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Summer 2015



Practical

Pre harvest soils diagnosis

Case study

Disc cultivator from the East in action

Big picture

Cover crops come to the fore

Insight

OSR establishment trials reap rewards

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Contents

Tillage News 4-7

The latest developments from the industry, plus a farmers perspective on precision soil management

Practical 8-15

Now is a good time to work out what is going on with your soils, the first of a two-part article looking a problem soils diagnosis

Case Study 16-19

How one Eastern European manufacturer develops disc cultivators and an early adopter in the UK's experiences

Big Picture 20-25

With increasing significance in nutrient capture and soil organic matter, cover crops are so much more than wild bird seed

Insight 26-31

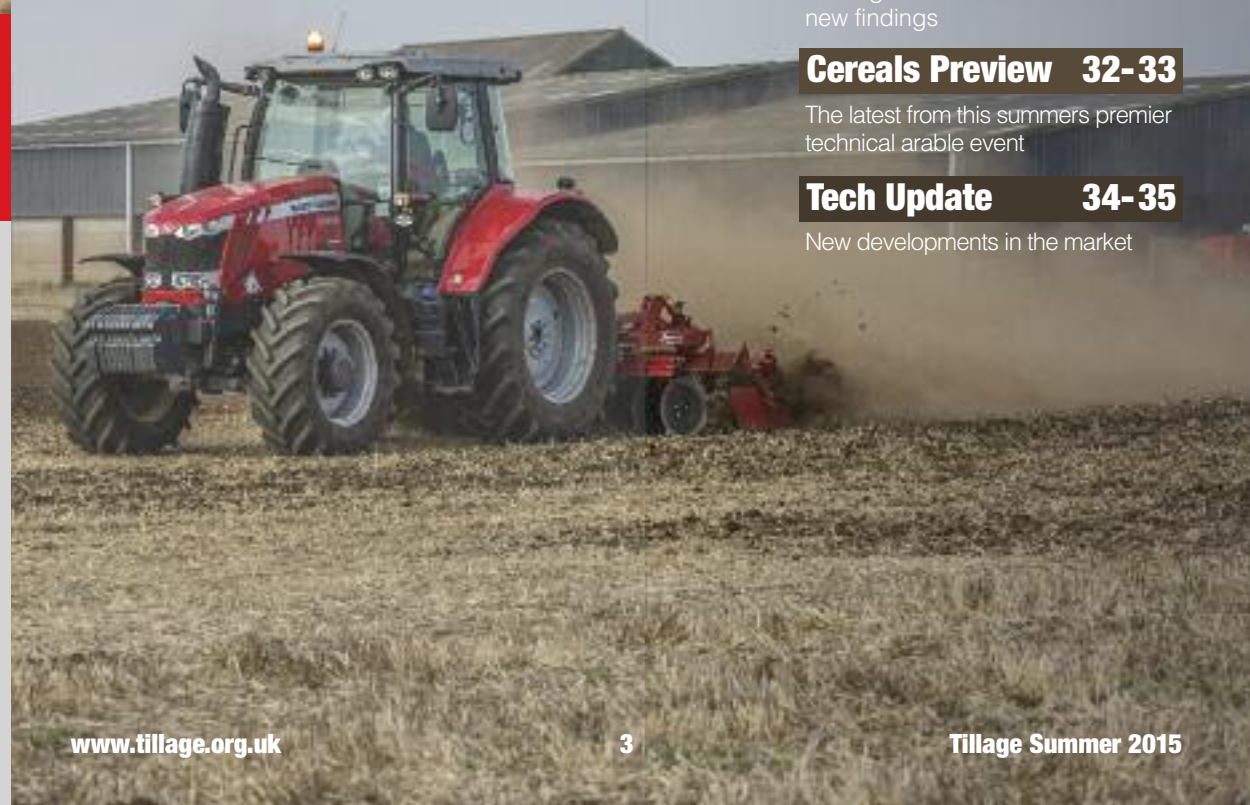
Ongoing trials work looking at Oilseed Rape establishment is coming back with some novel new findings

Cereals Preview 32-33

The latest from this summers premier technical arable event

Tech Update 34-35

New developments in the market



GOING UNDERGROUND

If your feet sometimes feel heavy at the end of a long day, it could be because you are carrying tens of thousands of species, and millions of organisms, in the mud and earth stuck to the soles of your wellies. The soil is teeming with organisms that are helpful or harmful to soil and crop health, so tread lightly!

Knowing your soil should be a vital part of your business intelligence."

A teaspoon of soil may contain as many as 600-800 million individual bacteria and several miles of fungal hyphae. Not all are disease-causing agents; many microorganisms bring benefits such as supporting soil stability, cycling nutrients, suppressing disease, promoting growth and breaking down toxins.

