I've always had the attitude that my soil management may not be perfect, but I generally know what's best for my farm. I've regarded myself as a responsible guardian of the soils in my keep, and of the water that passes through them. I'm open to learn new things about them from those I regard as experts, but view with disdain blanket measures imposed by regulators whom I regard as having little understanding of my own specific circumstances.

That was until Jan this year, when it was brought to my attention that half of one of my fields was being washed into a ditch and towards the River Ock, taking goodness knows what pesticides and nutrients with it. The worst thing was that it wasn’t me or an ‘expert’ who discovered this, but the local Environment Agency inspector.

So I’ve recalibrated my thinking about soils. Strip it down, be honest with yourself, and you realise there’s actually precious little we know for sure about the resource we’re entrusted with to grow the nation’s food and preserve for the long term. We may be fed up with being bashed over the head with Soil Protection Reviews and stewardship campaigns, but they come from the same place that yearns to increase production to feed the world. And if the solutions lie anywhere, they lie in the soil.

That’s why there’s a pretty broad scope to this year’s Soil Matters — with the help of our sponsors, CPM has brought together some key aspects of these challenges. We start with an assessment of some really exciting new AHDB-funded research (see p4). This ground-breaking programme looks across arable sectors and takes a new approach to knowledge exchange.

We’ve an update on the Metazachlor Matters campaign (p6), have talked to the experts about the fundamentals and looked at how simple changes can improve soil agronomy as well as reduce the risk of pesticide exceedance. With propyzamide in mind, we’ve looked at results from research into run-off and how it’s related to cultivations (p9).

But how do you reduce those cultivations successfully, without compromising other aspects of the system? We’ve drawn some advice from a cultivations specialist, and experience of a N Yorks grower (p12). Finally, we’ve talked to a tyre specialist about how to get the maximum performance for minimum impact from new tyre technology (p14).

We shouldn’t underestimate the depth of public concern there is for our soils, nor the weight of responsibility handed to us to manage them correctly. Solutions will be hard to come by, and we’ll probably never fathom exactly what they are. But we’ll achieve most if we keep an open mind and search for them.

Tom Allen-Stevens has a 170ha farm in Oxon, and wants to reassure the nice man from the EA that what’s left of it should now remain in place.

tm@cpm-magazine.co.uk
POWERFUL, DUAL-ACTION WEED CONTROL IN OILSEED RAPE.

A single spray with dual-action ASTROKerb delivers comprehensive weed control in winter oilseed rape. Like Kerb Flo 500, it is exceptional against blackgrass but with an added boost. It's also effective on hard to control, broad-leaved weeds, like poppy and nayweed. ASTROKerb, the power to deliver a cleaner crop this autumn.

@dowagrouk   uk.dowagro.com   UKHotline@dow.com

Solutions for the Growing World
Do you ever get the feeling that work you do to maintain or enhance your soil in one crop is slightly undone by another in the rotation? It's not that practice under any particular cropping regime is necessarily wrong, just that all crops are working in isolation, and perhaps there ought to be something that wraps around them and delivers a rotation that's reliably resilient as a whole.

An ambitious new AHDB-funded research partnership has now set out to address this. Four new projects have been awarded a total of £1.2M, but there's one aspect about this that's remarkable in itself, notes Dr Mike Storey, head of the AHDB's new resource management team. “This is the first example of a new functional approach AHDB is taking to commissioning and managing research.

“A lot of research has been carried out in the past, funded by individual AHDB crop sectors, looking at soil management in a single season. This new programme considers practice in a rotational context — it brings funding from AHDB Potatoes, Cereals and Oilseeds and Horticulture into one, coordinated body of work.”

It's also a five-year programme, he continues, rather than the usual three. “This will allow us to really pull out the practical outcomes and test them for robustness within the time frame of the programme.”

As well as different AHDB sectors working together, the programme involves a number of research partners. “It’s led by NIAB CUF, and brings in some really exciting work from the James Hutton Institute, Rothamsted Research and Lancaster University. So there are different skills involved across a number of disciplines and it’s a real opportunity for synergies and for some ground-breaking developments,” enthuses Mike Storey.

But a core element of the programme is the practical application. “A significant part of the funding has been allocated to develop a grower platform. It builds on the experience of Strategic Potato (SPot) and Monitor farms. We’ll be taking the research into a field-scale context and growers will get the opportunity to see it in practice,” he notes.

“Importantly, this is a two-way interaction — we want to encourage discussion, and the feedback will help develop the programme. This is far more actively managed than a traditional research programme.”

The grower platform is one aspect of the programme in particular highlighted by Dr David Firman, of NIAB CUF, who leads the research. “It’s the opportunity to put soil data into context and look at the economic consequences that will be really valuable,” he says.

“What's more, there's continuity in taking those measurements through the rotation and monitoring the effects on the growing crop through the life of the project. And it's a fantastic opportunity for knowledge exchange over other areas of research that haven't yet made it into the field.”

The plan is to involve around 75 sites in total, focusing on farms that have good crop records to provide a few years' management history to work with. “These will include SPot and Monitor farms, but we're looking for a broad geographic spread, including Scotland and Wales.

By Tom Allen-Stevens
Opportunity to collaborate on key soil issues

One of the main concerns for Robert Lockhart is the long term effect across the rotation of different management practices. “There’s a lot of fashion in farming,” he says. “How we crop our land has developed relatively quickly, with tighter rotations and often a quick succession of crops within that rotation. Then there are developments such as cover crops, and challenges such as potato cyst nematode. These all need to be documented and evaluated and the techniques refined so we know we’re heading in the right direction.”

