence.

July is a good month to take samples of blackgrass to send for resistance testing.

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July is a good month to take samples of blackgrass to send for resistance testing.
Peas are a notoriously difficult crop to grow, but experience through YEN suggests they can shine a light on limitations across the rotation. CPM visits an Oxon grower who's looking to gain an insight.

By Tom Allen-Stevens

There’s something to be said for the satisfaction you get from a well established, even pea crop — one that’s set its stride and appears to have everything it needs to fulfil its potential.

That’s probably why David Passmore is only too pleased to bring you to his crop, that sits like a thick, sprung mattress across his shallow soils, lying over chalk near Wallingford, Oxon. “Peas are a crop you either love or hate,” he says.

“They’re probably not for the huge farming enterprises with just one combine, that need crops to fit their system. But if you’re someone who celebrates that they’ve drilled or harvested on the right day, it’s a crop that can be immensely rewarding.”

For David, for whom peas have been part of the rotation for the past ten years, those are the two days that matter in the life of the crop. “They’re a good crop to have on the farm and get you away from a winter rotation. Some of our best yields have followed a pea crop,” he says.

If you get them wrong the crop will punish you, though, which is why he believes there’s so much to be learned by getting it right.

“The trouble with peas is the huge variability of yield. Our average is 4.5t/ha and our best is 5.7t/ha. But last year we achieved just 3.4t/ha.”

Seed crops

With 300ha of cropped land, Passmore Brothers specialises in seed crops. There are 12ha of Mankato peas — a pre-basic to basic crop grown for KWS. A similar area of Campus winter oilseed rape, grown for seed, is carefully rotated around the farm, with 100ha of winter wheat (KWS Crispin, Kerrin and Firefly) and 50ha of KWS Sassy and Irina spring barley.

But an important ‘crop’ for David is his livestock — the spring barley’s undersown with grass that’s grazed for two to three years with 160 head of Limousin beef cattle and 200 breeding ewes, before returning to a wheat crop. “On our lighter soils, we put forage rape into the ryegrass after its cut of silage, then back into spring barley, achieving three crops in two years.”

David credits the livestock in the rotation for his very low level of grassweeds. “There’s no blackgrass on the farm and this is something we’re meticulous about — we’ll always rogue any plants we see and in my farming career I’ve only ever used two cans of Atlantis (iodosulfuron+ mesosulfuron).”

His rotation, with its inherent focus on soil health, brings him some impressive yields — an ardent member of the Yield Enhancement Network (YEN), his wheat came fourth last year with a 14.01t/ha crop of KWS Kerrin. This year, he’s also joined the pea YEN (see panel on p62), but that’s not about the competition, he says.

“What I like about YEN is being involved — what you gain from it is what you put into it. So the pea YEN is less about the competition and more a learning exercise.

“The theory of growing peas is really very simple — the day you plant it has its maximum potential yield, so everything you do after that is aimed at retaining that potential. YEN helps you break it down so you can focus on what’s important. The first thing it teaches you is that you only see half your crop — the rest is underground, but...
that’s almost the most important part.”

The fortunes of the pea crop itself are largely determined at drilling. The roots are incredibly sensitive to compaction, and David takes great care to preserve the soil structure. “Peas are the most critical crop we grow for planting conditions, and you can’t go by calendar date. 90% of its yield potential is determined on the day you plant.”

Preparations for this start the previous autumn. Land is generally turned with a 5f Kverneland plough in Oct or Nov and left over winter. “You can min till other crops, but the old adage ‘you have to plough for peas’ still holds true, and while we do have catch and cover crops that we graze with sheep, not before peas.”

The aim is to prepare the ground in winter, including perhaps a pass with a 4m Flexi-Coil, so the 4.8m Kverneland tine seeder drill can go straight in when conditions are right. That was 28 March this year, although David had to wait until 20 April last year.

As in the wheat YEN, the key to a high-yielding pea crop is to maximise crop cover. “Biomass drives yield, and there’s no correlation with thousand grain weight — it’s down to seeds/m². The theoretical yield potential is 11-12t/ha, and while I know I’ll never get anywhere near double figures I’m intrigued to know where I’m going wrong.”

This theoretical yield is broken down to peas per pod, pods per plant and plants/m² and David’s been following the protocol to see how he can lift crop prospects at every growth stage.

**Seed rate rise**
That starts with seed rate. “We’ve raised the seed rate on the back of YEN — it used to be 80 seeds/m² but now we drill at 100 seeds/m².”

Nutrition is of vital importance to a high-performing pea crop. “We haven’t applied any P and K recently because our levels are good, although I am considering some Polysulphate next year. One aspect we have taken advantage of, though, is the tissue testing service through YEN.”

Two leaf samples are taken for analysis — one at second node, just before flowering and the other just after flowering. “The analysis showed up a lack of boron, so we applied this with magnesium in May. We’ve also applied Photrel Pro, which is a combination of micronutrients,” says David.

“YEN is showing us that, while the return you get from one micronutrient application may be insignificant, making many little steps builds crop momentum and delivers a significant yield benefit overall.” Marsh spot is also a concern, with a dose of manganese applied at the end of April, followed up with a second in June. ▶
Spring peas

Disease pressure varies considerably year-to-year. “Last year, we got away with a dose of Alto Elite (chlorothalonil+ cyproconazole). But this year, botrytis is what worries me, with the damp weather during flowering, so we’ve applied Amistar (azoxystrobin).”

David’s more reluctant to apply insecticides however. “Pea moth is the main concern. We’ve had traps out and haven’t reached threshold levels. I have seen aphids in the crop, which is a worry, but I’m holding off on insecticides.”

Keith Costello has been helping PGRO and ADAS set up the pea YEN and adapt the basic principles of YEN to the crop. There’s a core group of growers whose crops he’s visited each year to make regular inspections. That’s now developed into a protocol, and farmers have been invited from further afield to take part, with the aim of improving yields.

“The average yield for dried peas rose steadily from the 1980s at around 3t/ha to a peak at the turn of the century of about 4t/ha. But since then, it’s settled back down to close to 3t/ha. So why is that? My aim is to help growers identify the key factors and bring yields back up again,” he says.

The maths is fairly simple: a healthy pea plant will usually grow four pairs of pods per plant, with seven peas per pod. “That should bring 50-55 peas per plant, but typically you get a third of that, hence why we’re averaging a third of the crop’s potential yield. If you understand what’s going on in the plant and why it decides to set a lower number of peas, you can identify ways to increase this,” he reasons.

So as well as monitoring crops for their establishment, pod and pea set, Keith’s been assessing what key factors set these critical contributors to yield to help growers monitor and benchmark their own performance. He’s concluded there are five:

1. Establishment – This is absolutely critical, says Keith. Conditions have been kind this year, with dry soils allowed to self-structure and field work completed without damaging their integrity. But that wasn’t the case last year, so a keen focus on maintaining structure will make all the difference at establishment.

2. Roots – Keith’s observation is the rhizosphere below a pea crop today is not as fibrous as it once was. He speculates this may be down to heavier machines bringing more compaction to soils with lower organic matter content, restricting the sensitive roots. But very little research has been carried out in this area, so more work is needed to understand the rhizosphere.

3. Viruses – the incidence of some of the common pea viruses, such as pea initiation mosaic virus, and the prevalence of its aphid vectors has increased, Keith believes. A badly affected plant will produce significantly fewer peas, sometimes into single figures. Rather than straight treatment, he’d like to see more growers adopt an effective integrated pest management strategy across the rotation.

4. Nutrition – Sampling across crops at different growth stages is highlighting a surprisingly high number of incidences where crops are low or very low in certain nutrients. What’s less clear is whether these apparent deficiencies are relevant and at what stage they limit the performance. The first step for growers is to carry out leaf tissue analysis to put themselves in the picture.

5. Knowledge exchange – passing on experience and advice within the business and from farmer to farmer is key with a crop like peas, that may drop in and out of the rotation and is a somewhat specialist crop. This is particularly important in large farming businesses where farm managers retire or move on, without the succession of knowledge that may happen more naturally within a family business, Keith suggests.

He recommends two routes for growers to get more out of their pea crop. “Firstly take advantage of the technical information on offer from PGRO. Once you look in detail at your crop, you can identify the technical aspects to address, and the information is available to inform this.

“Secondly, share ideas. Increasingly within YEN it’s this two-way exchange of knowledge that is helping those growers who are involved make better decisions going forward. That’s even more important in peas where we have less of the specialist knowledge that perhaps we once had.”

And for those who have given them the attention they deserve, Keith believes the prospects this year are good. “When peas perform, they’re a marvellous crop, and there’s every chance that most growers will enjoy that satisfaction this year. So fingers crossed.”

There’s more information on the pea YEN protocol and how to get involved in the new bean YEN, which has similar objectives, in the current issue of Issue of The Pulse Magazine, that accompanies the July issue of CPM. There’s more detailed technical information for growers, while the PGRO website and new app have updates on key diseases and pests, such as pea moth.
Passmore Brothers large blue peas: how the finances stack up

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*Source: Passmore Brothers, 2018 harvest*

The two most important days in the life of a pea crop are when it’s drilled, here (left) with dual wheels to avoid compaction, and when it’s harvested, with the aim to keep it standing.

Back from spraying to allow beneficial numbers to build. It also helps in the following wheat crop if you’ve used less insecticides.

“You have to be on the ball with peas, though. It’s a crop that moves fast, so you make one fungicide application, for example, and find it needs another in as little as two weeks.”

Timeliness is absolutely critical when it comes to harvest, he says. “You have to put the combine through the day they come right, which for peas is below 18% moisture. The key aspect with blue peas if you want the premium is to retain the colour. If they stay out in the field, this bleaches the peas. Harvest is the second of the key days in a pea crop’s life.”

Another reason to harvest when the time’s right is to catch the crop when it’s standing. Much of this is down to variety, says David, and Mankato is one that he’s found stands well. While the combine will fly through a standing crop, it can take many times longer to pick one up off the floor.

Once the crop is harvested they’re put on a drying floor with ambient air blown through until the crop reaches around 14% moisture.

“They need to be stored in the dark, but are relatively easy to dry,” he says.

After last year’s disappointing yield, David’s current crop looks set for a good result. What’s more he’s hoping the extra attention he’s given it throughout the growing season as a result of YEN will also pay dividends. If not, at the very least he will be able to benchmark his performance against others to see where improvements can be made.

But perhaps it’s the value over the rotation where the crop delivers the most. “Over a farming lifetime, you learn which are the right things to do,” he says. “That’s where peas fit in — they’re good for the farm.”

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Gazing into a robotic future

Robotics in agriculture will bring about the same kind of change as mechanisation in the 20th Century – but it’s hard to predict exactly what that future will look like. CPM joins a seminar at the Cereals Event to gaze into the crystal ball.

By Olivia Cooper

Farmers around the world are already using a lot of robotics and precision technology — but we’re still at the forefront of what autonomous vehicles can really deliver. So what direction is it likely to take? Is the future one of swarming drones and little field robots or will we see large-scale autonomous vehicles sitting alongside more conventional machinery?

According to Prof James Lowenberg-DeBoer from Harper Adams University, that could depend on where you are in the world and how open you are to change. And British farmers, it seems, are already embracing future technology, with a Defra survey in 2012 showing that 46% of arable producers were using GPS, 38% were soil mapping, 25% yield mapping, and 31% were using variable rate technology (VRT) — among the highest VRT adoption in the world.

Unsurprisingly, larger arable farms are more likely to adopt precision ag techniques — and if US trends are anything to go by, then autosteer will become increasingly widely used. In 2016, 59% of US maize was planted using satellite guidance, although VRT lagged slightly behind, being used on 29% of the maize area.

Become more comfortable

So if precision agriculture is here to stay, where do robots fit in? Farmers are clearly becoming more comfortable with the idea of robots doing jobs for them: In the dairy industry milking robots have been around since 1992, and by 2015 a quarter of the cows in the Netherlands and Denmark were milked by them.

Drones have also become widely accepted — although their future use remains questionable, says James. “Worldwide, agriculture is fascinated by drones, but struggles with finding profitable uses. In 2017, 24% of US ag retailers offered drone services — but only 20% of those dealers reported that drone use was profitable to them.” Around half were being used for aerial imagery, with 22% offering soil electrical conductivity mapping.

However, the cost of gathering drone information has to be compared with alternative sources of information, he adds. “And the value of the information depends on how it affects decisions.” Satellite imagery is generally cheaper, so drones may end up being used less for information gathering and more for spot spraying and other ‘delivery’ activities.

That said, using drones for early disease detection could be a viable option, with the capital costs more than outweighed by spending less time field walking and reduced fungicide use, for example. “Precision agriculture is a toolbox, and farmers are picking and choosing what works for them.”

Ultimately, demand for crop robots will be driven by the cost and availability of farm labour, as well as greater efficiencies yielded by targeted plant management, explains James. And the type of technology that farmers adopt will shape the future of the sector. “Farmers and agribusinesses seldom use technology exactly as the developers intended,” he notes. “Farmers are very creative and often use technology for new purposes, which the developers never thought of. But production systems may change substantially when robotic systems become available.”

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Shatter the yield plateau with precision power

Precision farming could provide the answer to the yield plateau seen in arable crops over the past 16 years, with increasingly sophisticated technology offering industry-scale solutions.

According to Andreea Ailenei, UK digital programme manager at Rhiza, the poorest 10% of fields yield 45% less on average, while input costs remain the same. “Rhiza can help identify the underlying issues and come up with solutions — do you take that land out of production or target treat it?”

The product of a merger between Soil Quest and Intelligent Precision Farming in March 2019, Rhiza combines satellite data analysis with soil scanning and nutrition services, bringing together different technologies for greater accuracy. And having been developed alongside farmers and agronomists it provides a comprehensive, reliable, and easy-to-use suite of tools, she claims.

Working with partners including Cranfield University and James Hutton, Rhiza is combining soil brightness data with existing physical soil survey datasets to create a UK-wide precision soil map, explains Andreea. “The aim is to make it cheaper and easier for farmers to adopt precision techniques.”

Farmers using Rhiza technology over the past three years are twice as likely to have soils on target for P and K indices than the UK average, by increasing applications in areas of deficiency and reducing them where indices are high. And where they have adopted variable seed rates they have boosted winter wheat yields by an average of 4.7% to 10.21t/ha, generating a return of £69/ha, says Rhiza business manager Max Dafforn. “That’s a real tangible benefit.”

By measuring the green area index (GAI) of oilseed rape, it’s possible to calculate the nitrogen required to build a canopy with a target GAI of 3.5 at flowering: 50kgN/ha builds one unit of GAI, he adds. Using variable rates helps farmers to cut back on the thickest areas and increase applications where the canopy is thin, potentially saving N costs and boosting yields.