For instance, if the *Phialophora* fungus colonises wheat roots, it can act as a natural antagonist to the take-all pathogen, denying the more harmful organism the space and nutrients it needs to develop and damage the crop.

Soil structure and its chemistry also play huge roles in crop productivity, and we are all increasingly mindful of the impacts that practices, equipment and spraying have on the ground. For instance, heavier equipment

exacerbates compaction, potentially leading to drainage problems, nutrient leaching and rooting issues.

As knowing your soil is a vital part of your business intelligence, we have recruited a team of experts to be on-hand at Cereals 2015 to discuss the extraordinary activity taking place right underneath us.

You will also be able to discuss how AHDB is investing millions of pounds into research to understand soil ecology, water infiltration, root development and soil management.

www.ahdb.org.uk

Cereals 2015 takes place on 10-11 June 2015 in Lincolnshire
www.cerealsevent.co.uk



Dr Amanda Bennett, AHDB
Research Manager

Arable lessons from horticulture at Cereals



The practical role for integrated pest management (IPM) will be a hot topic on the Certis stand at this year's Cereals event.

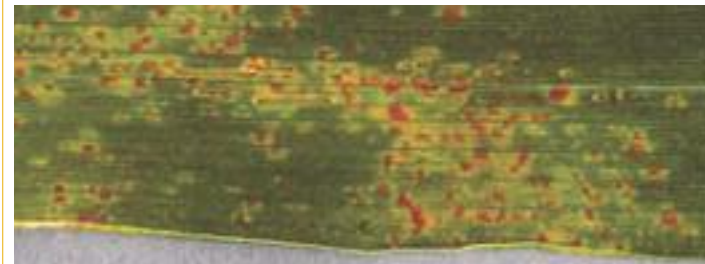
"The UK government are required to show that UK growers are using IPM as part of the Sustainable Use Directive," says Inez Cornell Certis' arable crops product manager.

"This, combined with the increasing pressures placed on the industry from the loss of several active ingredients used for crop protection, and the predicted loss of another 40 in the coming years, is a very real threat to arable farmers.

"However, the horticultural sector has been exposed to limited pest, disease and weed control solutions for a long period of time and has overcome such challenges by adopting an integrated approach, which the arable sector can learn from."

Certis' BASIS qualified team will be showcasing the company's expanding arable portfolio at Cereals on the 10 and 11 June, as well as providing practical advice on an integrated approach to crop protection. Cereals stand no 433.

Pathogen virulence monitoring comes from the ground up



Leaves showing signs of wheat yellow rust, brown rust and powdery mildew, as well as barley powdery mildew, are being requested.

The UK Cereal Pathogen Virulence Survey (UKCPVS) is calling for the industry to monitor cereal crops and send in diseased samples for analysis.

Managed by NIAB, and funded by HGCA and Fera, the UKCPVS tracks potential shifts in UK pathogen populations, identifying areas of concern – particularly potential breakdown in varietal disease resistance.

Dr Sarah Holdgate, UKCPVS project manager based at NIAB, said: "Our success relies on infected wheat and barley leaf samples sent in by growers, agronomists, plant breeders and official trials operators.

"May, June and July is the peak period for sampling and infected leaf material gathered from across the UK gives the team the pathogen isolates needed for robust testing.

"The more samples we receive, the more chance we have to detect an issue before it becomes an established

problem giving growers more time to act in the season and plant breeders more time to adapt their variety selection processes."

The request follows the release of UKCPVS results in March which showed cereal rust populations in the UK have become increasingly diverse – affecting varieties in different, and often unpredictable, ways.

Disease sampling in 2015

Typical crop disease symptoms can be seen in the photo gallery on the recently refreshed Cereal Disease Encyclopaedia.

Samples can be taken from any variety but varieties noted as resistant to the disease are of particular interest.

Simple sampling guidelines have been developed which should be followed to ensure samples reach the FREEPOST UKCPVS address in the best possible condition.

Leading science and agronomy on show at Cereals 2015



A wealth of novel science and agronomy will be on show at Cereals 2015, offering visitors an exceptional opportunity to keep up with the rapid pace of change in the arable sector.

Cereals 2015 takes place on Wednesday 10th and Thursday 11th June, at Boothby Graffoe, Lincolnshire. Tickets cost £24 each (£20 for students) and are available at www.cerealsevent.co.uk

Cereals offers two NROSO points and two BASIS points to members for attending the show.

Further points are available from participating exhibitor stands.

Further information at www.cerealsevent.co.uk

Get all the latest industry news between issues from our website
www.tillage.org.uk

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Making the most of your technology



James got into precision farming with a second hand Lexion 580 with Agrocom yield mapping on board.

farming," added James.

The next stage in James' journey into precision farming was to upgrade to Gatekeeper and included PF Actual and PF target modules as well as mapping modules. The yield data analysis made him question why so many variations were occurring.