With 140ha of arable crops on the South Staffs, Warwick’s border, his light, stony soils include 31ha of potatoes, grown for McCain. He also represents the NUF on the AHDB Cereals and Oilseeds Knowledge Transfer committee, and highlights this new programme as a different body of research to those that have gone before.

“The grower platform will be a critical part of it, and it’s important we get a good spread of sites, both geographically and across soil types and cropping mixes — we don’t want to end up with all the sites in East Anglia,” he points out.

“We also need growers with good historical information — even though it’s a relatively long research programme, it only covers just over one rotation on the average field, so having good information on what’s been before will be vital.”

He’s also keen to see how some of the emerging research plays out on farm. “Some of these lab techniques look very interesting. They could just be academic, but we won’t know until we try them out. Then there’s organic matter and work that suggests its make-up varies over different soil types — that looks very interesting.”

But the priority is to develop practices that have real value on farm, he reiterates. “It’s what the levy payer has been asking for and what growers pay for, and this is a real opportunity to deliver. The focus on soils, where so much is unknown, is a good thing, and it’s also heartening to see productive collaboration across the AHDB sectors — it’s been a long time in its gestation, so it’s good that growers will now be reaping the benefits.”

It’s a fantastic opportunity for knowledge exchange over areas of research that haven’t yet made it into the field, notes David Firman.

We also want to draw on a broad base of soil types and rotations.”

The project looking at the application of new technology will bring onto farm some cutting-edge work developed by James Hutton Institute, as well as evaluate existing practices. “The commercial application of procedures such as electromagnetic induction (EMI) scans have run ahead of research. We want to take a step back and look critically at the practical application.

“We also want to understand the effects of sequential cultivations on the rotation as a whole. So for example, where a field has been deep-cultivated and prepared for potatoes, how does that interact with later trafficking of spraying and harvesting operations? We’ll be looking at the effect of these on soil conditions across the bed module in relation to different tyre widths and pressures.”

The third project applies research carried out mainly at Lancaster University. “It’s fantastic opportunity for knowledge exchange over areas of research that haven’t yet made it into the field, notes David Firman. “We want to draw on a broad base of soil types and rotations.”

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The third project applies research carried out mainly at Rothamsted Research into soil organic matter (SOM) and applied amendments aimed at improving this. “There’ll be experiments to explore the response of key soil indicators across the rotation to SOM,” continues David Firman.

“We want to investigate rotational links to crop performance, and in particular crop amendments — whether it’s best to apply manures in one go before a particular crop, or regular, smaller amounts across the rotation.” Researchers will also adapt the Terranimoo model for soil compaction, developed by Aarhus University in Denmark, for UK soil conditions.

The final project explores root growth, harnessing work undertaken mainly at Lancaster University. “We’ll be looking to develop a system that uses DNA to quantify root growth and inform a better way of scheduling irrigation. It investigates links between soil geophysical characteristics, irrigation and root-shoot signalling.

A hypothesis is that plants send a signal from roots to canopy which, if better understood, could refine irrigation scheduling to maximise growth.”

But it’s the sum of the parts of the programme that will add up to more than their individual components, reckons David Firman. “Working with growers to get a good handle on what practices are going on within rotations and the impact on long-term fertility is probably the most exciting element of this research. The programme will bring a lot of information together and give us a very valuable insight into the very complex area of soil fertility.”

Research round-up

The AHDB soil and water research partnership is a five-year programme that combines investment from AHDB’s Potatoes, Cereals and Oilseeds and Horticulture sectors. Led by NIAB CUF, with Rothamsted Research, the James Hutton Institute and Lancaster University as core research partners, industry partners include Cambridge University Potato Growers Research Association, Frontier, Grimmme, Kettle Produce, Spearhead Marketing, B&G Farming, Greendale AP Farm Care, J & AE Montgomery, WB Daw & Son, Frederick Hiam.

The programme comprises four projects:

AHDB project 110002101. Grower Platform to support resilient rotations, upending the new soil programme as a whole. It draws on historic data and current rotations to quantify links between rotational management and soil physical condition with gross output, yield stability and economic margins. Bringing together researchers, growers, grower groups and supply chain partners, AHDB funding amounts to £239,000.

AHDB project 110002102. Applications of new technologies to enhance rotations, critically assessing existing precision farming technologies — including EMI soil scanning, GPS-enabled yield monitoring and infra-red spectroscopy — and investigates the practical benefits of managing fields in zones. Involving mainly field-based research, and aiming to develop a tool for growers to assess the risk to soil structure of sequential cultivations, AHDB funding amounts £354,000.

AHDB project 110002103. Enhancing rotational productivity and resilience, addresses concerns around the detrimental effect on subsequent crops of incorporating root crops into rotations, quantifying the physical and economic cost of soil damage.

Based on field trials with potatoes in the rotation and aiming to develop a ranking system for soils to highlight areas with a need for remedial intervention as well as a model for optimising organic amendments, AHDB funding amounts to £325,000.