Rhiza’s Contour web platform and app features local weather data, pest and disease models, high-resolution satellite imagery, SAR (radar) data and yield prediction, as well as precision soil zoning, soil analysis and variable rate nutrient planning.

“We believe we’re on the cusp of the fourth revolution in agriculture,” notes Max. “Digital tools can help minimise environmental pollution, optimise the production of safe food, improve the efficiency of agri inputs, maintain soil fertility, improve data flows and management practice, and ultimately, increase farm profitability.”

Drones may be best used for ‘delivery’ services.
Robots could change farm structures, says James Lowenberg-DeBoer.

Harper Adams University is running a three-week course with the Worshipful Company of Farmers, on Adopting Precision Technology in Agriculture. It comprises three independent weeks of study in the UK and the Netherlands, and aims to fill the gap between research, science and technology and the farmers who might use those new technologies. Applications for the first course close on 31 July - for more information visit harper.ac.uk/pta.

On course for technology

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Cereals report

Robots could change farm structures, says James Lowenberg-DeBoer.

“On course for technology”

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Robots could change farm structures, says James Lowenberg-DeBoer.

“My bet is that in places where conventional mechanisation works really well (large rectangular fields), we’re going to see more automated large equipment like smart grain carts, which arrive at the press of a button and sync to the combine. Where you have smaller, irregular-shaped fields there is potential for the use of more, small robots in the next five years.”

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CLAYDON
There was plenty of new kit on offer at the Cereals Event, with everything from compact drills to high capacity combines. CPM takes a look at just some of the options.

By Olivia Cooper

The weather may have been inclement at Cereals but it didn’t dampen the spirits of farmers on the lookout for their next new purchase. Whether upgrading to the latest precision technology or just tweaking the performance of existing machinery, there was plenty to look at.

Claydon

On view for the first time at Cereals, Claydon’s new 6m Hybrid T6c compact trailed drill is the latest addition to the OptiTill stable. More than 20% lighter and more compact than the Hybrid T6 model, the T6c combines the high output of a 6m seeding platform with the nimble handling and maneuverability of the 4m T4, on which it is based, says chief executive Jeff Claydon.

“Capable of drilling 45ha per day behind a 300hp tractor, this model is designed to appeal to farmers who value the combination of lower cost and greater maneuverability over ultimate hopper capacity and output.”

Carried on lower link arms, the T6c features a fully floating seeding chassis which follows field contours, ensuring accurate seeding depths. Providing a hopper capacity of 3500 litres it weighs about 7900kg unladen, and can deliver either seed only or a 60:40 seed: fertiliser combination. It will sow directly into stubble, in min-till situations or on ploughed/ cultivated land, while the ISOBUS-compatible RDS Artemis control system provides tramlining and variable seed rate capability.

Kuhn

Targeting the growing conservation agriculture sector is Kuhn’s new Aurock triple disc seed drill, which can establish crops under cover, in minimum tillage or direct drilling conditions. Launched in a 6m format, it’s available with single and dual metering units and hoppers of...
3500 litres and 5000 litres, respectively. This allows for dual cropping or alternative row drilling with independent management of seed depth.

Designed for low horsepower requirement, it needs a modest 180hp to operate. With a modular design, growers can opt for an integrated cutter roller with adjustable pressure for all cover types, alongside either 460mm diameter corrugated discs for working in prepared soil or for soil mixing, or 430mm embossed discs for cutting residues and minimising soil ejection.

ISOBUS-compatible, a simple press of the button at the headland allows successive lifting of the front tools, then stops the metering unit, ensuring no seed remains on the surface, right to the edge of the field.

**Stocks Ag**
Farmers who are looking for improved accuracy when spreading granules and small
Visitors were keen to see Fendt’s new Ideal combine.

Cereals report

- seeds could find recent updates to Stocks Ag’s Fan Jet Duo twin applicator of interest. It launched a number of new features at Cereals, designed to improve operation ease and accuracy.

  The new controller comprises a single screen terminal on which users can both control the applicator and observe coverage mapping, enabling variable rate application with repeatable accuracy of less than 1m against 10m with the previous system.

  Other improvements include a rear camera to observe the spread pattern and internal hopper lighting to aid filling at night.

Knight Farm Machinery

Spray operators are increasingly working at night to reduce the risk of drift, so Knight Farm Machinery is now offering boom lighting on all of its sprayers. The system can be supplied from new or retro-fitted, and shines powerful LED blue lights through the spray pattern, enabling operators to check that all nozzles are performing efficiently at all times.

“Spraying conditions are often at their best towards the end of the day and into the early evening, when the wind often drops,” says marketing manager David Main. “This system will enable operators to make best use of those working windows.”

Fendt

Visitors were, as ever, drawn to the biggest bits of kit on show, and Fendt’s Ideal combine did not disappoint. On display in the UK for the first time, this new combine has been designed from scratch.

  The company claims that it’s all about efficiency, high quality grain and straw and reliability, with simple operation and unique sensor technology for automated machine configuration.

  With up to a 12.22m PowerFlow table feeding into a giant Superflow augur, this behemoth should eat up the hectares. The header adjusts laterally by up to 8° to cope with sloping fields, and can be coupled on within five seconds using the optional Autodock feature.

  But what Fendt claims makes the Ideal stand out from the crowd is its single or dual Helix rotors, providing maximum output with gentle crop handling and low energy consumption. The convex and concave grain pans reduce grain losses on slopes, and with a tank capacity of up to 17,100 litres and a discharge capability of 210 litres/sec, the Ideal can handle a whopping 200t/hr.
Crowdsourced weather data drives decisions

Farmers can now access real-time in-field weather and soil information following the launch of affordable and portable monitoring stations, with linked-up data giving a reliable local picture.

Accurate, real-time weather data is vital to farmers, but until now it’s been expensive and difficult to source. CPM takes a look at a new option: Individual farm weather stations which link up to give a detailed local picture.

By Olivia Cooper

Farmers can now access real-time in-field weather and soil information following the launch of affordable and portable monitoring stations, with linked-up data giving a reliable local picture.

Launched by Sencrop at the Cereals Event, the weather stations enable farmers to see what field conditions are like at any point on the farm, enabling more efficient spraying and harvesting operations. But the real power comes from the ability to share data with other producers, offering a detailed picture of weather on a local, regional and national level.

“Installing a Sencrop unit in one or more fields puts the grower in immediate possession of data unique to that location,” says Fred South at Sencrop. “Automated analysis of this continuous data stream opens up a new and far more objective approach to field operations. Now there’s no need to take a chance on spraying and fertiliser applications with a forecast based on observations from several miles away.”

The stations measure parameters like wind speed, gust and direction, air temperature, humidity, rainfall, soil moisture and soil temperature. And there’s no need to rely on patchy 3G phone coverage or wifi — the units use a low power, long-range network which gives coverage almost anywhere. The portable stations are battery-powered — with rechargeable batteries costing £30 and lasting 3-4 years — meaning they can be moved around the farm according to the crop rotation.

“Previously, weather stations were difficult and costly to install — the whole aim for us was to have something that’s cheap and portable,” explains the firm’s Amber Ogborn. “They are all GPS positioned so you know exactly where they are.” Installation takes around 10 mins, with data online within 15 mins and updated every quarter of an hour, giving real-time information as well as historic details on your computer or smartphone app.

Sencrop has already installed 7000 stations across Europe, where potato growers have cut out up to three blight sprays from their programmes, because the conditions weren’t serious enough to merit spraying — saving them €160/ha (£143/ha), adds Fred. “It gives a new meaning to ‘decision support’. Farmers can choose to share the data with their agronomists, field operators, and other stakeholders, with both live rainfall monitoring and a seven-day forecast making for information-driven decisions.

“It’s also possible to set alerts for any combination of weather conditions — like frosts, minimum temperature, rainfall over a set period, and rising humidity, for example. In this way, farmers can ensure herbicide applications are made at the most effective time, and they can also monitor critical stages in cereal disease development, for optimal spray timings.

“But while the super-localised data stream is invaluable in supporting the individual grower, our system excels when it can number-crunch across multiple streams of data from multiple locations,” notes Fred. “It’s more than a farmer and his neighbours sharing data for their own good; this is about creating a pool of data that has benefits across the industry.”

Further information

A basic weather station — Raincrop — which monitors humidity, air temperature and rainfall — costs £380 plus £150/yr subscription. Windcrop — which monitors windspeed, direction and gusts — costs £330 plus £150/yr, while Sencrop Plus — Raincrop and Windcrop together — costs £699 plus £180/yr. A leaf wetness sensor is also available for orchards and vineyards. For more information visit sencrop.com.

Weather information to rely on

James Robinson replaced a manual rain gauge with two Sencrop units at his farm in Cambis, after he acquired another site 20 miles from the home farm. “It made sense to have more reliable data about weather conditions without having to drive out to collect it,” he explains. “Having live weather data is really helping to inform our management decisions on farm, improving our day-to-day operations. Knowing that it’s too windy to spray at the remote site saves time and fuel.”

He anticipates the local data and seven-day forecast will be particularly beneficial this harvest, helping to inform his combining operations and cultivations — and he’s keen for other farmers to come on board. “Sometimes showers can be very localised, and on a day-to-day basis it would be helpful to see local rainfall patterns.”

James Robinson finds it easier to manage remote sites.

Accurate, real-time weather data is vital to farmers, but until now it’s been expensive and difficult to source. CPM takes a look at a new option: Individual farm weather stations which link up to give a detailed local picture.

By Olivia Cooper

Farmers can now access real-time in-field weather and soil information following the launch of affordable and portable monitoring stations, with linked-up data giving a reliable local picture.

Launched by Sencrop at the Cereals Event, the weather stations enable farmers to see what field conditions are like at any point on the farm, enabling more efficient spraying and harvesting operations. But the real power comes from the ability to share data with other producers, offering a detailed picture of weather on a local, regional and national level.

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When buying a new cultivator or plough, there’s a massive variety of tine and disc designs to choose from – so how can you be sure that the equipment will do the job you want? *CPM* offers a guide to cultivator design and innovations.

**By Olivia Cooper**

**Machinery Cultivators and ploughs**

Shallow and fast, or deep and slow? Serrated discs or curved? Narrow tines or duckfoot shares? Oh, and what type of roller would you like with that? The choice of cultivator set-up can be quite baffling, particularly when most farms have one piece of kit which is meant to carry out a multitude of tasks.

So how do you go about choosing the best equipment for your farm? We caught up with a few manufacturers to get their top tips and latest developments.

The first step, according to Andrew Gamble at Väderstad, is to ascertain what it is you want to achieve. “Dig a hole and figure out what you’re trying to do with the machine — it needs to link to your agronomy.” Are you looking to move a lot of soil on the surface, to chit grassweeds, or do you need to go deep to remove compaction?

If breaking compaction is the aim, Väderstad’s BreakMix point — intended for heavier soils — could be an option. This provides deep loosening (30cm) without mixing at depth, while at the same time mixing intensively in the top 10cm of soil to speed up residue decomposition. In this way, it doesn’t bring clods of earth to the surface, and creates a fine seedbed ahead of drilling.

**Crenelated disc**

At the other end of the scale is the CrossCutter Disc for ultra-shallow cultivation. Designed for use in cover crops, maize and oilseed rape stubble, this crenelated disc cultivates the entire working width at only 2-3cm depth, crushing and mulching crop residues without mixing them in too deep. This ensures good oxygenation for decomposition, and also chits weed seeds in the soil surface without bringing up dormant seeds lower down in the profile.

For organic producers, it could be worth a look at the new Goosefoot share, fitted to the NZ harrow for mechanical weed control. This broad yet shallow share slices off weeds at the root and leaves them on the field surface without mixing the soil.

Or to add a mixing effect, the Väderstad TopDown fitted with wing shares is an alternative choice.

There are more than 40 different tine and disc options to fit to Väderstad cultivators — and they are easily changeable so you can tailor the set-up to suit requirements. Discs with bigger scallops should be used to cut heavier trash, larger discs are suitable for deep working while smaller discs are for shallow operations. “It’s the setup that’s important — point and disc choice is key to getting the results you require.”

Running too wide a point too deep will create too much ‘boil’ in the soil, and will increase fuel consumption, warns Simon Brown at Amazone. “You should only ever cultivate as deep as necessary, so it’s...”
When choosing a plough, Rob Immink at Maschio will take a farmer through several steps to identify the best option. Available horsepower and field size are two — influencing the size of the plough — followed by soil type. “If you have stony or heavy clay soils you’ll probably want automatic reset — other soils will get away with shear bolts.”

Those with variable soil types may benefit from hydraulic width adjustment, while manual adjustment is suited to more uniform soils. Sticky soils work best with slatted boards, whereas whole boards are fine for other soil types. “If you’re ploughing for potatoes you’ll need a deep board, while cereals want a wider one.”

Most farmers nowadays are using ploughing to control grassweeds, he adds, so are looking for complete inversion to bury the seeds. That will affect the mouldboard design — helical for shallower working depths or cylindrical for deeper inversion — while skimmer choice depends on the residue; are you ploughing maize stalks or short barley stubble?

“There are a lot of factors that determine what plough you need, so it’s important to weigh up all the considerations.”

Consider soil type when choosing a plough, says Rob Immink.

A tine is rigid, so it can dig deep or skip on the surface in undulating fields — it’s not really designed for really shallow cultivation,” he notes. “On the other hand, compact disc harrows have the ability to go shallower and follow contours across the full width.”

If cultivating to encourage straw decomposition, Simon offers a useful calculation: 1cm of depth per tonne of straw/ha. “So if you have 10t/ha of straw, cultivating at 12cm will be ample — if you go too deep the straw is outside of the aerobic zone and so won’t rot.”

Shallow tine cultivation should aim to cut off the root ball, provide straw-to-soil contact to trigger decomposition, and promote grassweed growth. “My favourite

Cultivators and ploughs

**Plough set-up**

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**Terrano GX**

ALL-ROUND PERFORMER IDEAL FOR SHALLOW AND DEEP CULTIVATION UP TO 25CM

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Cultivators and ploughs

A key aim is to loosen the ground without ‘boiling’ the soil.

He-Va’s CombiDisc can subsoil, cultivate and consolidate in one pass.

is a duck foot point as it has a flat profile and cutting action.” It can be mounted to achieve either a full or partial working width, depending on requirements.

For something that loosens the soil at depth, a narrow 40mm tine will do the job down to 30cm. “By narrowing the point you won’t need much more horsepower as it’s not moving too much soil. With a slight curve you’ll get a little bit of lift, but the aim is to shatter the soil sideways, not bring the lower soil to the surface,” explains Simon.

When it comes to disc choice, smaller diameter discs with a smooth surface are suitable for fast, shallow work. Serrated discs provide a bit more bite for heavier land, while larger serrations on bigger discs help with mulching stubble and digging down deeper.