"The best yielding area is adjacent to ditches so we purchased a Kongskilde Wingjet to place the fertiliser up to the outside edge of the field"

The next step was to precision soil sample. Having been told the most efficient way to sample a field was in a W shape we did this for many years. However, when you precision soil sample it throws up many questions and this caused us to probe into why areas were short and to investigate the interactions of various elements in the soil. We sampled through SOYL and latterly, using our Trimble Nomad on the quad bike with a manual spear. This also gives us a great feel for new land by feeling texture and seeing wet holes and then be able to address them, feedback perhaps you do not get from contractors," said James.

James considered his next fertiliser spreader very carefully and opted for a combination of the Wingjet and Bredal disc spreader. This allows a broad mix of fertilisers to be applied for specific problems in the field. Both spreaders have variable rate capability. A Trimble Yuma

a third wheat or spring barley," said James.

"Using Muddy Boots software we found the first combines yield mapping information was accurate as long as yield was recorded and calibrated over a weighbridge and the narrower table width gave far more accurate yield across a field and this data has been extremely useful and formed the basis for our whole entrance into the world of precision farming," said James.

The next combine purchased came with yield mapping. "It bought a host of new challenges with it but it gave us complete yield data across the fields. So over 5 years we decided to build up a dataset of yield data before moving further into precision

is used on the Bredal and communicates directly with the LH Agro box on the spreader.

"The data collected allowed us to produce prescription maps for the Vaderstad drills to follow for variable rate seeding. The first year we allowed unlimited seed and the seed rate in one area went up to 700Kg/Ha. We initially tried three fields in 2011 and then rolled it out to the whole farm in 2012.

Using RTK accuracy allowed them to target where tramlines



are placed to optimise the fields. Drainage maps can be overlaid on gatekeeper and then imported onto screens to know where the drains are when you are moledraining. It can also mark obstacles to warn drivers of poles, mainholes, etc and can also be used to mark drain outlets. They also use it to map all the field boundaries to ensure machines do no en-croach cross compliance strips. There are also definite advantages for users who want to employ strip tillage regimes sub as subsoiling in the autumn and sugar beet drilling in the spring, band spraying, precise placement of fertiliser in the seedbed.

So where to next? "We need to embrace and use the technology we have invested in"

NIAB TAG unveils The Hole Story at Cereals 2015

With advice on soil management, rotations, cultivations and fertility building

Soil specialists Nathan Morris, Mark Stalham and Chris Winney will be in the soil pit, digging around the

tines of a subsoiler pulled through a plot of wheat to demonstrate the importance of maintaining a healthy soil and the methods farmers can adopt to influence soil structure to ensure optimum crop yields.

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Soil issues – spotting the symptoms

OK, let's get prepared. 4x4 vehicle? Check. Spade? Check. Penetrometer? Check. Fully equipped with tools and some basic soil structure knowledge, it's time to get into the fields to see what may be amiss beneath the surface. Peter Hill reports.

Pools of water apart, there are plenty of signs on and above the soil surface that point to likely structure deficiencies beneath, providing clues as to where to plant the spade and get digging.

“Early spring onwards is a good time for crop issues to show up and also for examining soil structure because digging is easy and differences in soil strength are much easier to

recognise,” says Philip Wright of Wright Resolutions, who provides consultancy on soil structure and remediation to organisations and individual farm businesses.

“Wetter layers can be visible when soils are at or near field capacity,” he adds, “whereas later on, when the soil can become dry and very strong, differences are less easy to pick up.”

Water lying on the surface is a clear indication that all is not well below – as well as a condition that delays field access for routine tasks like spreading and spraying.



Consultant Philip Wright in his natural habitat explains the features and function of well-structured soil. Photo: Sustainability West Midlands.

Visible differences in arable crop height, growth and appearance are early warning indicators of the presence of soil structure problems.

"They may also result from differences in soil texture, of course, as well as influences on establishment, herbicide efficacy, and so on," notes Philip. "But nonetheless, these crop effects are a good sign of potential shortcomings in soil structure and the need to investigate to see if that is the case."

Indicators to note include an uneven canopy and more extreme symptoms such as bare patches in the crop. Heightened



When soils are at or close to field capacity is a good time to discover wet layers within the soil profile with drier soil beneath and above.

levels of damage by pests such as slugs and flea beetle, and by fungal disease, can be caused by poor crop vigour as they prey on the weaker parts of individual plants, which can be the result of poorer establishment and growth restrictions.

Crop effects are a good sign of potential shortcomings in soil structure

"Look also for crop colour symptoms potentially resulting from stress caused by impaired drainage, low soil porosity, lack of

nutrient, and so on," suggests Philip. "And heightened weed competition, too."