AHDB project 110002104. Linking soils, water and roots with crop productivity, seeks to gain a better understanding of how changes in soil conditions affect root growth, water uptake, canopy growth and yield potential in potatoes and other crops. Aiming to develop a cost-effective method for quantifying root length in field-grown potato, carrot and parsnip crops to improve irrigation scheduling, AHDB funding amounts to £195,155.
Healthy soils secure herbicide future

How you treat your soil once the combine leaves the field will have an impact not just on the crop you’re about to plant, and the medium-term effect reaches further than just the soil itself. It could have a direct bearing on the future of key oilseed rape herbicides.

The fate of pesticides is determined by a soil’s physical condition.

The job of ensuring metazachlor (MTZ) and quinmerac (QMC) are approved when they come up for re-registration has already started, according to Rob Gladwin of BASF. “MTZ comes up for re-registration in 2019, while for QMC its 2020. How they perform in the light of the Water Framework Directive between now and then will have a strong bearing on that process.”

Both actives have been detected in surface water and are very much in focus. A Defra consultation on the future of key OSR herbicides was expected to be circulated this autumn but will be delayed.

“Voluntary stewardship measures work, says Rob Gladwin, provided they’re applied on farm.

“The consultation could result in increased regulation and restrictions on the use of OSR herbicides, but one of the options is expected to be voluntary stewardship. As the consultation is delayed, the industry is acting to get ahead of the curve,” he explains.

The Metazachlor Matters campaign is now in its third year. It includes an advisory limit on MTZ of 750g/ha of ai, which shouldn’t be applied beyond mid Oct on drained land, and where drained land is in a Drinking Water Safe Guard zone, the cut-off is the end of Sept.

“We know that such measures work, provided they’re applied on farm,” continues Rob Gladwin. “A stewardship plan for bentazone was introduced in the UK ten years ago to protect groundwater — autumn use was removed and other restrictions were introduced in high risk areas. “The active is currently going through re-registration, and it looks as though those voluntary measures are paying off for the UK. But elsewhere in Europe, where no such measures were put in place, it’s come up against problems.”

Cracks in soil

With MTZ, along with the stewardship guidelines, growers are encouraged to ensure soil conditions are suitable. “The main issue to be aware of are cracks in heavy soil. MTZ and QMC can move very quickly through cracks to land drains and into a water course,” he points out.

“But good soil conditions for OSR will also keep herbicides in their place. So if you manage soils well, you’ll get a better crop establishment, as well as reduce the risk of a pesticide exceedence.”

So what actually constitutes a “good soil”? “It depends on what you want the soil to do,” comments Prof Jane Rickson of Cranfield University’s Soil and AgriFood Institute. “It could be for food production, flood control, habitat creation or carbon storage, for example.”

A fertile, healthy soil for good crop production can be defined by its physical, biological and chemical constituents, she explains. “Physically, we’re looking for a good structure, where combinations of soil particles are bound together as aggregates or peds. Depending on their size, the spaces or pores between the peds allow free movement of air and water, as well as providing preferential passage for root growth. “The peds themselves should be porous too, and their texture determines the pore sizes. Peds made from clay soils have small particle sizes, so pore spaces within the ped tend to be smaller — this is good for holding on to water, but these soils can also have poor drainage. On the other hand, peds comprising larger sand particles tend to have larger pore sizes, which drain rapidly and are good for flood control, but are prone to drought in the summer.”

On a catchment scale, the contribution these soil pores make to holding and managing a large rainfall event is significant, she points out (see table on p7).

Chemically, soils should provide sufficient nutrients and trace elements for plant and crop growth. Routine analysis shows up what additional nutrients should be...
applied as organic or inorganic fertilisers.

“There’s increasing interest in organic amendments such as composts, anaerobic digestate, manures, and leguminous cover and companion crops to boost soil nutrient content,” notes Jane Rickson.

“It’s important that the nutrients are available to the plant, and not locked up in the soil. This is related to the organic matter of the soil and the soil biology.”

Biologically, a large, diverse and active population of micro and macro-fauna, such as bacteria, fungi and earthworms, helps to cycle carbon and nutrients in soils, that are then available to the crop. “The gels and mucus excreted by the organisms also help bind the soil particles into aggregates, so helping soil structure,” she adds.

Overarching all of this is soil organic matter content (SOM). This helps to bind aggregates, improving soil physical condition and structure, so they are stronger to resist compaction and erosion processes, for example.

“SOM also regulates water movement, as its large void spaces can drain excess water, but its smaller void spaces hold on to water. It’s a food and energy source for the soil microbiology that regulates nutrient cycling in soils, making nutrients available to crops. And soil carbon is stored in SOM, rather than being released to the atmosphere as carbon dioxide, so this mitigates the negative effects of greenhouse gases.”

Soil degradation processes, such as compaction, erosion, loss of organic matter and loss of biodiversity, can all limit a soil’s ability to function properly. This affects not just crop performance, but a soil’s water-holding capacity and retention of residual herbicides.

“Soil physical condition will determine the amount of water that’s held in the its profile in pores, how much leaching and infiltration takes place, and how much surface runoff is generated. So the fate of pesticides, including their residence time in the soil or mobilisation to watercourses, is also determined by its physical condition,” notes Jane Rickson.

“Ideally, the products should be held in the soil for long enough to be effective on soil-borne pests and diseases, rather than being lost to watercourses via surface or subsurface flow, where they are ineffective or even potentially detrimental to aquatic habitats. Soil biology has a role to play too, as microorganisms can affect the biodegradation of products, so affecting their efficacy and the potential pollution risk over time,” she adds.