On the Catros and Certos disc harrows, the front row of discs are mounted straighter for more aggressive action on unmoved soil, while the rear row is angled more to work across a broader width and level the soil. “They also have rubber block mountings to allow more movement.”

Consolidating the soil after cultivation is important to ensure residue-to-soil contact, as well as breaking up any clods. “However, you don’t want to seal the soil as it’s important to draw oxygen in,” explains Simon.

Depth control

Open rollers are cheaper and provide good depth control, but they block easily in wet conditions. Rubber rollers are good for lighter land, while DW rollers are a better choice for heavier soil types. “If you really want to rip the soil up and leave it to weather then you can remove the roller altogether.”

A key aim of many modern cultivators is to loosen the ground and produce a decent seedbed without ‘boiling’ the soil and mixing the profile. KRM’s Maximulch uses a combination of low disturbance TCS tines with a wide share and 560mm concave discs to lift the soil profile and create vertical fissuring while leaving a level surface behind. The cut-out discs break up any surface panning and stubble residue, while the TCS tines can be adjusted down to a depth of 30cm.

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“The discs are mounted on pigtail tines, so they can move in three directions rather than just two,” says managing director Keith Rennie. “This gives greater soil shatter and enables them to skip over stones.”

For a truly multipurpose piece of kit, take a look at He-Va’s CombiDisc. Designed to subsoil, surface cultivate and consolidate in one pass it can be set up in different ways to work at any depth from the surface only down to 35cm. The subsoiler legs come with either shear-pin or hydraulic reset, and can be lifted altogether for shallow disc cultivation if required. The discs can be adjusted to work at anything down to 12cm, and work independently of the frame to follow contours, explains Opico’s Richard Amphlet.

By using a sabre disc rather than a more concave one, and mounting it on a curved arm, the disc is more upright when working on the surface, breaking soil sideways rather than scooping and smearing it. And when working at greater depths it is pulled to a steeper angle for improved residue incorporation, he adds. “Farmers need a cultivator that can cope with a massively changing industry as well as all conditions. Rather than having five cultivators you can have one that works in five scenarios.”

The CrossCutter Disc mulches crop residues without mixing too deep.
As contained systems, grain is inaccessible to pests in the Danagri-3S silo.

Getting a crop to harvest is enough of a challenge for growers, but for those drying and storing their own grain, the story doesn’t end with the combine. CPM takes a look at grain stores and gadgets to make the process work for you.

Promotional Crop Production Magazine: July 2019

By Melanie Jenkins

When operating a grain store, there’s a lot to think about; from grain movement to drying, moisture testing and system controls. So what options are out there to maximise grain quality with minimal input?

Danagri-3S

While grain store design hasn’t changed much in recent years, it’s all about adopting the most efficient system for your farm. Danagri-3S specialises in silos, with most sales in the UK from 250-1000t.

“When these, there’s the option to include an in-bin stirring machine which evens out the moisture content,” explains the firm’s Mark Unitt. Using this system, either an ambient or gas heater can take the moisture content of feed wheat down by 2% throughout the whole bin within 24 hours. “If you need a slower drying rate for milling wheat, malting barley or oilseed rape, it can usually reduce moisture content by 0.5-1% per day,” he explains.

As a contained system, grain is inaccessible to pests, and in the winter, cold air can be vented through to reduce the risk of mycotoxins building up, he adds.

When it comes to filling the bin, you can either use an auger or install an intake pit, speeding up harvest operations, says Mark. There are options of above-floor pits, level-floor pits or a dry pit system.

Above-floor pits comprise a hopper — from 1m to 10m wide — and are designed for trailers to back up to and dump into. Conveyors with capacities from 25-150 t/hr then transport grain to the silo.

Level-floor pits are becoming increasingly popular where underfloor pits can’t be used due to water table restrictions. The top of the intake conveyor is placed at floor height and can be 12-30m in length according to its strength and capacity. This enables farmers to put in a large enough pit to accept a full trailer or lorryload. The conveyor then empties the pit and can be turned off via a sensor when it’s empty.

The latest pit system is a dry pit from JEMA. This is a modular build, sunken intake pit designed to avoid water ingress and allow for conveyor servicing. It’s bolted together, sunk into a vertical concrete pit and then the edges are filled in with cement so there are no horizontal surfaces. The dry pit system fits with the JEMA chain and flight conveyors T45, T49 and T57 and capacities range from 12.7-48.3m³.

“When it comes to emptying the silo, Danagri-3S has a simple sweep auger machine which is carried into the silo once the grain has reached its angle of repose,” explains Mark. “It then circulates and drops down within the remaining grain and augers back to the centre sump leaving only a simple manual sweep-up operation.”

A more popular method, and the latest trend in bin emptying, he says, is for a direct drive Powsweep system to be fitted in the bin. Remaining in the bin at all times it’s operated by an electric motor on the external power drive.
The PLC dryer control panel sends alerts on dryer status, with all data logged for farm records.

Perry of Oakley’s automatic moisture control detects incoming and outgoing moisture changes.

In the next year, Danagri-3S is looking to update its electronic systems to ease the flow of information to the farmer. “This will make data on grain more accessible and automate moisture readings using sensors,” explains Mark.

**BDC Systems**

BDC Systems has developed an automatic sampling unit that can supply farmers with moisture content readings as grain passes through the dryer.

It takes samples from the incoming wet grain and outgoing dry elevators, which it processes through a multi-chamber duct incorporating a Sinar moisture probe specifically designed for this application.

Live readings showing the moisture content of both samples are displayed on a screen along with a graph showing the moisture trend, while historical data is stored for future reference. It can also be linked to BDS’s control panel and data can be viewed remotely. “This information can be used to adjust dryer settings which will save money and ensure grain goes into storage at its optimum moisture content,” says Matt Graine of BDC. “The ultimate aim is to automate the entire process.”

**Perry of Oakley**

Perry of Oakley’s PLC dryer control panel puts connectivity in the farmer’s hands, using a 12-inch touch screen to regulate handling and the dryer operations. The system can send over 70 alarms and messages relating to the dryer status, with all data logged for farm records.

The operator can enter crop type, intake moisture content and target moisture content, and the panel then sets up the dryer parameters, with temperature and fan speed set to suit crop type.

The auto discharge control system uses a list of adjustable parameters — including the sensitivity, rate of sampling and target hot grain temperature — alongside the exhaust air temperature — to control the process and maintain a consistent moisture content of the grain.

Storage and drying

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Dicam 2 has been made to peer-to-peer network, meaning it can connect with other systems like itself.

The panel can also provide automatic moisture control, which monitors the top and bottom of the dryer to detect incoming and outgoing moisture changes, thereby controlling the discharge speed accordingly. According to Perry of Oakley, the sensor is accurate to 0.5% between 5% and 18% moisture content and within 1% between 18% and 40%. Though it’s fully integrated with the PLC control software, it can also be installed with any make of existing drier or standalone system.

Mobile phone app technology has finally made its way to the grain store with Perry of Oakley’s app allowing farmers to view the plant control panel and have full remote control of the dryer from any smartphone or computer.

When it comes to physical grain drying, Perry’s Savannah series features fans which are controlled by an inverter, meaning there could be potential to save power and crop lift off by running the fans at a reduced speed. The fan selection has been revised on previous models to reduce overall power consumption, giving a maximum fitted power of 22kW per fan.

The drier has been built with a 2mm thick grain column for additional strength and longevity, while the top ducts are 3mm thick to prevent deformation and wear.

For handling very wet grain, the dryers are all fitted with Perry’s pneumatically controlled Shutter discharge to keep grain moving down the column.

Farmex
Farmex is soon to replace its process controller, Dicam, with an upgraded model. Used to regulate any process involving sensors, actuators, fans, heaters and beyond, the firm claims the product has a strong track record in crop storage facilities. “It was built as a flexible agricultural control unit, so there’s no limit to what sort of sensors can be connected to it and there’s no restraint to the capacity of the load,” explains Hugh Crabtree of Farmex. Sensors can be used in read- and display-only mode or used as a function of process control.

Dicam 2 is due for commercial release in 2020. It has been constructed to peer-to-peer network, meaning it can connect with other systems like itself, total flexibility regarding sensors and what it can control. However its processing and memory are more powerful so it has many more connectivity options. This means it can connect to other systems on the farm and could become the data capture platform for the whole site, says Hugh.

One of the main changes that end users will see is that access to the system is available via a new mobile app. “Instead of going to the unit to change the settings, these can all be done remotely, as long as there’s network connectivity,” he adds.

Through the app, users will have access to full functionality of their dryer, and will also be able to use a limited range of data analysis tools. The unit collects an in-depth range of data, but further analysis and subsequent access are granted through a subscription service, so the farmer can tailor access to their needs. “The systems work with a huge amount of data, but the app will just supply the farmer with what they need or want to know.”
The all-new FPT Industrial V20 engine is a 20.1-litre V8 behemoth that delivers a mighty 911hp (670kW) maximum power at 1600 to 1800 rpm, 4095Nm maximum torque and a productivity-boosting 48% torque rise at 2100-1500 rpm.

The power curve has been specifically mapped to match the precise requirements of foraging applications, explains forage and hay product marketing specialist Ian Bourke.

“We’ve focused on the torque — you need a good torque growth to handle lumps as they pass through the machine. But you need efficiency too.”

DLG tests have shown New Holland’s Forage Cruiser range brings in a maize crop with a fuel expenditure of as little as 0.45 l/t. The V20 engine delivers its most fuel-efficient performance in the 1600-1900 rpm working range. This, together with the low maintenance costs, results in a low total cost of operation, notes Ian.

The overall feeding system now features a 12.5% bigger intake channel thanks to higher lifting potential of the intake rolls. There’s thicker steel at the front end, particularly on the back roll, which is now more aggressive. This upgrade in metalwork and general build extends throughout the direct driveline of the FR Forage Cruiser to ensure that all the power from the mighty V20 engine is efficiently transmitted to the driven parts.
A new heavy-duty four-wheel drive system, developed to deal with the increased power and traction requirements, also delivers this to the ground, increasing the maximum torque transferred to the wheels by 60% compared with the standard four-wheel drive system. Terralock automatically activates and deactivates the four-wheel drive axle depending on the steering angle setting. Also new for the FR Forage Cruiser are two new crop processors, bringing a total of three available across the range. The DuraCracker system has been designed with reinforced frames and drives, raising the opening force by 50%. This delivers increased power and traction requirements, system, developed to deal with the

**Intelligent ways to denser bales**

Large square bales with a higher density can reduce transport and storage costs. So how do the leading manufacturers pack in more punch?

**Intelligent density**

Kuhn’s LSB 1290ID (Intelligent-Density) baler incorporates the company’s Twinpact plunger system to pack in the force required to create higher density bales. The machine’s driveline and transmission upgrades create further benefits, says the company, allowing a 200hp tractor to produce bales of over 500kg.

The LSB 1290ID is fully ISOBUS compatible and can be controlled from an ISOBUS terminal on the tractor or via Kuhn’s CCI 1200 or CCI 50 terminals.

**Ultra main gearbox**

Fendt claims its Squadra 1290 UD square baler delivers the best bale density available on the market today. The Squadra is fitted with an ultra main gearbox that packs in a press force of 760kN, producing straw densities of up to 245kg/m².

Hot off the press is a new feature Fendt’s calling Intelligent Hay, which collects and processes information about each square bale. During the baling process, the baler collects bale-specific data on the quality, GPS position, moisture content, bale flakes, as well as information about additives and the bale length and weight. With the third or fourth twine, a special weather and temperature-resistant twine fitted with an RFID chip is cleverly woven into each bale. The RFID chip allocates a metric to each bale, stored in a cloud memory, that can be scanned to access its data and displayed in the BaleLink app on a smartphone or tablet.

**Crop compression**

New features on the intake of John Deere’s large square baler range include a driven crop compression roller positioned behind the standard roller crop press. This improves capacity in large windrows by up to 10%, says the manufacturer.

The three models in the range are the L1524 (70x120cm), L1533 (90x80cm) and L1534 (90x120cm). All three models feature a 2.3m five line bar pick-up which incorporates the high capacity inline auger and rotor design.

The driveline design features individual cam clutch protection on the pick-up, rotor and feeder fork, meaning there’s no downtime changing shearbolts should a blockage occur. The pre-chamber design is fitted with trip plates positioned at the top, designed to improve bale formation and consistency, regardless of swath size or forward speed.

The L1500 Series large square balers are ISOBUS compatible with most adjustments controlled and monitored directly from the cab.

**Integrated bale weighing**

The Claas Quadrant 4200, 5200 and 5300 models now include integrated bale weighing for those who want to keep a close eye on bale quality during the baling operation. Using scales fitted in the bale ramp, the actual weighing process takes place automatically as part of the formation of each bale. Bales can be weighed at vehicle speeds of up to 20km/h, says Claas.

The driver can read the individual bale weight directly from the ISOBUS control terminal display in the cab or using the Claas Telematics you can generate the total area yield and the yield distribution by individual field, showing the bale location and the individual bale weights, along with its moisture level.
with New Holland’s HydroLoc technology, ensure constant chop length independently of throughput and crop type, says Ian, while the ActiveLoc system automatically adapts chop lengths to moisture content.

Up front, a new 9m maize header equipped with six big drums is designed for a tall crop and matches the capacity of the FR920. The header features a fast double-folding function and a fully hands-free support-wheel attaching function.

**Tractor test**


Seen first at SIMA in Paris earlier this year, it was a T6.180 Special Edition with Dynamic Command that was available for a drive at Goodwood. Four Special Edition tractors have rolled out of the Basildon plant to mark 100 years of parent company Fiat — two in New Holland heritage blue livery and two in a striking terracotta colour.

The new models have a NEF six-pot 6.7-litre engine under the hood, a proven source of power with NEF models widely adopted on T6 and T7 tractors. It features an optimized EGR-free (exhaust gas recirculation) combustion for efficient operation, coupled with an Hi-eSCR (selective catalytic reduction) after-treatment system to comply with Stage IV (Tier 4B) emissions standards.

The more powerful engine block delivers a maximum torque of 740Nm at 1500rpm, compared with the 700Nm of the 4cyl. You notice this, with a low-end torque that significantly helps in pulling away performance, and increased torque at mid-engine speeds, which improves engine lagging in transport and field applications.

The Dynamic Command transmission lets you shift between eight gears under load, without having to change ranges. This is coupled with New Holland’s Ground Speed Management (GSM), and at SIMA, GSM II was launched. This brings CVT logic to a powershift tractor — using a combination of data relating to engine load, forward speed and operator setting, it manages both engine and transmission speeds to optimise performance and economy.

The interface is similar to the Auto Command, with speed adjustment on the CommandGrip joystick, target speeds adjustable on a thumbwheel, Cruise Control, and a logical layout on the display. The performance can be adjusted to prioritise Power/output or Economy.