Blackgrass is a classic, of course, because it thrives in the wetter conditions resulting from poor drainage that crop plants dislike and in a stressed state pose less competition to the vigorous weed grass. Patches of blackgrass tend to be most obvious and strong in poorly drained, wetter areas of fields.

In arable crops, the impact of poor soil structure leading to soils that take a time to recover their ability to support tractors and other field machinery is largely felt through the disruption of

cultivation, sowing and field treatment schedules.

The news is not all bad: following the very wet autumn in 2012, agronomy provider Procam advised growers that wheat yields do drop off after the mid-September to mid-October optimum but that winter varieties

can still muster a successful performance when sown well into the late autumn and early spring, albeit at the cost of increased seed rate.

For mid- to late-November sowings onwards, a fast-developing or spring variety will do better – but it is not always

easy to switch variety plans, especially when seed has been treated with a fungicide that prevents it being carried over a year.

Procam suggests guideline figures of a 10% yield reduction from November drillings and up to 30% from winter cereals sown

Grassland factors

On grassland, warning signs include poor spring growth and overall production, weed grasses dominating more productive types and weeds growing in bare areas, points out EBLEX, the levy-funded body that promotes best practice in beef and lamb production.

Poor quality forage and poor absorption of manure and slurry are also indicators of soil

structure deficiencies, along with a rusty, grey-mottled hue that indicates poor drainage and previous waterlogging. This may also be accompanied by a foul-smelling layer of debris, prevented from breaking down by the exclusion of oxygen by water lying trapped in the soil for some time.

The impact on forage yields of poor soil management can be

considerable, adds EBLEX, with grass yielding as little as 7 tonnes/ha dry matter a year compared with the 9-10 tonnes potential of permanent pasture, 12 tonnes from a young grazing ley, and up to 14 tonnes from a silage ley and animal growth rates halved from the daily live-weight gain possible under the best grazing and soil management regime.



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Blackgrass thrives in wet soils where crops are unable to mount the same competition – so locations where distinct clumps are evident are good places to investigate soil structures. Photo: Bayer CropScience.

into the early spring are on the pessimistic side – farm data from the Procam 4cast database indicates that, on average, very acceptable yields can still be achieved from seriously delayed sowings.

But, clearly, anything that enables soils to recover quickly from high rainfall events will help keep schedules on track and make subsequent weed control management somewhat easier than when late drilling into poorer seedbeds reduces options.

Growing crops do not care to stand for too long with their feet in waterlogged soils because it starves them of oxygen – although scientists at the University of Nottingham are

working on varieties with greater tolerance of this situation.

Noting that barley is comparatively more susceptible to waterlogging than other cereals, with average yields slashed by up to 50%, the Nottinghamshire team has identified the mechanism used by plants in stress conditions to sense low oxygen levels and how that mechanism works in barley.

While that could lead to varieties with superior growth, yields and chlorophyll retention thanks to improved tolerance to waterlogging, for now, UK growers must rely on soil and water management to provide a healthy environment for their crops.

Back to the field with a spade, then.

“It’s tempting to head straight for the poor areas and start digging but resist,” urges Philip Wright. “It’s better to go to the ‘good’ parts first, away from any wheelings, to benchmark the field so that when moving to the poor parts it is easier to judge differences.”

Experiencing a tighter layer resisting the spade, or generally how different the poorer area feels, will then be more apparent.

“This is the starting point for getting a ‘feel’ for the field and any structure effects,” adds Philip. “It is possible then to examine the soil as it is carefully removed from the hole, and to



It’s tempting to start digging in a ‘poor’ area of the field but better to examine a ‘good’ area first and then a wheeled spot to benchmark the soil structure in a particular field before examining where problems are expected.

look deeper into the hole at the structure, porosity and rooting.”

During the examination, sample in the good areas a wheeled zone – not a tramline – where wheelings are visible from the previous establishment or cultivations operation, or harvest, he advises.

“If none are visible, pace out

from a tramline to where the drilling tractor would have passed and dig in a wheeled section to compare ‘absolute best’ – your first hole dug in a non-wheeled location – to an area possibly compromised by field traffic, to judge relative differences,” says Philip. “If differences are clearly evident,

this indicates a need to look at tractor ground loadings and tyre pressures to reduce the impact of field passes if possible.”

Having benchmarked the ‘good’ areas in this way, moving to more obviously compromised areas will provide further opportunities for comparison and most clearly show the depth and

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What the roots say



Root growth – from existing and previous crops – provide useful clues as to soil conditions beneath the surface.

Roots from growing crops and preceding ones can reveal a great deal about the sub-surface condition of soils.

“Look at the extent and depth of root growth – if they appear to stop at a depth, especially older root fibres, look closely in this zone for low porosity and determine whether this is a barrier,” notes Philip.

“Waterlogging – even temporary – can be the cause, and soil mottling shown by brownish red blotches in a generally grey soil colour, is a good sign of this.”