Clare Tucker of BASF echoes the advice on maintaining a decent soil structure. “It’s good for the crop and good for weed control. You need a crumb structure that will retain moisture, so it helps seed germination, but it’s also essential to activate the pre-emergence herbicides.”

However, the economics of the crop and threats such as water storage mechanism

<table>
<thead>
<tr>
<th>Water storage mechanism</th>
<th>Equivalent depth of water (mm)</th>
<th>Storage volume (10^6 m^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil pores to a depth of 0.5m</td>
<td>50</td>
<td>78</td>
</tr>
<tr>
<td>Surface depressions in a ploughed field</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Drainage ditches</td>
<td>2.75</td>
<td>4</td>
</tr>
<tr>
<td>100 detention ponds of 25,000 m^3</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Godwin and Dresser, 2003. Soil and water management in the Parrett catchment. Note: a one in two-year, five-day rainfall event = 62mm or approximately 100 x 10^6 m^3

There are ways to reduce the front-loading of your herbicide programme, says Clare Tucker.

**METAZACHLOR MATTERS**

**Oilseed Rape Growers – Think Water This Autumn!**

Metazachlor and Quinmerac are fundamental to early season weed control in oilseed rape. However, the frequency and magnitude of concentrations in raw surface water represent a real risk to restrictions being placed on these active ingredients. Time for action is NOW.

**EARLY ESTABLISHMENT IS KEY**

**Think Best Practice**

1. **In the farmyard**
   - From sprayer lifting spillages, container rinsing, disposal of caps & containers.

2. **In the field**
   - Via drift, drainage and run-off.

**Think Agronomically**

1. **Soil**
   - Ensure good soil structure, remove compaction but don’t overwork.

2. **Seedbed**
   - Ensure good seed to soil contact. Don’t make seed beds too fine but do consolidate.

**3. Establishment**

- Drill oilseed rape from mid-August onwards. Plan trials across the slope if possible.

**4. Apply herbicides**

- Pre and early post-emergence for best performance.

**5. Application**

- Follow stewardship guidelines. Avoid cracked or waterlogged soils. Monitor weather forecasts.

**METAZACHLOR MATTERS STEWARDSHIP GUIDELINES**

- Maximum dose rate for winter oilseed rape is 750g/ha
- Land that is not drained—no timing restrictions.
- Drained land: Avoid applications after 1st October
  - If soil seedbeds are favourable and drains are not flowing, applications can continue until 15th October
- Drained land in Drinking Water Safeguard Zones—no applications after 1st October
- Go to www.wytoy.co.uk for zoning details

**THINK WATER. THINK AGRONOMICALLY.**
Avoid practices that will degrade soil. Examples include:
- Cultivating light soils on steep slopes, giving rise to erosion risk.
- Harvesting crops or working soils when they are wet, giving rise to compaction risk.
- Overtake of the plough and over-working soils, which exposes buried organic matter to the air, so oxidising it into CO₂.

Maintain soil organic matter content (SOM). Practices to increase it include:
- Use of cover and companion cropping.
- Conservation or reduced tillage.
- Use of organic amendments (e.g. manures).
- More extensive rotations (e.g. including grass leys).

Take a long term outlook. Building up SOM takes a number of years and positive results will not be immediate. But soils with sufficient SOM are more resilient, and will be more economically and environmentally sustainable in the long term.

How to build resilience into your soil – Jane Rickson’s top tips

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Autumn Pesticide Stewardship – Why Farmers Need to Take Action!

- The Drinking Water Directive (DWD) EU drinking water limit for "total pesticides" in treated water is 0.5 ppb. For an individual pesticide it is 0.1 ppb.
- Water Framework Directive (WFD) requires all water bodies to reach "Good Status" - both chemical and biological by 2027.
- Pesticides are the biggest issue for the UK meeting the WFD.

The INDIVIDUAL PESTICIDE LIMIT IS EQUIVALENT TO:

- 1 second in 320 years
- 1p in £100 million
- A grain of wheat in 390 tonnes

DRINKING WATER PROTECTED AREAS (DwWPAs)

DwWPAs ensure protection from water quality deterioration and that water treatment meets the Drinking Water Directive. There are 651 in total in 2013 includes surface water and groundwater.

There are 486 surface water DwWPAs in England, 42% (202 of 486) of which are currently "at risk" - extra treatment has already been required or there is a real risk it will be needed.

The biggest issue is pesticides which cause risk in 25% (112 of 458) of DwWPAs.

Metazachlor is an issue in surface water, affecting 11 DwWPAs.

THE COSTS OF REMOVING PESTICIDES FROM RAW WATER

An average cost of £150 per Mega litre (ML) of water, an average site will treat around 36,000 ML of water per year which gives a total treatment cost of £5,394,219 per year per site.

www.metazachlornews.co.uk

Reduction rate

One example is to split a full rate of Shadow (dimethenamid-p+ MTZ+ QMC). “You could apply a reduced rate of 1.5 l/ha pre-emergence and then make an assessment of what top-up is needed when the crop is at 1-2 leaf stage when the foliar graminicide is also planned. Also, by splitting the dose, if there’s a heavy rain event, you’ll potentially lose less herbicide.”