Where the T6 is optioned with IntelliTurn — automatic, repeatable end-of-row turns — there’s now the option to automate the start of the HTS II function (Headland Turn Sequencing), based on distance from the headland or field boundary when used in conjunction with IntelliTurn. The integration of these two functions results in a completely automated end-of-row turn and implement function sequencing.

**Pay attention, 007**

The AgXtend range is where New Holland places its next-generation and precision farming gadgets. Sensor-based technology delivers real-time data on crop biomass, soil or surrounding conditions that can be used to adjust inputs or inform decisions, and it was the CropXplorer that was available for a test drive at Goodwood.

This is an Isaria attachment, mounted on a standard three-point hitch or front weight, that comprises two optical sensors set 6.9m apart on a foldable boom. These have their own light source and scan the biomass of the crop, sending data back to the cab via Bluetooth. The Map + Overlay...
mode of the on-board software allows farmers to use yield potential maps in combination with the sensors for on-the-go adjustments to N applications.

Designed to be easy to set up and use, no calibration is required, and it’s compatible with ISOBUS fertiliser spreaders as well as most of the non-ISOBUS spreaders capable of variable rate application.

SoilXplorer consists of a contactless, front-mounted soil sensor using electromagnetism to measure soil conductivity at four different depths: 0-25cm, 15-60cm, 55-95cm, 85-115cm. These measurements can be used for two main purposes: mapping to determine soil type and heterogeneity as well as relative water content, and detecting areas of compaction for variable depth soil cultivation.

There’s also the NIR sensor that can be mounted on all types of equipment, such as forage harvesters, combines, balers and slurry tankers, and feed back on criteria such as yield, moisture as well as crop constituents. On forage harvesting machines, it can determine ADF (acid detergent fibre), NDF (neutral detergent fibre), starch, ash and crude fat. Used on a slurry tanker, it monitors the amount of nitrogen applied.

The FarmXtend App is a weather station using a number of connected sensors to monitor in-field conditions. WeatherXact measures temperature and humidity at a height of 1m and at crop level. RainXact is a rain gauge, while SoilXact records soil moisture and temperature at different depths. Bringing the data together is a clever app that can determine disease pressure (based on temperature and humidity) for a variety of crops as well as optimal time for spraying.

The Xpower’s a little bit different and may be the most intriguing of the bunch. It’s an electro-herbicide –– rather than spraying the weed, it zaps them, and is capable of destroying the complete plant down to the roots, with no environmental pollutants or residue. It consists of electrodes that pass over and come in contact with the weed to complete the circuit and deliver the shock that fries it. Application booms are available in different working width from 1.2-3m.

The AgXtend range of products can be fully integrated into New Holland’s existing PLM precision farming platforms.

**Combi solutions to pick up, roll and wrap**

Having a separate wrapper in the field when baling up forage ties up an extra tractor and operator and causes extra trafficking, but a number of manufacturers offer combination models with their round balers.

Kuhn’s range of baler-wraper combinations includes the i-Bio+ and FBP 3135 BalePack. All have a standard 2.3m wide pick-up, Integral Rotor intake system and hydraulic dropfloor, as well as a choice of two OptiCut intake rotors and Kuhn’s IntelliWrap system.

The i-Bio+ is an ultra-compact lightweight and manoeuvrable machine ideally suited to sloping ground, smaller fields and areas with restricted access. The first combination baler-wraper to offer Kuhn’s film-binding system, it also operates with conventional net binding with a simple switch between them. The FBP 3135 BalePack is a fixed-chamber round baler-wraper combination designed for high output working. Both designs handle bales up to 1.25m in diameter.

Pöttinger has two baler-wraper combination models in its Impress range of variable chamber round balers. The 155 VC PRO produces bales up to 1.55m in diameter while the 185 VC steps this up to 1.85m. There’s a smooth bale transfer to the company’s twin satellite wrapper unit, which features satellite arms mounted from below the table to increase wrap stability and application, says the company.

John Deere’s C451R and C461R variable-chamber wrapping balers feature a full-frame chassis and use the Fast Release System in conjunction with a high capacity feeding system. The balers now feature a 15% faster wrapper working at 40rpm and an 18% faster table transfer system compared with the previous C440R model. These new wrapping balers are also available with a tandem axle as standard.

Fendt’s solution is the Rotana Combi machine. A moving transfer arm pushes the bale onto the lower table. To prevent it from slipping, the bale transfer ramp is also equipped with moving side parts. The tilt angle of the main chamber has also been reduced to 8° to improve stability on slopes and the throughput of the combi-machines. all Rotana Combi machines have a film preload as standard and there’s a choice of three different spans, depending on the type and quality of the film.

Claas has its Uniwrap, available for the fixed-chamber Rollant 455/454 and 375 balers. The wrapping process has been accelerated by over 30% — just 23 secs for six layers of film — while bale transfer takes 12 secs. Pre-stretching of up to 82% ensures airtight bale wrapping and reduced film consumption, says Claas.

**The Crop Xplorer is an Isaria attachment, comprising two optical sensors set 6.9m apart on a foldable boom.**

**The Crop Xplorer is an Isaria attachment, comprising two optical sensors set 6.9m apart on a foldable boom.**

**The Crop Xplorer is an Isaria attachment, comprising two optical sensors set 6.9m apart on a foldable boom.**
The use of telemetry for wireless two-way instant transfer of data between farm kit and computer tech is on the rise. *CPM* visits a Cambs farming operation where John Deere and its local dealer are helping to get the most from the technology.

By Martin Rickatson

Between thumb and forefinger, Ed King holds up and examines a computer memory stick. One of the smallest day-to-day implements of modern farm management, it’s an easily recognisable tool of the trade for those who practise precision farming, with its ability to store and transfer records, field maps and a huge amount of information.

Yet for all its capabilities, it’s delicate, easy to lose, can become corrupted and still has to be moved physically between farm office computer and tractor, sprayer or combine when up or downloading data. While the latter doesn’t sound like a big undertaking, you could be left in a field an hour from the farm, with a corrupted or incorrect stick, or without one at all because it’s been mistakenly left behind.

This means wasted time and fuel returning to base or having someone deliver it to the machine.

Sentry’s Cambs farming business is moving to make the memory stick largely redundant, however, using telemetry to move, process and present data. It’s valued by arable manager Ed King for its ability to wirelessly and immediately transfer data from machine to computer and vice-versa. This is not just for record creation but also to allow remote monitoring of ongoing activities and machine health both by himself and — with his permission — by the dealer. Under the guidance of regional director John Hall, Ed’s driving an initiative to help realise the value of this technology across the Sentry business.

Reference farm

With the help of John Deere and its local dealer, Ben Burgess, the aim is to create a ‘reference farm’ at Sentry’s Chatteris base to show the full capabilities of Deere’s suite of Agricultural Management Solutions (AMS) precision farming systems and technologies, under which its telematics technology falls. From there, the plan is to help roll out use of the technology across the wider Sentry business.

“We’ve been increasing our use of precision farming technology across Sentry arable units year-on-year,” explains John. “That began with yield mapping, and progressed to auto-steering using John Deere’s AutoTrac technology — Deere is Sentry’s preferred tractor supplier. More recently we’ve begun variably applying seed and nutrients.

“The development of telematics and the greater levels of data management and analysis it brings means we’re keen to tap into the data accumulated in recent years and gain more from such technology. With Ed working alongside Ben Burgess and John Deere to create a model reference farm here for AMS and its FarmSight tools, including JDLink telematics for use in job, field and fleet management, we have the opportunity to find out what’s possible, set some standards and apply them across all our farms.”

Comprising 300ha farmed around...
AMS allows Ed to monitor ongoing activities and machine health remotely and – with his permission – so can the dealer. Using the MyJohnDeree app on his smartphone, Ed can remotely check work progress, fuel levels and other data.

Chatteris for multiple landowners, plus a further 300ha nearby at Downham Market, Sentry’s Cambs operation grows combinable crops, with crop establishment services carried out on another 250ha, and the business also providing individual contract operations. With soils spanning clay loam through to sand over gravel, yield mapping has been used for some years to identify areas of significant variation. Over the past year, this has been supported by fully-updated SOYLsense soil analysis and mapping plus variable-rate drilling.

“Two years ago we began talking with Deere and Ben Burgess about the costs and benefits of bringing more aspects of precision farming into our everyday practices,” says John.

“The offer was made to help us set up a ‘reference farm’ to identify the equipment we required, and increase our knowledge of and confidence in the capabilities and value of telematics, so we could aid the adoption of the technology on other Sentry units.

“As a recent recruit to the team, joining us four years ago as a trainee, Ed brings a new skill set, and being young and especially proficient in this area of technology, he’s taken on the mantle of precision farming specialist within Sentry. As he develops his knowledge of its uses and benefits here, he’ll use that experience to help other managers.”

With the farm’s purchase two years ago of a John Deere 750A direct drill to minimise soil movement for blackgrass control, one of the first moves in the step up in its precision farming activity was an upgrade from 15cm auto-steering signal guidance to full 2.5cm RTK for the farm’s drilling tractor, in order to also switch to controlled traffic.

“We plough and use an Amazone Cirrus cultivator drill for winter barley and peas on our lighter soils, but are gradually working towards full direct drilling on our heavier land,” explains Ed.

Switch to RTK

“In the same year as the switch to RTK guidance, via a mobile RTK solution signal supplied from our dealer Ben Burgess’s RTK network, fields were mapped and, pre-drilling, tramlines established on the farm PC, this information then being accessible remotely by the drilling tractor. Wireless data transfer means this mapping, traffic paths and tramlines can be shared across all of our tractors via the MyJohnDeree telematics portal.

A central, secure web portal accessible via a PC, tablet or smartphone that –

Using the MyJohnDeree app on his smartphone, Ed can remotely check work progress, fuel levels and other data.
connects users to data from their machines. MyJohnDeere.com is used for up/downloading field, fleet and machine info, monitoring machines and analysing data. Deere’s FarmSight portfolio encompasses the maker’s machines, AMS precision farming technology and dealer-driven remote services. At JDLink’s launch, Deere committed to all-makes connectivity to any machine with a power source, system openness, seamless integration of products and systems and transfer of data, and comprehensive data privacy and security.

The company also promised to work with firms such as implement manufacturers, input suppliers and software providers. It’s taken an ‘open system’ approach and inviting virtually any firm to become a John Deere partner by implementing a data communication interface to the Operations Center in MyJohnDeere.com. It also created a physical data storage location in Europe, in which it promises full data security and privacy.

Paul Moss is FarmSight specialist with Ben Burgess, and guided Ed through the initial learning/training process once the business had subscribed to JDLink and remote data transfer and analysis could commence. “A single login leads to the various John Deere apps onMyJohnDeere.com, such as the JDLink telematics app and the Operations Centre app, which provides an overview of machine location and work progress,” he explains.

Data handling

“The Data and Account Management system within MyJohnDeere.com ensures secure data handling and protection, and accounts are set up so that only the customer controls data access. “There are two JDLink subscription levels. Free, entry-level JDLink Access + RDA provides remote machine monitoring and location-based data. Using the machine’s CANbus system, analysis of engine load helps identify the time spent doing different tasks and on idling, to target improvements in working efficiency.” The RDA element (remote display access) enables the owner/manager and/or dealer to remotely access the display to provide operator assistance, monitor and possibly address issues with the tractor without attending site, saving downtime and service costs, says Paul. “The second version, JDLink Connect, which Sentry Cambs is using, is a subscription-based service that provides all the JDLink Access benefits plus wireless data transfer for sending/receiving agronomic data such as prescription and as-applied maps.”

Co-ordinating the farm’s new RTK-accurate A-B lines with SOYL-derived nutrient mapping, both uploaded to MyJohnDeere.com on the office PC and then accessible through the John Deere GreenStar terminal in the tractor cab, has meant that this year for the first time the farm variably-applied nutrients.

“Throughout the year, satellite imagery uploaded to MyJohnDeere helped gauge each field’s additional nitrogen needs, allowing us to variably-apply accordingly,” says Ed. “Similarly, for pretty much any field task that relies on data, field maps and/or guidance, the required information is available via MyJohnDeere at the touch of a screen button on the terminal in the tractor cab as well as on the farm PC and my phone. The only information I can’t see on the latter are the maps.

Land farmed by Sentry Cambs comprises a block around Chatteris and one at Downham Market, plus crop establishment and contracting for others.
“With the spread of land we work across, it’s good to not rely on a memory stick, with the associated risks of damage or the wrong information, and it’s reassuring that data transfer is guaranteed 100% reliable and instantly up-to-date. In addition to our own work, that’s particularly important for the contract tasks we undertake when it comes to logging jobs and billing. With RTK mapping and instant data recording, we know exactly how much work has been done.”

Part of the Operations Centre of the user’s personalised MyJohnDeere.com web portal, the MyJobsConnect job management tool can be accessed either from the office computer or tablet/smartphone app, with transmitted information including job type, customer and field names, product application (eg seed or fertiliser rates) and the equipment used. It also makes possible viewing of machine locations and work progress.

“Being able to track location is especially useful when carting — I know exactly where trailers are and how soon one is likely to return. It’s also handy for seeing how much of an operation has been completed, knowing when fuel is required and spotting an issue with a tractor or implement, perhaps before the driver has had time to contact me.”

Conversely, he’s also received occasional notifications from his dealer of tractor issues that required attention.

“Dealer monitoring, for which we’ve given permission to Ben Burgess, has proved its worth a couple of times when they’ve notified us of machine operating issues, which we’ve then been able to investigate.”

**Further support**

Of the further support available from his dealer, Ed says he has had little need of it yet, but reckons the initial face-to-face training with someone who knows the system well was useful in helping learn to get the best from it.

“We’ve probably not yet used anywhere near all of what the system can do — things like finding and ordering parts is one area, although we do use it to check parts numbers when ordering on the phone,” continues Ed.

“The next step would be linking what our sprayer is doing wirelessly to Gatekeeper, which we use for crop recording, and then link to our stock recording and auditing through MyJohnDeere. Currently I’m manually entering agronomist recommendations into Gatekeeper.”

There is a compatibility issue, however.

“Although the GreenStar 4600 terminal used in our sprayer tractor is the latest version, it cannot talk to Gatekeeper, while the older GS2630 used in our other main tractor can. Ultimately this should be addressed so we can make this a completely paperless and wireless process, from recommendations to job recording.”

He notes that Deere’s compatibility claim is borne out by the fact the farm’s trailed 36m sprayer is of a different make.

“We run a Horsch, operated via ISOBUS through the Deere GS4600 terminal, and have had no compatibility issues, either with operating the sprayer or recording and transferring operating data. Wireless data transfer really comes into its own when spraying, for things like sending field/ tramline maps and recommendations. Once it’s mapped and its tramlines are placed and recorded the first time, any new contract land is instantly logged into our system.”