Bear in mind that some soils are naturally waterlogged at times of the year and in these cases mottling can always be

present and not necessarily serious. Again, evidence of roots growing through such zones is a good sign.

Any areas shown up by poor root growth are best checked again nearer to harvest – or at least when crop roots will have grown to their full potential, Philip suggests.

In the end Nature is needed to provide complete restructuring

“If roots eventually grow through such layers and open them up – soils that shrink and swell can naturally structure if this effect is

maximised by roots extracting water – it may not be necessary to remediate by cultivations,” he points out. “Dragging metal through soil only does so much, in the end Nature is needed to provide complete restructuring and porosity which is stable.

“That said, if zones are identified where roots have not managed to pass through, giving Nature a helping hand to start the restructuring process can save time and aid the bank balance,” he adds. “Waiting for Nature to do its job unaided in an environment compromised by unnatural processes can stretch the bank manager's patience!”

extent of any problem, as well as the likely need to correct it.

If planning to use a penetrometer, it is vital to first dig and confirm issues and to then use this time-saving device only if the identified issues can be “felt” as the penetrometer is pushed into the ground.

“It can be OK to use a penetrometer in other parts of the field to save digging time provided the field is consistent texture-wise and it is done immediately, before moisture levels change,” cautions Philip. “If it shows up different effects, then dig down to confirm why and, most important, to see in detail what is going on and if anything needs to be done; there is absolutely no substitute for a spade.”

Digging in the poorer areas of a field will most likely reveal a

more dense soil with lower porosity – either extensively through the profile or within a band at a depth associated with prior cultivations.

“If this coincides with a change from topsoil to subsoil, water may be held up naturally as a result of differences in capillaries,” notes Philip. “As long as roots are growing through and beneath

There is absolutely no substitute for a spade

such layers, things are likely to be OK and manageable.”

Compromised soils are more likely to be found where drainage is impaired – this being the most important aspect of maintaining good structure. Low levels of soil organic matter will also

contribute, as will regular and intense cultivation – such as stone and clod separation for root crops – and the passage of heavy machinery when soils are damp or wet.

Using the crop, comparing good to compromised areas, confirming later if Nature has overcome issues, and remediating in a controlled manner to assist natural restructuring – plus, of course, digging and checking such remediation is effective at the time – is a good sequence of operations for checking soil structure.

Choosing and using effectively appropriate remediation techniques will be the subject of the second part of this article being published in the next edition of Tillage.

Cultivating Establishment Ideas Tillage-Live 2015

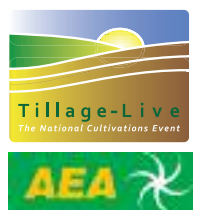
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The discs, have a fluted blade with a serrated edge. The flutes continue towards the centre of the blade, so they should retain an effective cultivating and mixing action even when worn, which conventional notched discs do not.

Old and new names team up in tillage

Little known outside eastern Europe until recently, Czech firm Bednar has appointed Knight, well known for making its own cultivation kit, to sell its equipment in the UK. Martin Rickatson finds out more from the firms and a UK user.

Few firms with a well-known brand and a hard-earned reputation for manufacturing quality farm machinery would risk those attributes by putting their resources behind a complementary line of equipment from an unfamiliar name. So it's perhaps a sign of how highly it rates the maker that Knight Farm Machinery chose to do just that with its deal last year to become the UK importer for the range of

Bednar tillage machines from the Czech Republic.

Founded in 1991 as a farm equipment dealer co-owned by the Bednar family, the firm began manufacturing tillage equipment in 2000, in the green livery and name of Strom, as the dealership was known. Disc harrows were the firm's first products from its factory at Moravska Trebova, 125 miles east of Prague.

The switch to Bednar branding

and yellow paintwork for the line of products which, by then, included a growing range of minimum tillage cultivators, came about when the family took full ownership of the manufacturing company.

Since then, the firm has focused on broadening its range, to include drills as well as tillage equipment, and expanding into new markets. After establishing successful operations in Germany

and France, more recently it turned its attention to the UK, resulting in the unveiling at last year's Cereals of the deal between Bednar and Knight. The latter company says it intended to be selling £5m/year of Bednar equipment within five years, and to date has signed up 10 dealers for the range.

Jan Bednar, second generation of the family to run the company, says the firm recognises that the generally heavier soils of the UK present their own demands, but it's here that he believes the firm has designed into its range features which meet those challenges.

Robust design

"For example, we have focused particularly on areas such as ensuring machines run level and leave consistent seedbeds, as well as robust design.

"We have also invested in a new factory to support our expansion into new markets, turning over our original plant purely to research and development. The new, purpose-built two-storey facility is modelled on those designed by leading car manufacturers, with automation which is designed to maximise output and minimise

manual handling, giving the factory a projected output of around 2,300 machines/year." One building on the new site houses cultivator and mulcher production, with a second adjoining two-storey building in the pipeline for manufacturing the firm's recently-introduced drill line.