She encourages growers to look at the range of actives available and target their use more closely to the expected weed burden. “MTZ is useful for chickweed, mayweed, speedwells, shepherd’s purse and meadowgrass. Dimethenamid-p (DMTA-P) has the same weed spectrum as MTZ but also brings in cranesbill, while QMC is useful for cleavers and poppies. MTZ needs to get to the roots of the germinating weeds, whereas DMTA-P works through the emerging shoots as well, so DMTA-P works better than straight MTZ in a typical dry autumn.”

So a product like Shadow (DMTA-P+ MTZ+QMC) is more consistent, covers all the key broadleaf weeds, and starts off the blackgrass programme, she says. New this year is Tanaris (DMTA-P+ QMC), which fits into blackgrass programmes, offering a lower cost start prior to propyzamide and is free of MTZ.

“A good option for growers concerned about front-loading programmes is to grow Clearfield varieties that have varietal resistance to imazamox,” notes Clare Tucker.

“Imazamox is highly effective post-emergence on a broad range of OSR weeds, including charlock, so the Clearfield system offers clear benefits as far as flexibility is concerned.”

The imazamox can be applied as Cleranda (with MTZ) or Cleravo (with QMC). “If high populations of early weeds such as poppy and mayweed are expected, a low pre-em dose of MTZ could keep them in check until a follow-up application of Cleravo is applied.”

Physical, a good structure is where combinations of soil particles are bound together as aggregates or peds.
Regulatory action will be required, warns Andy Bailey, unless we can reduce the amount of propyzamide in surface water.

That’s the message from Dow AgroSciences’ principal biologist Andy Bailey regarding propyzamide, the active ingredient in Kerb and Astrokerb. “We have to be blunt,” he warns. “Unless we can reduce the amount of propyzamide that’s challenging water companies’ ability to provide drinking water below the 0.1 microgram/litre level, regulatory action will be required.”

The publication of a Defra consultation on the options to reduce the amount of winter applied OSR herbicides in surface water has been delayed, he notes. “However, we can presume that the options on the table range from an enhanced Voluntary Initiative approach all the way up to withdrawal of the active ingredient. “That’s the worry; so we, as an industry, have to show that we’re playing our part in reducing the amount of propyzamide leaving fields.”

The maximum dose that may be applied is 840g/ha of active ingredient, but even if 97% of that remains in the field to do its job, the 3% lost can create problems for water companies, explains Andy Bailey. “The problem is that the EU limit in drinking water — 0.1mg/l — is a vanishingly small amount. So you need very little to enter a watercourse to breach that limit. The amounts we find in surface water have no environmental consequences — they’re well below the levels that would cause any sort of problems for aquatic organisms. But depending on the effectiveness of the water-treatment plant, they can cause issues for water companies trying to meet the 0.1 mg/l limit in tap water.”

The herbicide escapes from the soil by two routes — through drainage and by surface run-off. A trial at Loddington in Leics in the winter of 2008 found that approximately 3% of the propyzamide applied to the field was lost to surface water. Of that 3%, 80% was lost via the drains, and 20% by surface run off. However, the concentration in the 20% escaping as run-off was up to three times higher.

“The issue with propyzamide arises for two reasons,” says Andy Bailey. “Firstly, its application timing — it’s autumn/winter applied with the peak in the first two weeks of Nov. At that time of year, the drains are generally running and the flow of water is out of the field. Secondly, propyzamide is moderately soluble in water, and at that time of year has a relatively long half-life because of the cold soil temperatures. Conversely, of course, these two features are also important from an effectiveness perspective.

The Loddington trial had just two plots on fairly steep land (5% gradient), and examined the impact of 6m buffer strips at the edge of the field and the effect of two establishment methods — ploughing and disc cultivation via a Simba Solo.

The buffers generally reduced the concentration of propyzamide in water running off from the surface of the field, but in Jan, when the rainfall was twice the monthly average, they were overwhelmed. The amount of propyzamide lost from the field via the drains was much the same irrespective of the establishment method. Andy Bailey believes that was because by the time the herbicide was applied, the soil
structures after ploughing and after the relatively deep Simba working were similar.

An unmapped spring line also confused the picture, he notes. “In fact we were surprised to find that we collected more water than had fallen on the field. But the results encouraged us to invest further on a better designed and much more expensive trial.”

Conducted at Cockle Park in Northumberland the following year, it consisted of nine 80m x 20m plots isolated from each other and the rest of the fairly level (1% gradient) field by vertical polythene sheets. The drain and surface flows from each plot were collected separately, and the concentrations of propyzamide in each were measured.

The trial assessed the impact of three cultivation treatments — plough, tine and min till — and three buffer approaches — no buffer, a 6m bare buffer and a 6m grassed buffer.

Although surface run-off at the site was low because the field was relatively flat, the buffers did help cut propyzamide losses (see chart right). “It showed they can be very effective,” says Andy Bailey. But bearing in mind the Loddington experience, he notes. “In fact we were surprised to find that we reduced the peak concentrations found in the drainage water, he notes.

“The message is that the less soil disturbance you cause during establishment, the better it is as far as reducing the amount of propyzamide lost.”

What else might help?

“We can consider sacrificing some effectiveness to protect watercourses,” he suggests. “The key to getting the absolute best out of propyzamide is a cold soil that’s at least 80% of field capacity.

“If you move from that ideal situation, so instead of applying it in Nov you apply it in Sept or the beginning of Oct, the control of the target weed might not be quite as effective, but there’ll be less propensity for the propyzamide to leave the field. That’s because it’ll be broken down more quickly and there’ll be less drain flow. But I realise that’s quite a dramatic thing to ask a farmer to do.