Compatibility will be further tested when the farm takes on a 350hp tracked tractor of a different make on a short-term hire this summer, primarily for soil loosening with a 12-leg/6m Grange toolbar.

“We’ll require a modular telematics gateway (MTG) box to marry the tractor to the John Deere StarFire receiver and GreenStar terminal that we’ll put on the tractor in order to transfer data wirelessly, but while we won’t be able to monitor the tractor itself, once this is installed the field data transfer to MyJohnDeere.com should work as well as with a Deere tractor,” says Ed.

“As a contract farming company this data management is just as important to us as if we owned the land — it makes us more efficient. Our farming is based on short-term agreements, but we farm for the long term, targeting the best returns by using the right equipment. The management of data accumulated, though, remains ultimately with the farm owner, to whom it would pass were we to leave a farm.

“Telematics isn’t so much about hardware — we already had the necessary satellite receivers, in-cab terminals, office PC and smartphone. It’s about a little extra investment in software to help get much more out of the technology. It means I’m able to do more management from the tractor seat — there are only two of us full-time.”

John says long-term relationships between Sentry, Ben Burgess and John Deere have been instrumental in helping put in place a system he believes has the potential to bring about significant savings in management and maintenance costs.

“This pilot project to allow us to assess the benefits of telematics required a three-way commitment between us, making dealer and manufacturer trust essential, but we’ve seen tangible results that have convinced us of its value.”

**Farm facts**

<table>
<thead>
<tr>
<th>Sentry Cambridgeshire, Chatteris, Cambs</th>
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<tbody>
<tr>
<td><strong>Area farmed:</strong> 600ha plus a further 250ha of contract crop establishment</td>
</tr>
<tr>
<td><strong>Soil type:</strong> Clay loam through to sand over gravel</td>
</tr>
<tr>
<td><strong>Cropping:</strong> Winter wheat, winter OSR, winter barley, spring barley, spring peas, plus land for parsnips and potatoes</td>
</tr>
<tr>
<td><strong>Staff:</strong> Ed King and one full time arable operator</td>
</tr>
<tr>
<td><strong>Tractors:</strong> John Deere 7290R, 6215R, 6210R, plus harvest/autumn hire of 320hp crawler</td>
</tr>
<tr>
<td><strong>Combine:</strong> 9m Claas Lexion 580+</td>
</tr>
<tr>
<td><strong>Sprayer:</strong> 36m Horsch Leeb GS trailed</td>
</tr>
<tr>
<td><strong>Drills:</strong> 6m John Deere 750A, 6m Amazone Cirrus</td>
</tr>
<tr>
<td><strong>Key cultivation equipment:</strong> Kuhn 6f plough, 6m Väderstad Carrier, 6m Grange low disturbance toolbar, 3m Sumo Trio</td>
</tr>
</tbody>
</table>

A modular telematics gateway (MTG) box will allow the JD StarFire receiver to be used with the tracked tractor hired in this summer.
Mind out for 4IR

Politicians enthuse about it, but whether farming will embrace the fourth industrial revolution or sit sceptically behind the curve may depend on a change of mindset. CPM explores the World of Opportunity.

By Tom Allen-Stevens

As a CPM reader, who leans towards the progressive side of agriculture, that headline probably drew you in. But have you truly considered what farming’s fourth industrial revolution (4IR) could mean for your business, how you interact with your land, with society and your family, and how you will exist as a farmer?

That may sound a bit touchy-feely for an industry that talks in terms of hp per m width, that seeks to shave a few % off fuel use, and which applies an agrochemical just in time for an incremental yield gain. But 4IR could do away with all such measures and more, and leave in its wake a generation of producers searching for a new paradigm of what it actually means to be a farmer.

It’s this complete change of mindset that lies at the heart of the farming vision towards which the Small Robot Company (SRC) is striving, explains co-founder and Shrops farmer Sam Watson-Jones. “It’s all very well developing a new concept and a new service that will carry out field work. But the danger is that the industry will simply look on Small Robots as tractor replacements — the change is far more fundamental,” he says.

Team of farmbots

SRC launched around 18 months ago with the concept of a new service where field work would be carried out by a team of three farmbots: Tom, Dick and Harry will plant, feed and weed arable crops autonomously, while Wilma is the AI (artificial intelligence) brain behind the operation, gathering and storing data and applying algorithms to decide tasks. The aim is to cut chemicals by up to 95%, prevent soil erosion and run-off, and reduce cultivation emissions by up to 90%. Significant cost-of-production savings are on the cards for farmers.

Since its launch, SRC has attracted £2.5M in funding, both from private investors (mostly farmers) as well as government funding through its Industrial Strategy. Some of the UK’s brightest brains in robotics and AI are now working with SRC on developing the prototypes and algorithms (see panel overleaf).

But Sam believes it’s just part of a seismic change agriculture will undergo over the next 10-20 years. “The whole...
The concept of the digital farm opens up a completely new range of possibilities,” he says. “The most successful farmers will be those who look beyond the boundaries that currently limit what the business does. They’ll take on new measures towards achieving a different set of goals — farmers in 20 years’ time will think of themselves in a completely different way.”

And there’s the rub — farming, more than other industries, has historically been relatively reluctant to change, he suggests. “If my great grandfather was to come back to our farm today, I reckon it wouldn’t take him long before he was up to speed with how the business operated. Compare that to a pre-war doctor or engineer — technology has transformed beyond recognition the way in which so many other industries operate.”

It’s a concern shared by Defra and AHDB — both have commissioned research to explore farmers’ decision-making behaviour. Dr David Rose of the University of East Anglia has led some of this and has more recently looked at how the farming industry can overcome some of the barriers to change.

“It’s a big problem in agriculture,” he says. “Companies like Apple and Google know how to market their innovations and have an infrastructure in place that sets out to understand end users, their needs, and preferences. This ultimately makes uptake of their products far more likely.”

In agriculture, however, so often the innovations are developed with no farmer involvement at all, so adoption can be a slow process. “The user-centric design is so important, but one of the difficulties for a manufacturer bringing a new product to market is commercial sensitivity — that’s why so much innovation goes on behind closed doors,” explains David.

Defra-funded work, published in Nov 2016, identified 15 factors that are influential in convincing farmers and advisers to use decision-support tools. These are seen as a route to lead users through decision-making, but similar factors influence uptake of innovations. The core factors are:

1. Performance expectancy – the desire for a tool to perform well
2. Ease of use – instantaneous results

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3. Peer recommendation – endorsement from another farmer or through an adviser network is a key determinant
4. Trust – there must be faith in the source of the tool
5. Cost – a free tool is more likely to be tried
6. Habit – whether it fits in with a farmer’s usual routine
7. Relevance to user – it should be flexible to serve the needs of the individual
8. Farmer-adviser compatibility – it works well when both use the same tool

A number of factors modify the strength of the core factors: age, farm size, farm type, and level of IT education. Facilitating conditions, such as broadband availability and ability to use the tool in wet weather, affect use. Finally, there are driving factors, such as whether its use is needed for compliance purposes and the level of marketing a tool receives.

But once it reaches the farmer, how can you tell if you’re someone who’s more receptive to new thinking? “The first point is that it doesn’t have to be about new technology — it’s the enquiring mind,” David says. “So simply introducing a new system to monitor a key variable, such as tiller counts, could be just as innovative as using a drone or an app."

Ask yourself if you regularly try something different, he suggests. “If you make mistakes, that’s good, as long as you learn from them.”

Collaborative outlook
And a crucial aspect is to look beyond the farm gate and to have an open,

The robotic route – evolution of a pioneering technology

The visibility SRC has had across all sectors has brought in expertise and innovations from a far broader field than just agriculture, says Ben Scott-Robinson.

SRC has had an intensive year of gathering data and putting the technology through its paces, with the two current prototypes of Tom — Rachael and Britney. The engineering and AI team is now just about to start a ‘Super Secret Summer Camp’ at its new headquarters in Salisbury.

“It’s a bit like a hackathon,” explains SRC co-founder Ben Scott-Robinson. “We have a vast amount of data to process which is shaping the algorithms. There’s also the design of Tom itself to refine. The team will hunker down and focus on delivering a pre-commercial service to our Farmer Advisory Group (FAG) members this autumn.”

Since SRC started, it’s captured huge interest and publicity as well as picking up a raft of technology awards. This has been important to draw in funding, as well as to help recruit leading-edge talent in robotics and AI from across the UK and further afield, says Ben. “The visibility we’ve had across all sectors has brought in expertise and innovations from a far broader field than just agriculture.”

It means the two prototypes are equipped with an impressive array of gadgetry that tells the robot exactly where it is, as well as sensors and cameras to capture crop growth and status. “For full autonomy, precise geo-referencing is essential — that technology has come on in leaps and bounds so that Tom is now navigating with much greater accuracy and efficiency,” he continues.

“He’s also about to acquire a nose — we’re working with partners developing a sensor that detects volatile organic compounds that will bring valuable data on soil health and nutrient status.”

The first prototype ‘T4’ has also been trialled. The Tactical Tail-Tom Trolley is a somewhat larger four-wheel-steer high-clearance bot, designed to capture data from up to a metre above the crop later in the season. “Over the summer we’ll be working on the redesign of Tom so he’s ready to go for the start of the next cropping season,” says Ben.

The prototype of Dick and Harry — Jack — was seen first by farmers at last year’s CropTec. This is an arachnid, four-legged design that folds in for transport and will soon carry up to a one-tonne payload. “We’ve been carrying out load and motion testing with the aim of bringing a moving Jack into the field this autumn,” he reports.

“Now electronic weed-zapping technology is under development for next year.”

But it’s the AI brain behind the bots, Wilma, who may have received the biggest transformation over the past 12 months. “The first step she achieved last year was to recognise wheat from non-wheat. She’s made huge strides this season in weed recognition, and our focus now is on blackgrass — the first service we’ll be rolling out will be reliable weed recognition and geo-location.”

Ben’s tight-lipped on details of just what sort of service farmers can expect to see this autumn. “What’s exciting is that there really is nothing else like this in agriculture at present. We’ve also been developing a web-user interface that will bring farmers and agronomists into Wilma’s world.”

This is the area that could see a dramatic leap forward in the near future, and not just in agriculture, he enthuses. “Augmented and virtual reality (AR and VR) systems are being developed in other sectors. We’re looking at how we can use VR for example to give agronomists a better remote view of crops than the poor resolution, top-down view offered by satellites and drones. AR could give you an insight into your crops you’d never get with the naked eye.”

SRC is also working with others across industry to develop a set of human-robot interaction (HRI) protocols. “We don’t want to be on the back foot with legislation; that’s already caught out drone technology. The aim is to develop rules proactively that regulators will accept as industry standard.”

With the technology advancing at such a pace, however, Ben admits it’s a challenge just to stay focused. “This is where the farmer involvement through the FAG has proved invaluable, and where the Hundred Club will also come in — everything currently is driving towards delivering a service that will be valued by farmers as soon as possible. It’s a massive task we’ve set ourselves, but I’m actually surprised how much we’ve already achieved, and that buoys us towards our goal.”

The robotic route – evolution of a pioneering technology

The visibility SRC has had across all sectors has brought in expertise and innovations from a far broader field than just agriculture, says Ben Scott-Robinson.

The robotic route – evolution of a pioneering technology

The robotic route – evolution of a pioneering technology

The robotic route – evolution of a pioneering technology

The robotic route – evolution of a pioneering technology
David Rose says there’s much to be learned from companies like Apple and Google, who know how to market their innovations.

“Crop production magazine july 2019

Digital Direction

Collaborative outlook. “The peer-to-peer approach is one of the strongest drivers of change in agriculture. Those who leave the farm to go to farmer meetings, who join farmer networks, with the aim of learning something new — as well as sharing knowledge — are most likely to catch the bow wave of positive change.”

So what’s his verdict on SRC? “Perhaps the biggest challenge it faces is delivering on performance expectancy — proving there’s value to a system that’s still very much at concept stage will be key. On top of that, there are fundamental issues that all operators in this space face — whether autonomous technology is safe to use, and the socio-economic impact on the industry.”

But David believes some of the difficulties new technologies struggle with may be managed through SRC’s Farming as a Service (FaaS) concept — the farmer doesn’t buy the robots, but pays for a service to be delivered, with all the technical intricacies of the technology handled by SRC engineers. “This service-based model addresses big barriers, such as lack of technical knowledge, and so long as there’s a cost-benefit, the initial cost of buying the technology is minimised.”

What makes SRC stand out in his view is the collaborative approach, however. The concept started through a series of farmer interviews, and a farmer advisory group is regularly consulted and kept up to date with progress. “There seems to be a real appetite to consult and engage with the farming community, shown in the way SRC has set out to understand farmers, the problems they face and address them. This user-led approach has a lot going for it, and I think the work they’ve done so far is interesting, although there’s always the challenge of making sure you are consulting all types of farmers, not just the keenest ones,” notes David.

Sam points out the farmer involvement is being expanded, through SRC’s Hundred Club. This panel of additional farmers will join the initial 20 and come on board as the first to trial SRC’s robotics service when it’s ready for large-scale commercial trials in 2021, as well as helping the technology take

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For farmers with the right mindset, the thinking strategies are far more valuable than any technology they’ll take on and adapt in the future.

But we’re very much focused on seeking out the keenest farmers who will champion the technology going forward,” he adds.

Farm Ambition Blueprint
He’s taken the focus on mindset one step further, too, with the Farm Ambition Blueprint (FAB). This is a series of full-day, quarterly workshops that take place over the course of three years. The purpose of the programme is to develop thinking about how new technologies could change your business and open up new opportunities.

“As farmers, often we’re so wrapped up in addressing the hundreds of operational decisions we take every day, we ignore the two or three big ones that really point towards achieving our goals,” explains Sam.

So the workshops aim to give participants more clarity about what they want their farm to become and a better focus on activities that add the most value. This is all presented within the context of technology convergence, which is where SRC’s specialist knowledge comes in.

“There’s never been a better time to really explore this,” enthuses Sam. “We’re living in an age where robotics are at a level that’s actually useful for farmers. Couple that with our ability to gather data, and it now really is possible to think of a crop on a plant-by-plant basis. But alongside this, AI has developed to a level where many of the

The Hundred Club – a wider advisory panel of farmers, who are regularly consulted as the technology takes shape and will trial SRC’s robotics service when it’s ready for large-scale commercial trials in 2021. Contact SRC for further information and the application form to join the group.

Farm Ambition Blueprint – a business coaching programme designed to develop your thinking about how new technologies could change your business and open up new opportunities. Similar to Harper Adams’ new Adopting Precision Technology in Agriculture (APTA) course, FAB focuses on personal development. Full-day quarterly workshops over three years, starting Nov 2019. Cost: £1200/yr, with a tenfold return guarantee.