While component supply and some steelwork-sourcing is contracted-out, all design, assembly, shot-blasting and painting is done in-house. The factory currently has some 180 staff working a double shift system, with employment likely to



All design, assembly, shot-blasting and painting is done in-house.

rise to 220 as the new drill production line comes on line. A further 22 people work at the nearby parts centre.

Knight is to wait until the 3-6m Omega min-till grain and grain/fertiliser drills, equipped with disc cultivation elements and double-disc coulters, are fully tested and in production before deciding whether to bring them to the UK – 8, 9 and 12m models are also planned – but the Rutland firm has initially committed to offering a line of three cultivation implements (plus a mulcher range) to UK buyers. This consists of the Fenix tined cultivator, the Terraland chisel plough, and the Swifterdisc, a shallow-working 3-12m tine/disc cultivator/weed germinator which, badged as the Swifter, is also available minus the discs.

"In the Czech Republic they are often used to work down over-wintered ploughing and leave it level for drilling. We have also run the machines on autumn ploughing and they worked down medium heavy soils into an excellent seedbed, which demonstrates their versatility."

Work down post harvest

Bednar maintains that disc cultivators' ability to work immediately after harvest to chit

weed seeds and preserve moisture, ahead of any necessary deeper tillage operations, helps reduce power requirement and steel wear.

"Chopping and mixing of plant residues with soil to encourage their breakdown and stimulate controlled growth of weeds and volunteers is, of course, the aim with compact discs, but achieving sufficient speed can be a problem," says Jan Bednar.

"They become unstable and create waves on the soil surface, resulting in depth consistency problems for the cultivator and following drill."

"This is caused by a small gap between the rear set of discs and the rear packer and, on trailed machines, the unsuitable location of the rear axle behind the packer roller. One solution is to slow down and operate under 10kph, but this severely compromises the work rate.

"Our solution is to incorporate the transport axle between the rear discs and the packer, or in front of the disc sections, and to provide sufficient distance between the rear discs and the rear packer."

The firm's 4.0-7.5m Swifterdisc XO-F incorporates an integrated axle in front of the rear packer, while the 10-12m Swifterdisc XE



"Both the Swifter and Swifterdisc can work as germinating cultivators or be used to finish off seedbeds," says David Main, Knight sales manager.

(a 14m is in development) has four wheels at the front, ahead of all the working elements. Pairs of discs are mounted on each arm, reducing the number of legs by half over single disc-mount systems, and providing twice the available space for trash to pass through, reducing the potential for blockages, claims Bednar. Large 520mm wavy-edge discs cut and mix trash, while larger units are being developed.

Early adopter success story

One of the first UK customers for the Swifterdisc XO-F was Hertfordshire farming business Gardener Partners, which farms 400ha (1,000ac) in the south-west of the county, near Hemel Hempstead. But its use of the compact disc is perhaps a little unusual in that works in conjunction with – ahead of and following – the plough. The blend of the two processes is the business's newly-adopted method of trying to improve weed suppression, and early results suggest it would appear to be working.



With a 5m machine working behind our 170hp John Deere 6170R we achieved a workrate of 7.3ha/hr using about 5.0l/ha of diesel.

Sterile brome

Sterile brome is one of the key problem weeds on the mainly clay-based soils, many of which have high chalk, flint or gravel contents. With chemical control options limited, and the weed presence increasing in both density and location, farmer Richard Gardener last year made the decision to split the business's tillage and drilling requirements, previously all handled by contractors, and take the former back in house to try an alternative approach to control.

The enterprise consists of four farm units run as one, with a total of 340ha (850ac) of combinable cropping including winter wheat, winter oilseed rape and winter oats, and both winter and spring barley, complemented by permanent grassland and fallow.

Worsening weed burden

"The weed burdens were getting worse, particularly where sterile brome was concerned, and we decided we had to change the system to reduce them," says farmer Richard Gardener.

"By taking cultivations back in house, we are in control of weed chitting and control, while at the same time reducing our costs. Our contractor had been using a



The Swifterdisc has proved to be the ideal tool for chopping and mixing into the soil" Operator Stuart Tabernor.

tine/disc cultivator and then working down the seedbed before drilling, but we chose to cultivate shallowly for a weed chit, spray off and then plough down, before working down the ploughed ground with another cultivation pass ahead of drilling."

The business tried a range of different machines for its weed chitting and post-ploughing plans, but ultimately decided that a Knight Bednar Swifterdisc, in 5m format and with notched solid steel packer rings, best suited the farm's stony clays.

"It does exactly the job we want, and both build quality and strength are impressive. The frame includes diagonal struts to keep it rigid, and twin rams on each wing when most other machines have one. The rear scrapers are on quick release clips rather than welded, so we can remove them if we don't need them."