“It’s also important to use the appropriate dose. Kerb has lower recommended rates for controlling grasses other than blackgrass. Keeping the rate as low as possible will help.”

One area which can definitely help is to ensure that sprayer filling, loading and wash-down areas meet best practice guidelines, says Andy Bailey. “Preventing farmyard losses is still very important and they’re the easiest to control. A well designed loading and wash-down area will prevent any spills or contamination from the sprayer reaching watercourses.

Dow AgroSciences has responded to the challenge of safe handling by redesigning the packaging of Kerb 500 and AstroKerb, he adds. “In doing so we’ve been able to eliminate the foil induction seals found on many other pesticide containers. These seals were identified as a significant contributor to losses of pesticides in the filling and loading area.”

The water is monitored using weir tank flow meters (left), while an automatic water sampler and data logger has been used to assess the propyzamide content (right).

At Cockle Park, surface run-off has been collected via a trench with adjacent 6m grassed buffer strip (left) and edge-of-field collectors (right).

“They should be widest at the most vulnerable part of the field. If you have a low corner in a field that’s close to a stream, that’s where they need to be wider.”

However, the fact remains that of the 2-3% of applied propyzamide which is lost from fields, most leaves through the drains, he stresses; and in that context the impact of the different cultivations at Cockle Park is significant (see chart below).

“The chart shows that the lowest losses came from the plots that were min tilled.” The min till plots also reduced the peak concentrations found in the drainage water, he notes.

Effect of cultivation regime

Source: Dow AgroSciences

Plough: inversion tillage to approx. 30cm depth (ploughed, power harrowed and drilled using an Accord Combination drill, then rolled); Tine: non-inversion tine cultivation to approx. 20cm depth (Sumo Trio one-pass cultivation system, drilled with a Väderstad Rapid 400P, then rolled); Min till: minimum tillage to approx. 8cm depth (Pottinger Terratic system, drilled with the Väderstad Rapid 400P, then rolled)

Surface run-off

Source: Dow AgroSciences

The following five charts show the impact of cultivation regime on water flowing into surface water. The charts show the percentage of propyzamide lost in surface run-off.
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be strong, be KUHN
A trend towards more targeted tillage puts the emphasis on cultivation kit that works shallower and is more versatile. CPM seeks advice. By Tom Allen-Stevens

Will Waterer reckons most growers need some form of cultivation to encourage grassweeds and volunteers to chit.

A move towards more measured cultivations is seeing growers put less pressure on their soils at the same time as reaping rewards in terms of lower costs. But the transition must be managed carefully to make the most of these benefits and keep grassweeds in check.

That’s the view from machinery manufacturer Kuhn, which has recently appointed two crop establishment protection specialists to help UK growers manage the move towards reduced cultivations. Will Waterer offers support across the south of England and Wales, while Marcus Ainley takes care of interests north of the Humber.

“Minimum tillage takes in a huge raft of approaches and techniques,” explains Will Waterer. “But what we’re increasingly seeing is that growers are moving away from sinking tines down to 14in simply because they have the horsepower to do so. They’re taking a spade out, looking at the soil structure and making an informed decision before dropping a machine into the ground.”

The advantages of reduced cultivations are two-fold, he says. “There’s clearly a lower cost, through less fuel used and wearing parts. But there’s also a benefit to the soil — through better targeting of deeper cultivations and subsoiling, the trafficability of the ground increases over time as it maintains its own structure.”

Another driver that’s increasingly shaping cultivation practice, he notes, is blackgrass. “There are many growers who have successfully made the transition to zero tillage and are managing grassweeds in a non-disturbance regime. For most, however, some form of cultivation to encourage grassweeds and volunteers to chit is the less risky approach.”

Trashy surface

So how do you make the transition towards reduced cultivations? “Consider first what seedbed you’re trying to achieve. You don’t need to create an onion bed as modern drills are far more capable of delivering good crop establishment from a trashy soil surface. So if there’s no need to bury the trash, leave it on the surface where it will encourage earthworms and help build organic matter.”

The second step is to consider grassweed control. “If you routinely mix the top 30cm, you’ll press reset on your weed seed-bank every year, and bring seed to the surface that will otherwise lie dormant. Shallow cultivations, carried out as close as possible behind the combine, will keep the seed shed in that year near the surface and encourage it to chit,” says Will Waterer.

If deeper cultivations are needed to lift compacted areas, for example, they should be targeted and carried out closer to drilling, he adds. “If your aim is ultimately to move to a zero tillage or strip-till system, you can consider reduced cultivations as the stepping stone — you have to build the soil structure to get there.”

Kuhn has two pieces of kit targeted at light stubble cultivations: the Optimiser and Cultimer. The Optimiser carries two sets of 510mm discs with a press, and is designed for shallow stubble cultivation at high speed. Its main function is to pass through stubbles at 2-5cm depth to aid weed and volunteer chit, but can be used for secondary tillage to knock down a ploughed or cobbly seedbed.

Will Waterer reckons minimum tillage is best for shallow cultivations, while the larger notched ones are more versatile. The press sets the working depth, but on the trailed version there’s an optional front-wheel kit that gives you extremely precise depth control.

“Consider a choice of discs,” explains Will Waterer. “The small notched discs are best for shallow cultivations, while the larger notched ones are more versatile. The press sets the working depth, but on the trailed version there’s an optional front-wheel kit that gives you extremely precise depth control.”