Farmer investors – join the hundreds of farmers who took a stake in farming’s future and invested during the recent Crowdcube funding campaign, which raised £1.2M in equity. The campaign has closed, but there will be future opportunities to invest. Contact SRC to join the prospective investor list.

For more details on how to get involved with The Small Robot Company and to view The Ambitious Farmer, a book which explores the personal journal of technological change, go to http://www.smallrobotcompany.com/farmambition

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Digital Direction

As arable farms progress towards a digital future, it can be difficult to know which forms of data generation, capture and analysis provide a really worthwhile benefit to the business, and which are costly and time-wasting distractions. CPM is working with some of the industry’s leading companies in this area to bring growers some Digital Direction. These articles track the significant steps on the journey towards the data-enabled farm, and also explain and profile the technologies involved.

CPM would like to thank the Small Robot Company for sponsoring this Digital Direction article and for providing privileged access to staff and material used to help bring it together.

Small Robot Company is reimagining farming with robotics and artificial intelligence. Its farmbots Tom, Dick and Harry will plant, feed and weed arable crops autonomously, with minimal waste. This will enable farmers to be more efficient, more precise and more productive, and is also kinder to soil and the environment.

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hundreds of decisions needed to nurture each of these plants can be done without farmer involvement.”

And potentially, that redefines entirely the role of the farmer itself, he argues. “FAB is about focusing on the farm business rather than being lost within it.” He accepts that few farmers, “only the most ambitious”, would stump up the £1200/yr total cost of the workshops, but is offering a tenfold return guarantee.

“Over three years of investing in FAB, we’ll give you ideas and strategies that, if executed, can create a minimum of a tenfold return on your total investment in the programme. If, at the end of the first year, you don’t feel that you’re on the way to realising this and you’re not getting value from the tools and techniques we’re offering, we’ll provide you with a full refund,” assures Sam.

But he’s confident that it’s those who invest in their personal development who’ll be the ones who’ll reap the rewards from 4IR. “For the right farmer, with the right mindset and right approach, the thinking strategies are far more valuable than any technology they’ll take on and adapt in the future.”

Digital Direction

What makes SRC stand out is the collaborative approach, with farmers such as Andrew Hoad, of Waitrose’s Leckford Estate, one of its farmer advisory group.

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Have you driven past a crop of barley as it’s coming into full ear, looking great, then a week later you drive past the same field and it looks as if someone has sprayed it with glyphosate? That’s how quickly the devastating effects of ramularia can take place.

Ramularia is fast becoming a global problem in winter and spring barley production, and is now present in 14 countries. It’s quite easy to confuse the disease for net blotch and other abiotic leaf effects, although the 5R rule helps (see picture).

Having been to two ramularia research meetings in the last six months, agronomists and researchers from as far afield as New Zealand and Uruguay are saying the same thing: there’s no genetic resistance and there’s broad-based resistance to strobilurins, triazoles and SDHIs. Ramularia is classed as a high-risk pathogen to resistance, equal to septoria, and investigations have shown that many different mutations to the key fungicides all co-exist.

The only fungicide that offers any control is chlorothalonil, soon to be lost throughout Europe due to regulation. This is a shame as I’ve seen several fungicide trials on winter barley over the past few years, and where ramularia was present, yield responses from the addition of CTL were on average over 1t/ha. There wasn’t a similar response from the inclusion of other multisite fungicides available such as folpet or mancozeb.

So what exactly makes it a unique and difficult disease to control? The fungus is predominantly seed-borne, and it grows systemically and asymmetrically in the plant. It’s undetectable until the plant changes from vegetative to reproductive growth, and some “stress event” takes place. Stress triggers the production of toxins called rubellins, which cause the chlorosis and necrotic spotting on the leaves. Flowering can be enough to trigger this response, but there’s also evidence that waterlogging and possibly late season PGRs can also act as a trigger.

More knowledge is needed as to what physiological changes occur in the plant that induce the changes in the behaviour of the fungus, i.e. the point it changes from endophytic to necrotrophic.

It’s also thought that the expression of rubellin and the leaf symptoms are dependent on light intensity. Laboratory trials have shown that light intensity prior to inoculation produces greater rubellin production than plants grown under low light conditions. Could chlorothalonil be acting like a sunscreen and preventing some UV light penetration into the leaf tissues, thereby minimising the stimulation of rubellin formation? Leaf wetness around flowering is also a key influencer in the amount of disease expression.

Logically, one would have thought that a seed test could determine the risk of the disease, with it being a seed-borne disease. Unfortunately, research to date has not established a good correlation between the quantity of ramularia DNA in the seed and how much eventually appears in the leaf of an infected plant.

Wheat, oats, and rye can all get ramularia, but the whole rubellin mechanism is suppressed in those crops, resulting in no leaf symptoms. This maybe an important clue to enable scientists to understand how the disease can be supressed and whether a microbiological mechanism can be introduced genetically into barley either through gene editing or genetic modification.

There are no varieties with resistance to ramularia within the UK, nor globally. AHDB withdrew their resistance ratings as they were proving to be unreliable between years, and within a season between trial sites. One fact that does seem to receive unanimous endorsement from the scientists, is that varieties with the mildew resistance gene (mlo) are more susceptible to the pathogen, although the reasons are not well understood. There also seems to be a resistance gene that works at the seedling stage, but plants with this gene are more susceptible to later infections.

Are there other means of controlling the disease through an integrated management approach? There’s a definite need for investigations of drilling date, rotation, cultivation methods, bio-pesticide use and resistance elicitors such as laminarin. Seed treatments using microwaves, steam and hot water have been tested with varying degrees of success.

All in all, this is a disease with some real concerns in the absence of the only fungicide that controls it. The only positive note is that there are many of the best research scientists and plant breeders in the world working together on developing solutions that will hopefully be with us in the not too distant future.
Rather as a schoolteacher might pass through the classroom, Célia Bequain passes through the ear rows of RAGT’s wheat-breeding program at Ickleton, Cambs.

This is the very first venture out into the field for these wheat crosses, each row grown from just a single unique ear, and they’ve recently come into ear themselves. As senior wheat breeder, Célia’s checking to see how they perform, stooping occasionally to take a closer look, to straighten a flag leaf or inspect their stems.

In one row, she bends a wheat ear and smiles. “It’s lovely to see the progeny of Skyfall. It may be the number one wheat but I know what I have here is an improvement on its quality, yield and disease resistance.”

It’s one of hundreds of progenies from the landmark variety which was awarded the NIAB Cereals Cup in 2015 for its outstanding merit and value in the marketplace. But you’d hardly recognise the distinctive parent from the variety of wheats that scatter this field.

“When I look at wheat, what I see is diversity — all the phenotypes and all the potential,” enthuses Célia. “So the height, the strength of the stem, whether the flag leaf is wide and floppy or narrow and erect. Does the ear have close, compact florets, or is it more lax? I look for the lovely, even rectangular shape, rather than a tapered ear, that may produce poorer grain set at its tip.”

**Breeding technology**

It’s the breeder’s eye, combined with the latest breeding technology, that delivers what RAGT believes is its ability to put into the marketplace the best wheats in the UK. There are tens of thousands of combinations made every year and it’s the skill of the breeding team to whittle that down to the few star performers that may one day take pole position on the AHDB Recommended List.

Skyfall itself is a cross of Hurricane with C4148. “It came from our N European breeding centre at Prémesques, near Lille. C4148 is from an exotic background, bred especially to bring in new genetics, and that’s probably why Skyfall has been so successful,” explains Célia. “It was tested in both France and the UK, but showed up early on as one that performed well in the UK, particularly well suited to our climate.

“What I like about Skyfall is the way it looks — lovely short, stiff straw, with good fertile, well shaped ears. It’s notable for the way it grows — it’s erect with the ears bunched up, unlike others that spread out into the space available.”

But Skyfall didn’t jump out of the ear rows completely by chance. Like most modern varieties, it was screened using genetic markers to help breeders zero in on wheats of interest. The DNA of a variety is assessed early on for alleles, or gene sequences, that match with known phenotypic traits.

In Skyfall’s case, the genetic markers identified little more than its resistance to orange wheat blossom midge and to eyespot. But the technology has come on in leaps and bounds in recent years as more has been understood about the wheat genome, and the cost of unravelling its complex chromosomes has come down.

“The beauty of our facility here at Ickleton is that we apply the genetic markers early on. We now have a very strong base of...”

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**Innovation Grow the best wheat**

There’s an art to choosing potential winners from the hundreds of crosses a modern plant breeder makes every year, but increasingly genetics and clever science put confidence into the decisions made. CPM visits RAGT’s UK plant-breeding station to get an insight.

*By Tom Allen-Stevens*
and there are usually seven or eight before a variety enters National List trials, by which time the millions of potential new lines that started off the programme have been narrowed down to just ten.

**Single seed descent**

“We accelerate the programme through single seed descent, which allows us to grow two to three generations in a year, but it still takes over six years to stabilise a variety enough to meet DUS (distinctiveness, uniformity, stability) standards. I prefer not to use double-haploid (DH) techniques, to give us the chance to observe more recombinations — at early generations I can choose tens of lines from any of the close to 1000 crosses we made. With DH, the cost and reduction in genetic variation means that the technique is better limited to specific crosses.”

But one new technique Célia does put to good use is genomic selection (GS). “This puts all of our phenotypic and genotyping data through a software model — it’s a bit like a virtual breeder, although it relies on the skill of a breeder to input good information. Initially we used it towards the end of a programme, but increasingly it’s helping us identify parents to cross with.”

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**Science puts confidence into the art of the breeder**

As head of genotyping for cereals at RAGT, Chris Burt puts the data behind the breeder’s eye. He runs the genotyping lab at Ickleton, one of two operated by RAGT in Europe, the other being in France. Here, winter wheat, winter and spring barley, pasta wheat and triticale are the main crop types pulled apart, scrutinised and annotated.

“A trait the breeder spots phenotypically in the field, I want to understand genetically, and develop ways to track it through molecular markers,” he says.

For some traits, this is now relatively easy and saves a huge amount of screening and time, he explains. “Orange wheat blossom midge (OWBM) is associated with a very narrow part of the wheat genome, so the genetic marker for this trait is now well established — it’s why the proportion of varieties offering OWBM resistance has shot up in recent years. But it’s one of the most difficult traits to identify phenotypically in the field.”

However, traits such as septoria resistance and baking quality are more complex. “Septoria resistance is controlled by a number of different genes, which each have a moderate effect — it’s not absolute like OWBM resistance. The genes also have an effect on yield and other traits. But as we understand more about the wheat genome and apply this though our models, we're improving the genetic markers we use, and are getting better at reliably identifying the varieties with promise.”

Increasingly, he also produces whole genome profiles of varieties and breeding lines. “This feeds our GS models and also helps us focus in on specific areas of the wheat genome we’re interested in, such as areas we know have a link with yield.”

The material he receives comes mainly from within RAGT, which operates 17 research stations across Europe, servicing the company’s 300 breeders and technicians. “We also analyse other breeders’ varieties — under Plant Variety Rights (PVR) any variety on the EU Common Catalogue can be crossed with our lines to generate new varieties. We also bring in material from further afield, such as CIMMYT (the International Maize and Wheat Improvement Centre, based in Mexico). We’re constantly looking for novel material to enrich our breeders’ programmes.”

Chris sits on the breeders’ panel of the Designing Future Wheat programme — a BBSRC-funded programme spanning eight research institutes and universities which aims to develop new wheat germplasm containing the next generation of key traits. “We prefer to be as open and collaborative as possible with our pre-breeding work.”

Chris believes the application of science and genetics RAGT puts to its breeding programme shows through in the way the company consistently brings forward leading varieties. “There’s still every chance we’ll spot the happy accident in an ear row or cross made in the glasshouse. Now we can apply robust genetic markers and analysis to what we’re seeing in the field and that puts more confidence into the decisions made early on.”
Breeding pipeline leads with strong wheat candidates

RAGT has four wheat varieties vying for a place on the AHDB Recommended List for 2020/21:

**RGT Saki** — This Cougar/KWS Santiago cross is the one Célia is most excited about. That’s down to its combination of high treated and untreated yields, which is backed up by an impressive array of disease scores. OWBM resistance rounds off a promising package.

**RGT Wasabi and RGT Lantern** — Two hard feed varieties yielding a shade beneath RGT Saki, but both with a very attractive agronomic offering, reckons Célia. RGT Wasabi is a Revelation/Santiago cross, with OWBM resistance, as well as the Pch1 gene for eye spot resistance. RGT Lantern has KWS Kielder and Relay in its parentage, with OWBM resistance, and performs particularly well as a second wheat.

**RGT Blossom** — This is the big quality hopeful of the 2019 candidates, with a yield matching Skyfall. Its parentage is complicated, says Célia, with Gladiator, Soletice and Cordiale crossed with Gallant, and each bringing their strength into the result. Roasting a bullet-proof Hagberg, it stayed true in 2017, when other varieties lost theirs. Baking trials are showing RGT Blossom up as a consistent, top quality performer.

**Horizon hopefuls**

Look out for RW41723, which is currently in NL2 and showing real promise as a good quality variety, says Célia. But perhaps what’s most interesting here is its complicated parentage — it’s part of RAGT’s parental development programme which brings in some exotic lines to add some aspects you may not have seen before. Current yield scores put it 2% above Skyfall, with a 7.5 for septoria and a 9 for both rusts.

Three RGT Illustrious x Skyfall lines are in NL1. They’re all a step-up from their prestigious parents, in yield, disease resistance and quality, reckons Célia. All boast good treated and untreated yields and all have Pch1 eye spot resistance as well as OWBM resistance.

This allows RAGT to bring greater diversity into its lines. Célia feels the current RL is too reliant on the progeny of just one parent variety — Robigus — and believes it’s through introducing new genetics that will bring superior performance.

The GS model is proficient at giving clarity to results that may have been achieved from two very different growing seasons, and this gives the breeding team confidence when they believe they’ve identified a potential winner. “RGT Gravity was the first where we really put the model to the test. GS confirmed what we were seeing in the field, and that gave us confidence to multiply up seed and bring it to market a year early,” notes Célia.

“Gravity has helped validate the model, but it’s one that is constantly evolving and improving as we understand more about the wheat genome and relate this to our own knowledge on how wheats behave. We can now trust it and use it in more creative ways.”

And the fruits of this bold reliance on technology, backed up with the breeder’s eye, are in the plots and waving in the wind, vying for her attention. “Genomic selection has undoubtedly helped us select the Skyfall crosses we now have, the first of which have now entered NL trials. But no matter how far technology comes, nothing will replace the feeling you get as a breeder being here in the field, seeing how the variety expresses itself, getting to know its character and where its true strengths lie.”

Grow the best

A modern arable business relies on its main cash crops to deliver to a high and consistent standard, and it’s the genetics it uses that underpin this performance. Modern breeding techniques have delivered outstanding varieties in recent years, and an insight into how this is achieved can help identify the leading lines of the future.