The front corner wheels play an important role as – in combination with the staggered arrangement of the rear roller – they keep the entire machine running level and working to a consistent depth, says Stuart.

"We like the discs, which have a fluted blade with a serrated edge. The flutes continue towards the centre of the blade, so they should retain an effective cultivating and mixing action even

when worn, which conventional notched discs do not.

"The fact that it is also more reasonable to re-blade could be significant bearing in mind the abrasiveness and high stone content of some of our soils.

"This spring we used it to work down over-wintered ploughing, and after a couple of passes it produced an ideal seed-bed, even though the ploughing had not weathered as much as we had expected because we didn't have any real frosts last winter".

The machine's first outing during summer 2014 highlighted its effectiveness and economy of use, says Stuart.

"We used it to cultivate land coming out of set-aside, doing two or three passes with the discs set to work about two inches deep, and it proved the ideal tool for chopping into the vegetation on this and mixing it into the soil.

"But its first job was to go through 225 acres (90ha) of oilseed rape stubbles, and it did an excellent job of chopping and mixing the residues into the ground up to an inch deep.

"With a 5m machine working behind our 170hp John Deere 6170R, we averaged 9.4mph (15km/hr) over that area, so we the machine covering 5m in a pass we achieved a workrate of almost 18ac/hr (7.3ha/hr) and used a total of 448 litres of diesel in the process, which works out at less than two litres/acre (5.0 l/ha). It takes a little more fuel when working on ploughing, and when working on some of the steep banks we have, but that's to be expected."

"Hopefully, with the new system we will see improved results in weed levels over the long term, particularly with the sterile brome."

Increasing significance of cover crops

Cover crops, often sown to provide game bird and wildlife habitats, are increasingly seen as having a much wider place on arable farms, Andrew Blake discovers

Until quite recently, over-winter cover crops within arable rotations have had two main roles – boosting soil organic matter levels and soaking up nutrients which other might otherwise be leached from bare land.

Now, however, they are seen as offering several other benefits, not least in countering burgeoning blackgrass infestations.

There are plenty of opportunities for cover crops, and Paul Brown of Frontier Agriculture and Kings believes they can help address the apparent plateauing of wheat and oilseed rape yields.

Average wheat yield has plateaued

Despite the use of improved varieties and pesticides, average wheat output – about 8t/ha in 2002 – had fallen below 7t/ha by 2012, and rose only slightly above 8t/ha last harvest, he notes.

“I firmly believe that many soils are in poor health, in other words not as biologically active as they should be, and are badly structured. Introducing cover crops carefully into the rotation can help overcome this.



“Well managed and biologically active soils are fundamental to profitable farming.”
Paul Brown Frontier Agriculture and Kings

Mr Brown highlights the importance of capturing nutrients left over from previous crops,

especially nitrogen at risk of leaching.

At best only 70% of nitrogen fertilizer applied to cereals is used by the crop, and on medium and clay soils as much as 40% may remain unused after harvest, he points out.

Lower than optimum yields, manure applications and warm autumns which increase mineralisation in the soil all potentially raise the amount of nitrogen available for cover crops to capture.

The company's monitoring on six heavy land sites in Bedfordshire found that the average loss in 2013 between September and the end of the year was 57kg N/ha – a year earlier over the same period it was as high as 78kg N/ha.

Mr Brown points to a University of East Anglia snap-shot of field drain outfalls. It found that between October and December 2013 the mean nitrogen loss to the drain water was about 18mg/litre where the land was ploughed and left unsown or drilled with winter wheat, but averaged only 2.6mg/litre where an oil radish cover crop had been sown.

“Essentially it showed that bare land loses nitrogen at five times the rate as cover cropped land.

“A lot of that nitrogen has been paid for,” he stresses. “Many growers don't realise how ‘leaky’ nitrogen is in the soil and how inefficient most cereals are at capturing and using it. The case for cover crops suddenly becomes more viable when growers realise how much nitrogen is potentially being lost through their water systems.”

Kings is running a series of trials to assess how much nitrogen various cover crops may capture, and the results in table A are typical, he says.

Cover crops improve soil fertility by adding organic matter and opening them up via their different root lengths, Mr Brown explains. "They also help remove excess water and give growers the opportunity to review their spring cultivations."

Improved soil structure

"The improvement in soil structure and tilth allows them to reconsider various spring drilling techniques, especially direct drilling with a disc drill."

Weed reduction

Much more work is required to understand the weed reduction



1. The result from a typical cover crop mixture used by some Kings growers. "Autumn sown it includes two types of radish, phacelia, vetch, oats and rye."

properties of cover crops, but results so far are promising, says Mr Brown.

"We've seen some very significant reductions in blackgrass from some cover crops, and we have several trials to tease out what's happening."