The press is also key to good moisture preservation and seed-to-soil contact — both essential for a good weed chit. “There’s a choice of press for the Optimiser. The T-Ring roller is a light, open press for crumbling clay or cloddy soils. The T-Liner’s the most popular, and is a closed-ring press for medium-heavy jobs and...”
The Optimer carries two sets of 510mm discs with a press, and is designed for shallow stubble cultivation at high speed.

**Tech specs: Kuhn Optimer and Cultimer**

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**Cultivation switch to battle brome**

A growing problem with grassweeds persuaded N Yorks grower Edward Hardwick it was time to look again at the cultivation regime.

“We moved away from the traditional plough and power harrow about eight years ago, and the main cultivation tool is now a 3m Sumo Trio,” he says. “But over the years, we’ve had more and more problems with brome — great brome is the most prevalent — while blackgrass is also more problems with brome — it was down to hand-rogueable trash,” he adds.

Farming 485ha on the edge of the N Yorks Moors between Scarborough and Pickering, AW Hardwick and Sons crops around 360ha of combinaibles with 65ha of seed potatoes. Winter wheat, winter barley, oilseed rape and spring beans rotate around the brashy soils over limestone with a predominantly clay base. There’s also a small area of spring oats.

“We’ve found OSR to be a particularly dirty crop,” continues Edward Hardwick. “The wheat that follows generally has a heavy burden of brome. We try to be vigilant, but we can’t rely on the chemistry to do the job. We looked again at our cultivations and realised we weren’t really giving the weeds enough of a chance to chit before drilling.”

So last year he invested in a 5m trailed Optimer. “We’re using it mainly as an extra pass after OSR to get a weed chit in front of the wheat. It’s also used to encourage a chit on the stubbles before a spring crop, depending on conditions.”

Ease of use from a robust piece of kit were the main attractions of the Optimer, says Edward Hardwick. “There are quite a few manufacturers that supply these cultivators. We’re not farming vast amounts of acres so need something that does the job, isn’t too complicated, and comes in at the right price.

“The Optimer is simple to set up, and the adjustments work well. We generally use it at around 50-75mm, but can set it to go deeper. With stony soils, some of our land lies quite thin, but it leaves a level surface and you get a good weed chit.”

The Cultimer is a tined machine that can be set for shallow stubble cultivations or for deeper soil restructuring.

Edward Hardwick needed a light cultivation to encourage brome grass to chit on his brashy soils.

Consolidated surface. At the front, it hitches onto the hydraulic arms, which gives you a tight turning circle, although you have to make sure the arms are adjusted to ensure there’s very little play. You can adjust the height easily, though, and the working depth is quite precise.”

He’s only had the Optimer for a year and is looking to see how he can use it best to continue to reduce cultivations while maintaining the soil structure and keeping in control of grassweeds.

“We’re looking to reduce carbon emissions, as well as fuel costs, and environmentally it’s the right thing to do. But in one year, we’re already getting results on the brome — it was down to hand-rogueable levels in the winter wheat,” he notes.
It can make the difference between a set of tyres representing a cost or a contribution to a business.

While it’s not always evident at first glance, dig into their design and it’s clear agricultural tyres have undergone significant advances in recent years. Load carrying abilities, speed ratings, traction transfer and comfort provision have all improved markedly, courtesy of innovations such as new tread designs and flexing sidewalls. But investing in the tyres that can offer these attributes is one thing — extracting the maximum possible performance from them is quite another.

That’s where tapping into the expertise of an agricultural tyre specialist can be invaluable, believes Pete Sampson, who fulfils that role for Notts-based Tanvic Tyres. From a farming background and with 28 years’ experience in farm tyres, he suggests he’s seen a gradual shift in the way many farmers are putting greater consideration into the selection and set-up of their rubber.

“Among a growing number of farmers there’s greater awareness now of the difference tyres can make to the performance of tractors and other self-propelled vehicles,” he says.

“They’re tapping into the expertise in tyre selection, inflation and weighting that a good specialist can offer, and it means they can take full advantage of this. It can make the difference between a set of tyres representing a cost or a contribution to a business.

Technology advances

“But there’s also a fair proportion who aren’t making use of the advice available to them, and missing out on the full potential of their tyre investment. Tyre technology has advanced considerably, even in just the past four or five years, and like any farm tyre specialist I’ve had to develop my knowledge accordingly. Many farmers could get a lot more from their tyre investment if they use the full expertise available from a fully trained agricultural specialist, who should in turn also be benefitting from the experience of their suppliers.”

Improved tread designs may have done a great deal for the traction and ride comfort offered by modern tyres. But the real game-changer has been the development of tyre carcase structures which have a larger diameter, yet have sidewalls capable of a greater degree of flexing than usual. So the total structure can bear greater payloads at the same pressure, or the same payload at a lower pressure. This is achieved by having a much longer and slightly broader tyre footprint without the physical creation of a wider section width.

“This is one of the key areas in which tyre technology has changed,” says Pete Sampson.

“Increased flexion (IF) and very high flexion (VF) tyres offer the possibility to boost outputs, reduce soil impact and cut fuel costs over tyres of the same size without this technology. That’s possible through their capability to bear higher loads at the same pressures, or the same load at much reduced pressures, without any need to alter pressures between field and road. They’re fully safe and effective in both environments. But they must be set up properly to achieve these things.”