In this series of sponsored articles, CPM has teamed up with RAGT to explore how a variety is selected and how science improves the reliability and the speed with which a winner’s found and becomes a farmer’s favourite.

One hundred years of farming excellence

One hundred years of farming excellence started for RAGT in 1919, with the creation of RAGT Plateau Central, a farmer co-operative in southern France. It became a private company in 1962, with plant breeding starting in 1962.

Since then, RAGT has built up an enviable reputation for excellence among the agricultural and related industries. In the UK, a significant step for the company was when it bought the cereals breeding programme from Monsanto in 2004. This brought with it all the breeding excellence and experience from Cambridge-based Plant Breeding Institute (PBI), which defined the post-war UK plant-breeding scene, and provided the backbone to the cereal varieties still in use.

Today, nearly one hectare in every five growing wheat across Europe has been sown with an RAGT variety, while in the UK strong offerings in wheat, barley, oats and oilseed rape are consistently among the leaders in the AHDB Recommended Lists.
More than 20 years of research into ferric phosphate has resulted in a formulation that’s the world’s market leader. 

CPM talks to the company that first introduced ferric phosphate and discovers how research knowledge has been transferred into successful slug control in the field.

By Lucy de la Pasture

Innovation
Research Briefing

More than 20 years of research into ferric phosphate has resulted in a formulation that’s the world’s market leader. 

“Research shows no increase in efficacy from including attractants in the formulation.”

Ferric phosphate has been available to UK arable growers for more than a decade, but its heritage stretches back to 1997 when it was first introduced as a molluscicide.

The company behind the discovery and patented formulation of ferric (III) phosphate, is German manufacturer Neudorff, a company that specialises in natural products and is better known in the UK for their presence in the home and garden market.

“Although we introduced ferric phosphate in the home and garden market initially, our focus changed when we saw a demand in agriculture and horticulture for an effective and environmentally friendly molluscicide. So we set about developing a form of ferric phosphate that was appropriate for agriculture,” explains Peter Baumjohann, head of technical support at Neudorff.

A mutual pedigree in biorational products made Certis the perfect marketing partner for a professional ferric phosphate product, which was first registered in the UK in 2005 for horticultural use as Ferramol, formulated with 1% of the active ingredient.

New formulation

“The 1% pellet is applied at a dose rate of up to 50kg/ha which isn’t economic or practical on broadacre crops. So we developed a 3% formulation of ferric phosphate for use in agriculture which has a dose rate of 7kg/ha and this gained UK approval in 2008 as Sluxx,” he explains.

“We set out to find a molluscicide formulation that was suitable for all temperature situations in agriculture. The pellet needed to perform over a huge range — from the high temperatures often encountered where slug control is needed in potatoes or during oilseed rape establishment, to the much colder temperatures when slug control is often necessary in cereal crops,” he comments.

Peter highlights that Neudorff now have ferric phosphate registrations in more than 20 countries and are the market leaders in Europe, the United States and Japan. Their legacy of research into ferric phosphate and a programme of ongoing studies gives the company’s product an edge when it comes to field performance, he believes.

“The formulation of Sluxx has improved over the years. The most recent formulation, Sluxx HP has improved resistance to moulding which means it remains palatable to slugs even when it’s lain on the soil surface for several weeks,” he says.

A high-quality pellet is a prerequisite for successful slug control and Peter points out that formulating a palatable pellet is no easy task. Sluxx HP contains durum wheat, which seems to be a favourite meal for slugs, and Neudorff have experimented with several different qualities of flour to find the one which they find the tastiest.

But unlike other pellets, Sluxx HP doesn’t contain a specific attractant which Peter considers isn’t necessary in their formulation, an opinion based on both field experience and scientific research.

Peter Baumjohann says independent research shows slugs move randomly and test potential food before deciding to eat it.
“Studies have looked extensively at slug behaviour and have found that slugs don’t detect food over a long distance. They move randomly and test the objects they encounter by chance using their lower pair of sensory tentacles, only then do they decide whether to eat them or not,” he explains.

“In laboratory studies, there’s been no significant difference in slug preference for Sluxx HP or a competitor’s ferric phosphate product, which corresponds with our own research that shows no increase in efficacy from including attractants in the formulation.”

Because there is no plan to their movement it means that the number of baiting points is an important factor, he adds.

“The more baiting points there are, the greater the chance of a slug coming across a pellet as it moves around looking for something to eat. The 7kg/ha rate of ferric phosphate gives approx. 60 pellets/m², which provides an additional 17 baiting points when compared with a competitive product.”

Another of the challenges in formulating a ferric phosphate pellet is to maintain its palatability while also being able to withstand periods of rainfall without losing efficacy. The fact that Neudorff’s ferric phosphate formulation is used for snail control in the paddy fields of Japan bears testament to the fact that this balance has been successfully achieved.

Understanding what the research means in practice is the key to getting the best performance out of ferric phosphate, believes Laurence Power, technical manager for Certis.

“Research has shown that when slugs feed on ferric phosphate they go below ground and die which is why there is no visible sign of dead slugs on the soil surface,” he explains.

**Pathological changes**

The slug behaviour is a direct result of the mode of action of ferric phosphate which acts on multiple organs within the slug, adds Laurence. “At first, ferric phosphate irritates the slug’s mouth and crop, causing the slug to stop feeding. Ferric phosphate leads to pathological changes on cellular level in the hepatopancreas, the central organ of the slugs, causing the slug to effectively ‘internally bleed out’.

“The slug can no longer produce the slime that it needs to keep cool, so it retreats underground in an attempt to thermo-regulate,” he adds.

That means the symptoms of successful slug control are at the opposite end of the spectrum to metaldehyde, which causes excess slime production and dead slugs are readily found on the soil surface.

“With ferric phosphate the opposite happens, with the only visual sign being that the crop is no longer being damaged so it is growing away,” explains Laurence.

Over the many years of trials that have been carried out, ferric phosphate has consistently demonstrated an efficacy on a par with metaldehyde, he explains.

“But the Sluxx formulation has a key advantage over metaldehyde when temperatures begin to fall. At 20°C both active ingredients offer similar levels of slug control, but at 10°C the ferric phosphate formulation is much more effective.

“The low temperature performance is important, especially since the loss of neonicotinoid seed treatments and a shift to later planting to help control BYDV and blackgrass in crops,” says Laurence.

To get the best levels of slug control it’s important to adopt cultural approaches to slug control and only use slug pellets as the last resort in an integrated pest management approach.

**Electronic tagging reveals slug behaviour**

Dr Keith Walters, professor of invertebrate biology and pest management at Harper Adams University, has been looking at how slugs behave after ingesting ferric phosphate.

“Slugs spend a large proportion of their life under the soil surface, so when you’re trying to look at how they move and disperse around a field, it’s very difficult to see what they’re doing. We came up with the idea that if we used radio-frequency identification (RFID) tags, the same kind of technology that the vet uses to microchip your cat or dog, and put them into slugs then we could track them underground using an antenna, without having to dig them up,” he explains.

To carry out the study, a large number of grey field slugs were collected from a commercial field and brought back to the laboratory where they were left to acclimate and then divided into six groups. Slugs were then released five at a time into plastic containers, filled with soil from same

field as the slugs were captured, which had an airspace left above them.

“The results were remarkably clear,” says Keith. “The slugs which hadn’t eaten any ferric phosphate seemed to behave quite normally, in accordance with what we know they do in the field. They would go periodically beneath the soil surface to hide from predators and avoid dehydration but would come to the soil surface at regular intervals in order to feed.

“The group of slugs that fed on ferric phosphate behaved very differently and they eventually retreated below the soil surface and didn’t come back up again. For the first three hours we looked at them intensively and their behaviour didn’t seem to differ from the control group.

“But thereafter they began to quite rapidly move below the soil surface and, after the first day, 50-60% of the slugs were below the soil surface. That proportion increased until almost

""At the end of the experiment, we dug out every last slug and found very high mortality in the group which had ingested the ferric phosphate pellets.”

Laurence Power points out that the Sluxx formulation performs better than metaldehyde when temperatures fall to 10°C.

**Research Briefing**

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“The group of slugs that fed on ferric phosphate behaved very differently and they eventually retreated below the soil surface and didn’t come back up again. For the first three hours we looked at them intensively and their behaviour didn’t seem to differ from the control group.

“But thereafter they began to quite rapidly move below the soil surface and, after the first day, 50-60% of the slugs were below the soil surface. That proportion increased until almost

""At the end of the experiment, we dug out every last slug and found very high mortality in the group which had ingested the ferric phosphate pellets.”

Laurence Power points out that the Sluxx formulation performs better than metaldehyde when temperatures fall to 10°C.

**Research Briefing**

To carry out the study, a large number of grey field slugs were collected from a commercial field and brought back to the laboratory where they were left to acclimate and then divided into six groups. Slugs were then released five at a time into plastic containers, filled with soil from same

field as the slugs were captured, which had an airspace left above them.

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""At the end of the experiment, we dug out every last slug and found very high mortality in the group which had ingested the ferric phosphate pellets.”
To help growers get the best out of technology used in the field, manufacturers continue to invest in R&D at every level, from the lab to extensive field trials. CPM Research Briefings provide not only the findings of recent research, but also an insight into the technology, to ensure a full understanding of how to optimise its use.

CPM would like to thank Certis for sponsoring this Research Briefing and for providing privileged access to staff and material used to help bring it together.

As the market moves from metaldehyde to ferric phosphate slug pellets, the principles of good slug control remain exactly the same. Certis have been marketing ferric phosphate pellets in the UK for over 10 years and today’s high-quality products (like SluxxHP) are equally effective as metaldehyde.

Adopting an integrated pest management approach will improve overall control. Cultural controls are a key part of IPM but choosing the right quality of pellet is also important.

Sluxx HP is manufactured using a wet process which provides the pellets with high levels of durability and rainfastness, as well as the consistency critical for good ballistics, explains Laurence. As with all pesticides, formulation is only half the story and good application is just as critical.

The way ferric phosphate works means the only visual sign of slug control is the crop growing away.

Experimental set-up:
- 3 slug pellets of each formulation and plant in the plastic box
- the positions of pellets and plants were randomized for every repetition
- Pellets and plants were placed with 5 cm distance to the rim

Results showed attractant does not influence slug feeding behaviour

Significant risk

Even having adopted cultural controls there may still be a significant risk of slug damage in some fields. In these situations, Laurence advises monitoring the slug population using traps and then applying pellets prior to feeding damage and ahead of any predicted periods of wet weather.

“Don’t allow slug populations to build — go early and go hard,” he suggests.

“When you adopt this approach with ferric phosphate, repeated applications are often not always necessary.”

Certis have been marketing ferric phosphate pellets in the UK for over 10 years and today’s high-quality products (like SluxxHP) are equally effective as metaldehyde.

Adopting an integrated pest management approach will improve overall control. Cultural controls are a key part of IPM but choosing the right quality of pellet is also important.

A good slug pellet needs to be spreadable, durable, and palatable to work well.

www.certiseurope.co.uk/slugforce

I experimentation:
- 3 slug pellets of each formulation and plant in the plastic box
- the positions of pellets and plants were randomized for every repetition
- Pellets and plants were placed with 5 cm distance to the rim

Source: Certis, 2019

The way ferric phosphate works means the only visual sign of slug control is the crop growing away.
PROMISING FUTURE FOR ORANGE OIL

AS THE industry faces tightening restrictions on sprout suppression chemistry, trials have shown that orange oil could prove a timely alternative for potato growers and processors.

Don Pendergrast, Head of Technical Services for UPL UK & IE, said: “Growers are anticipating the potential loss of CIPC, so will therefore need to seek alternative products to bolster their sprout suppression programmes.

It might feel bleak, but other products have shown promise, particularly natural alternatives such as orange oil. Trials in the Netherlands have demonstrated orange oil’s potential as a suppressant in lower storage temperatures, which would prove valuable particularly in the fresh-pack sector.

“And due to its volatility, orange oil leaves no residue – a valuable selling point when marketing to supermarket retailers.”

Limonene, the active ingredient in orange oil, disrupts the cell wall of the growing sprout, causing cell wall fluidity and degradation of the enzymes critical to sprout development.

Working with the industry, storage trials using orange oil are currently taking place at Sutton Bridge Crop Storage Research in conjunction with the Fresh Potato Suppliers Association (FPSA). A recent taste test took place to compare orange oil-treated potatoes with those treated with CIPC.

Don said: “We are working with industry to evaluate the potential role of orange oil and how it can be successfully integrated into a wider sprout suppression programme alongside products such as maleic hydrazide.

“We will use the results of the taste test to help inform this work and position the product so that it is used most effectively, but we are confident that no taint will be detected.

“The industry recognises that integrated control for sprout suppression using a variety of active ingredients will be the future. We believe that orange oil will have a valid place within that.”

EU registration for orange oil is expected later this year or early 2020.

Transform agriculture

UPL is a leader in global food systems and following the acquisition of Arysta LifeScience, becomes one of the top 5 agricultural solutions companies worldwide.

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Attention turns to disease

Roots Sugar beet fungicides

With sugar beet crops now at the stage where they’ve developed mature plant resistance to aphids and hence virus yellows, the focus turns to disease control. CPM talks to BBRO.

By Lucy de la Pasture and Rob Jones

Growers will need to monitor crops closely if fungicides are to be well-timed and canopies kept clean of disease, according to advice from British Beet Research Organisation (BBRO). Recent weather has provided plenty of moisture and it’s been followed by warm air which has created the humid conditions that favour disease development.

For those with sugar beet, it means conditions potentially favourable to rust (Uromyces betae) which remains the principal disease threat to crops based on recent seasons. Many growers will no doubt still be concerned by the threat posed by virus yellows and the unprecedented numbers of peach potato aphids (Myzus persicae), the dominant vector for virus transmission, but with most crops now at full canopy their focus will switch to disease control, says Mark Stevens, head of science at BBRO.

“Crops are growing well but some are at various stages of development, with the most backward just meeting within the row. The more forward crops met across the row several weeks ahead of the longest day. Add in the virus threat posed by abundant numbers of peach potato aphids and it’s clear that many crops are under more pressure from pests and diseases this year,” says Mark.

The rain in early June will have helped crops move on but has also ensured conditions favourable to disease spread. “Conditions appear to be conducive for rust,” he says. “Research shows that if crops are to be protected, the first fungicide should be applied at the initial signs of disease, typically July, and a second spray applied about four weeks later,” he adds.

Rust concerns

With much to ponder, what are the main points growers need to consider if crops are to be suitably protected? First, rust is still the disease to look out for. “The threat posed previously by powdery mildew has not manifested for several seasons, with the exception of 2018, so rust should be the major concern. It was late coming in last year, but that doesn’t mean it will be in 2019,” he says.