Pete Sampson urges buyers to look beyond price when selecting replacement tyres, instead considering the potential return on investment from the best available tyre for the bulk of the work the machine will be doing.

“Replacing tyres on an existing machine obviously gives the opportunity to explore new options. But equally, buyers of new tractors shouldn’t feel they have to stick with the standard tyres supplied with machines off the line. Tyres are a significant investment, and a key part of getting the best from a machine. If there’s an option you prefer, specify it with the dealer or talk to your local tyre specialist.

Firstly, calculate how much time you spend on road work, heavy draft work and lighter field tasks. Also, consider how you do things — ploughing on-land, for example, can cut the risk of sidewall damage and, more importantly, reduce compaction in the furrow bottom.

“The view that big is beautiful and wider rubber floats better is outdated. The right 650mm or 710mm section-width tyres with a tall aspect ratio, offering a longer footprint, can be just as effective at spreading weight and providing maximum traction as the sort of 800mm tyres traditionally reckoned to be better for soil
Chris Germany, who runs a 1200ha combinable crop family enterprise at Norwell, Newark, is this season replacing a John Deere 5430i self-propelled sprayer with an AGCO Challenger RG645D. Where the Deere had been running primarily on 710/60 R38 VF rubber, the Challenger will be delivered on 710/70 R38 Bridgestone VT-Tractor tyres supplied by Tanvic.

“I had intended to go for similar tyres to the Deere, but I’m not afraid to try something new rather than following the norm, and everyone knows how to get the best from the design and exploit its full potential,” he says.

“Tractor and self-propelled machine users shouldn’t expect to simply throw on a set of new boots and expect them to work well. Tractors need to be weighed, using weigh cells under each wheel, and attached to the implement they’ll be mainly working with. It’s then important to weight the machine accordingly, particularly if it’s to be doing heavy draft work.

“A lot of the time we find there’s insufficient weight on the tractor’s nose, and all four tyres are underperforming as a consequence. It’s essential that weighting takes into consideration the weight transfer to the rear axle that takes place when the implement is put into work, with front end weight in particular adjusted accordingly. Only then should the tyre pressures be adjusted according to the manufacturer’s recommendations.”

A committed manufacturer should be able to offer advice and support alongside that which comes from its dealer, suggests Pete Sampson.

Correct weighting

“With Bridgestone, for example, agricultural tyre specialist Steve Lamb has helped on a number of new tyre installations where its VT-Tractor tyres have been specified by customers. An hour spent weighting correctly and checking pressures is a good investment, and good specialists and their suppliers should be able to help here.

“Even once installation of new tyres is complete, we occasionally see operational issues where the customer still needs a little help in getting the best from his tyres. Most commonly that’s caused by subsequent over-inflation, where perhaps someone has mistaken the way in which these tyres bulge at the base for a lack of air.

“It often used to be a rule of thumb that having three cleats in contact with the ground was a sign of correct tyre and machine set-up, but the correct pressure settings for modern tyres will increase that cleat count considerably, thus ensuring maximum traction and work rate. With VF tyres such as the Bridgestone VT-Tractor, maximum cleat contact is the aim.

“I’ve seen one incidence where one of our fitters installed a new set of VT-Tractor tyres at 1.6 bar (23psi) to seal them, while ensuring the tractor was weighted correctly and then adjusting the pressures ready for work, dropping them by half. The farmer later reported that he felt the tyres were underperforming, but when we investigated the cause was clear — they had been topped up with air on the basis that they looked soft. After resetting they worked exactly as they should. It’s even more important with IF and VF tyres to go by the book, and not by appearances.”

Bridgestone’s Steve Lamb agrees that over-inflation is one of the key setting mistakes among those using IF or VF tyres for the first time.

“On tractors and self-propelled sprayers doing a lot of roadwork, the visible result is worn tread centres, but there’s also a cost in terms of poor traction and higher fuel use,” he points out.

“Rather than ‘selling and forgetting’, we help customers throughout their use of the VT-Tractor product, even providing every customer with a digital pressure gauge. It’s a small element, but one which underlines the importance of correct pressures.”

Sprayer swap sets test for new tyres

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“I had intended to go for similar tyres to the Deere, but I’m not afraid to try something new rather than following the norm, and everyone knows how to get the best from the design and exploit its full potential,” he says.

“With many self-propelled sprayers near or at their weight limit for the tyres they’re fitted with, he pointed out that the greater rolling circumference would give him an additional carrying capacity of up to 3.0t per tyre at 1.6 bar (23psi), and the ability to operate at much lower pressures while still being able to travel safely on the road.”

Chris Germany makes a point of setting his tyres carefully, with help from Pete Sampson, and while he uses a Case IH Quadtrac 500 for main cultivations, the remainder of his tractor fleet comprises a trio of wheeled Fendts.

“The RoGator isn’t the lightest machine, but with the Bridgestone Tractor-VTs I can spread that weight with long footprints from tyres run at the lowest possible pressures. While we rotationally plough to control blackgrass, the majority of our land is min-filled, so we need to keep compaction to a minimum. We have some fairly heavy clay, and we also have some reasonable hills, so good traction is a must, and I’m looking forward to seeing how the tall very high flexion tyres with their longer footprint perform in these circumstances.”
New VT-TRACTOR

Low fuel consumption

Reduced soil compaction

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