Secondly, Mark points out that even low levels of disease can affect yield. “The impact of low levels of disease on crop performance continues to be an area that we’re researching and this includes looking at differences in varietal susceptibility. But there is evidence to suggest that yield potential is already negatively impacted before symptoms become visible on the plant, in some seasons,” he says.

The third point to consider is the timing of fungicide applications, he suggests. Bayer’s own fungicide trials last year highlight the importance of application timing, adds Edward Hagues, Bayer campaign manager for root crops.

The two trials, which took place at Bracebridge in Lincs and Aspall in Suffolk, had an average of 39% infection in untreated plots.

“The average figure hides the true range of disease between sites which was 17% for the Bracebridge trial, assessed on 31 Oct, and 60% for the Aspall trial assessed on 25 Sept,” he says.

“The evidence demonstrating the benefits of fungicide protection across contrasting seasons is now overwhelming,” he claims.

For the greatest yield protection Escolta (cyproconazole+ trifloxystrobin) should be applied at the first signs of disease and then again about four weeks later.

Where applications of Escolta were well-timed — which was late July and late Aug in 2018 — disease control reached 94%, whereas relying on a single application of Escolta in early July meant control slipped to 65% at Bracebridge and 85% at Aspall into the early autumn.

“The point to note is that there’s no set date when Escolta should be applied, it needs to be applied at the first signs of disease. This typically occurs in the latter half of July, though crops should be monitored from the start of summer in readiness for fungicide to be applied when disease appears. “The advice given to growers over the past six years remains valid and, where it’s followed, it has consistently delivered high levels of yield protection,” says Ed.

While rust was reported in all fields, there were also sporadic levels of cercospora leaf spot (Cercospora beticola) last season, with the disease found at low levels in Notts, Lincs and Cambs.

“Conditions were largely unfavourable for cercospora in 2018, its occurrence not
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\(^1\) BBRO sugar beet reference trial, 2012. \(^2\) Escolta's yield of beet in the 2012 average beet price of £198.33/ha.

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Cercospora hasn’t been as much of a threat to crops in the UK as in mainland Europe but is a disease not to overlook.

Rust has become the principal disease threat in recent seasons and fungicides need to be applied at the first signs of disease.

proving damaging to sugar beet crops last year,” adds Ed.

That’s not to say the potential impact of the disease should be underestimated, with sugar yield losses of up to 40% possible, compared with 20% from powdery mildew and 14% from rust, clarifies Mark. It’s the reason why cercospora tends to grab the headlines, even though it’s much more of a threat in continental Europe than it has historically been in the UK.

It isn’t a new disease to the UK and was first identified in the 1930s, he explains. “In 2017, increasing amounts were found in UK because the warm, moist autumn conditions were conducive to its development.”

Cercospora needs hot and humid conditions, with periods of leaf wetness. Although the weather was hot in 2018, it wasn’t accompanied by moisture which was why infection was only present as a sprinkling in some crops, whereas levels of powdery mildew was higher than in the previous five years and rust came in late.

“As our climate changes, we need to continue to have cercospora in mind, particularly with a diminishing pool of active ingredients, increasing resistance and very few new fungicide products on the horizon,” he adds.

Mark says that fungicides do more than just protect against yield loss. Fungicides also help the crop in other ways — they can enhance plant growth through their physiological effects and also play a role in reducing frost damage by maintaining good crop foliage into the winter.

Morley trial data from 2016-18 shows a 20.6% uplift in yield from using a two-spray fungicide programme, which is the BBRO recommended approach.

One of the difficulties the UK’s European neighbours encounter with cercospora is fungicide resistance, though the disease can still be managed by alternating fungicides with active ingredients belonging to different groups. It’s one of those diseases that has shown insensitivity to successive fungicide groups, with QoI and azole resistance the latest problem as they are the foundation of most UK fungicide programmes.

“As an industry we need an integrated approach to disease management and to develop disease-resistant and tolerant varieties,” concludes Mark.

There’s been a new phenomenon occurring in a few sugar beet fields over the past couple of seasons. Symptoms present as ‘silver’ beet, which starts as a blue-grey matt colour and becomes increasingly silver as the leaf grows.

Affected leaves crack in a way that looks similar to the damage caused by hail or the voracious Silver Y moth. Leaf veins may go yellow and roots fail to fully develop, with browning in the root tissue.

So what’s causing it? Researchers in Belgium have concluded that it’s caused by a bacterium, Curtobacterium flaccumfaciens, which appears to be associated with the seed, explains Mark.

“It’s not a new disease and was first recorded in the UK in the 1940s and 1950s in red beet. It was reported randomly last year across all four factory areas so BBRO are keeping an eye on it but only single plants appear to be at low levels so we don’t think it will cause significant yield issues,” he concludes.

A bacterial disease which causes silverying of beet leaves has been cropping up in UK fields over the past couple of years.

Cercospora hasn’t been as much of a threat to crops in the UK as in mainland Europe but is a disease not to overlook.

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Since maleic hydrazide’s approval was renewed with the proviso that treated crops can’t be fed to livestock there’s been a lot of confusion. CPM gets some clarity on where it leaves growers this season.

By Lucy de la Pasture

As potato crops continue to bulk up this month, thoughts begin to turn to maleic hydrazide application. For many growers it’s a useful strategy to suppress sprouting during storage and reduce the numbers of volunteers in subsequent crops which carry over a host of disease and pest problems.

Maleic hydrazide has been winding its way through the increasingly complex corridors of the EU pesticides regulations under (EC) No 1107/2009. It successfully gained Annex 1 status on its reapproval last year, but the new regulatory requirements placed on all maleic hydrazide products have been causing some confusion in the industry, explains head of technical services at UPL, Don Pendergrast.

Like many other active substances going through the re-approval process, the difficulty has arisen not due to the maleic hydrazide itself but the regulatory focus on its metabolites, he explains. The expert review by European Food Safety Authority (EFSA) has identified data gaps concerning the metabolites which has led to the imposition of a restriction preventing any crop wastes (peelings or stock feed potatoes) being provided as livestock feed.

Incomplete testing

Even though the genotoxicity and toxicity testing didn’t reveal any concerns, the testing was viewed as ‘incomplete’, which in EU regulatory speak means there’s some uncertainty remaining over its probable safety in the food chain because there’s a possibility that 3-pyridazinone ‘may’ be produced during farm livestock digestion.

The current situation for growers is that there’s ‘old’ and ‘new’ label product available this season, with old label product in the use up period (which ends on April 30, 2020) and product that’s been manufactured under the new label.

“All new label product has a statement saying, ‘Do not feed treated crops to livestock’ so growers are going to need to check their labels carefully and keep records to identify where old and new label stock has been applied in order to comply with the legislation,” he advises.

AHDB released a statement last month suggesting growers should contact their supply chain customers to find out their position on maleic hydrazide treated potatoes. “It’s anticipated that very few, if any, will accept crop treated with the new label as most businesses are not able to segregate waste.”

Specialist potato agronomist, John Sarup of Spud Agronomy based in Yorks, the work is being done to provide the EU with the data needed to lift the livestock feeding restriction on the maleic hydrazide label, says Don Pendergrast.
Heavy rainfall during June has triggered a number of Hutton Criteria warnings across the country.

says many of his growers have a stock of old label product to use up this season. “For those who haven’t got any old stock maleic hydrazide, there’s always the dilemma whether to risk applying new label to crops. But some processors have already contacted growers to say they will only accept potatoes treated with the old label and will be carrying out due diligence checks during the course of the season.”

The industry statement goes on to say, “The owner of the potato crop has the responsibility to ensure that potatoes that have been treated with new label maleic hydrazide products don’t enter the livestock feed supply chain. This means you must inform anyone who buys potatoes from you if they’ve been treated with new label products. The owner of the potatoes also has the responsibility to avoid on-farm waste and out grades being fed to livestock.”

With all the emphasis being on the grower, it leaves them in a tricky position which is something Don fully recognises and has been working together with other manufacturers to get the restriction lifted by submitting new data, but it has become apparent that there won’t be any prospect of a label change before application this season.

The necessary trial work on feeding treated crop to livestock and the subsequent detailed risk assessment is unlikely to be complete until later this year. It could then take another 12-18 months for EFSA to respond to the findings.

“We acknowledge that this is a disappointing outcome and have worked to ensure it’s as easy as possible for growers to distinguish between the two product variants, by providing an alternative MAPP number for Fazor. Our technical team is also on hand to answer questions regarding the product and its stewardship,” says Don.

“We’ve highlighted our concerns regarding the livestock feeding provision and are now working together as an industry task force to produce the data necessary to potentially lift the restriction.”

The new maleic hydrazide label situation has a potential knock-on effect for blight control where growers stop applying it this season to ensure their customers will accept the crop, believes John Sarup.

“Maleic hydrazide provides control of volunteer potatoes and these are the biggest problem we have as they’re the primary source of late blight inoculum, as well as carry-over of rhizoctonia and pest problems such as free-living and potato cyst nematodes.”

The prospect of large piles of waste potatoes left to rot down in the corner of the farm because they can’t go as stock feed, is not going to help the fight against blight. The first genotyping results from samples of blight collected by blight scouts has revealed the aggressive strain 36_A2, which has proved difficult to control in recent years.

Genotype 36_A2
According to Dr David Cooke, of the James Hutton Institute where the AHDB-funded testing is conducted, of the 15 samples confirmed as blight to date, six have been genotyped. The first samples from cull piles in South East England were genotype 36_A2.

“The other more recent samples from Essex and Suffolk have been confirmed as 36_A2 with a further one from Kent being a mix of genotypes 36_A2 and 6_A1.”

“It’s too early to draw conclusions about how the national picture will look, but this gives growers, particularly those in the South East and Eastern England, advanced warning of the strains in their area.”

The heavy rain in June has ramped up the blight pressure in many areas, just at the time when many blight crops are going through rapid canopy expansion.

In the Waveney Valley, Norfolk, full Hutton Criteria were recorded for June 11, 12 and 13 (just as the heavens well and truly opened), with more occurring during the month as the rainy conditions continued.

Hutton Criteria occurs when a location experiences two consecutive days with a minimum temperature of 10°C, and at least six hours of relative humidity (90%). This methodology came about following research funded by AHDB Potatoes, undertaken by the James Hutton Institute. It’s believed that this is one of the most accurate ways of forecasting potato blight.
Evolutionarily fit and could prove more challenging to manage. The survival and spread of these clones, such as EU_36_A2, EU_37_A2 and EU_41_A2) increased in frequency. Three newer clones (EU_36_A2, EU_37_A2 and EU_41_A2) increased in frequency.

Potato agronomy

Exceptionally dry

Last year saw the approval of new blight fungicide, Zorvec Enicide (oxathiapiprolin), but the exceptionally dry season meant that the product wasn’t in the demand that it would have been in a more blighty season. 2019 is proving very different, with heavy rain and waterlogged ground in many areas stretching blight spraying intervals while the crop was growing rapidly. Corteva Agriscience’s field technical manager Craig Chisholm suggests growers consider the length of protection they need and whether their chosen blight spray has any curative properties.

The potential for a high blight pressure year was already present due to the increase in volunteer potatoes across the rotation, coupled with the mild winter. Dry conditions and recent cooler temperatures kept a lid on it.

“Early use of CIPC is likely to be needed this season, especially where maleic hydrazide hasn’t been applied to crops because of the new label restriction,” predicts John Sarup.

“We’re looking at storing processing potatoes at cooler temperatures and then warming them up in store to burn off any of the sugars they’ve accumulated under the cooler conditions, which would result in dark fry colours normally. It’s a tricky one because once the potatoes have been brought back up in temperature then they will need to be moved out of store in a fairly short time-frame,” he explains.

John expects a lot more usage of alternative sprout suppressants, such as spearmint, this year as growers move away from CIPC.
So far, this year stands out for the difficulties being encountered controlling pests. Cabbage stem flea beetle have captured the headlines and it’s been a war that some have lost with many wounded crops limping home.

Aphid virus vectors have caused sugar beet growers to be on high alert with regular patrols to check for an invasion. The one thing both pests have in common is widespread resistance to pyrethroids – these spineless little guys actually have so much backbone that they’re seemingly indestructible.

To add to the growing threat of the insect enemy, this autumn will also be the first without a neonicotinoid seed dressing in cereals, meaning BYDV will have to be in mind when planting decisions are made. Even though its aphid vectors aren’t showing the same resistance to pyrethroids, there’s no guarantee that spray applications will be timely at the time of year. It could be trench warfare just when they need controlling the most.

It may be a woeful situation but it’s perhaps important to realise that it’s one of our own making where a relatively cheap pyrethroid has been added to the mix as ‘an insurance’. And now we’re paying that premium.

But is all lost?
No, it’s not but perhaps there’s another way of thinking that puts consideration for predators at the heart of every insecticide spray decision? These little guys are actually on the same side but very few of us could get beyond identifying a hover fly or a ground beetle, let alone know anything about the countless other invertebrates that are capable of interrupting the life cycle of pests through many devious and daring means.

That leaves us playing catch up and on a steep learning curve as to how best to give these friendly bugs everything they need, recruit them to the pest control regiment and harness their elite attacking force behind enemy lines. For starters, a ‘friendlies’ ID book would be useful so we all get to know what our own forces look like. We wouldn’t want them coming under friendly fire but all too often that’s what’s happening, we’re dropping the bomb without bothering to discover whether the snipers on the ground are actually getting on top of the situation.

These guys need back up. That is, food and shelter to keep them strong and these need to be scattered at strategic locations so that they can take cover, rest up in relative safety and gather together a kindred force of other resistance fighters behind enemy lines.

They need to be able to move quickly and take out the enemy before they even know they’re there. These elite bugs are experts at hitting the target hard and then melting out of sight.

It’s a case of going back to the drawing board and learn how we can support these daredevils that are putting themselves on the line to keep our crops safe. That means looking after the solitary guys that prefer to fight their own battles but also provide the right back up for the ones where teamwork is the order of the day. These more sociable chaps like to plan their attack from all sides.

Not so many years ago hedges provided cover for the covert ops teams on the ground. It meant it didn’t take long to get to where the action was, no 100-acre fields where there’s little hope of getting to the middle and back to cover again without being taken out by the fella that’s hunting them.

While major planting of hedges is an unlikely scenario in modern times, perhaps replicating this patchwork with strategically placed RV-points of biodiversity amongst the monoculture is possible. It’s a meeting of agriculture and ecology that few have yet managed to achieve but the knowledge is out there, it just requires embracing — not as another cost but as an insurance premium that will actually pay out in time.

We’re not there yet — the predator special forces aren’t in sufficient numbers to make the difference in all crops. But next time it’s ‘back against the wall’ time and the first instinct is to reach for the insecticide can, spare a thought for these brave little chaps who would rescue your crops in a heartbeat if they had the chance.

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