Table B shows the January assessed impact of various cover crops (and bare land and wheat) on blackgrass plant populations which were all similar at the start of the firm's replicated trial in October.

"During November and December we saw the blackgrass die in some cover crops. This needs further work,

but we think it's linked to both competition and allelopathy," says Mr Brown.

"Some cover crops, mustard and radish for example, are known to reduce soil nematode levels.

"The important point to remember is that there are wide differences between individual varieties within a species. There may be 20 varieties of mustard available but they're not all the same in their effects."

Cover crops, including trials for using herbicides on them, are a key part of Agrovista and Bayer CropScience's Project Lamport which is exploring new ways to control blackgrass.



2. The heavy biomass crop killed off by glyphosate four weeks earlier



3. Enabling spring barley to be drilled directly on 15 March.



4. The Propino spring barley on 8 May which went on to yield 9.3t/ha.

Blackgrass control is key cover crops target

Agrovista's Chris Martin believes the key to using cover crops effectively is to choose the most appropriate mix for the specific purpose, be it soil conditioning, nutrient trapping, fumigation to tackle soil pests, or weed suppression.

"There's certainly no one mix available which suits all needs," he stresses.

"We're looking at a wide range of cover crops to satisfy each and all of these purposes throughout the UK, but I think our most innovative work is where we are using specific covers to help control resistant blackgrass and ryegrass."

Table A - Cover Crop Performance

Crop	Fresh weight t/ha	Dry weight t/ha	%N	Total N kg/ha
Oil Radish	24.7	2.7	4.3	115
Winter Turnip Rape	19.5	2.8	3.1	88
Mustard	16.7	2.3	3.1	72
Vetch/rye	19.5	2.2	2.7	60
Kings Vitality mix	22.1	2.6	2.5	67
Kings Structure mix	20.6	3.5	2.0	72

Source: Kings trial Autumn 2014 Essex – Above ground harvest 18th December

Table B - Impact on blackgrass population

Crop	Fresh weight t/ha	DM t/ha	%N	Nitrogen kg/ha	Potash kg/ha	Blackgrass plants/sq m
Siletina Radish	39.8	4.93	4.6	227	204	4
Defender Radish	31.5	3.02	4.8	147	171	0
Mustard	33.6	6.72	3.52	236	212	103
Winter Turnip Rape	26.9	3.55	3.35	119	163	0
Strigosa Oat	11.4	2.34	2.84	66	62	202
Bare land	4.7	1.45	2.44	35	23	268
Wheat	6.6	1.63	2.9	47	38	504

Source: Kings 3D site, Alford, Lincs 15th January

Theory suggests that a black oat and vetch mix should provide several benefits, he says.

"Firstly we're looking to condition and dry out the soil to introduce drilling windows after the peak blackgrass germination period."

This should allow autumn crops to be sown later or enable spring crops to be sown on

heavy land where neither activity would usually be possible, he explains.

Encourage germination

"The idea is to encourage as much blackgrass to germinate amongst the cover crop as possible."

Mr Martin points out that the approach differs from others

where cover crops are intended to compete with or smother blackgrass, and it has given promising results.

"In establishing the cover crop we employ vigorous cultivation to encourage blackgrass germination. Everyone knows that the biggest blackgrass flush occurs when we put the drill in the field regardless of stale seedbeds."

Cover crop establishment best practice

Sow as soon as possible after harvest

Use minimal cultivations

Direct drilling is ideal

Consider seed-bed starter fertiliser

Monitor slugs and flea beetles

Use high seed rates

Aim to maximise crop biomass

"The black oat and vetch mix is also slow to colonise the ground which allows a good blackgrass flush.

"Once the cover crop is established, its massive root structure allows further light cultivation, using a straw rake for example, to encourage a further blackgrass strike."

Before drilling the late autumn or spring crop, a split glyphosate application is employed. The first destroys the cover crop, and the second, ten days later, ensures that any shaded blackgrass is killed, he explains.

Direct drill

"We then drill straight into the cover crop using a disc couler drill with as little disturbance of the soil as possible to avoid setting off another flush of blackgrass.

"We've successfully used several drills to achieve this including direct drills such as the Great Plains Spartan and the Moore Uni. We're also working

this season with strip till drills such as the Claydon.

"We're also trying cultivator drills, such as the Vaderstad Rapid, getting lower soil disturbance by lifting the cultivation elements out of the



"The theory is that we have used sun-powered roots from the cover crops to do our deeper cultivations and structure the soil." Chris Martin, Agrovista

ground, and using just the disc coulters.

"Last year's results demonstrated a dramatic reduction in blackgrass numbers in the following crop without using herbicides."

Spring wheat plots after fallowing and several stale seedbeds throughout the autumn and winter ended up with 55 blackgrass heads/sq m at harvest, he notes.

"This was still a great reduction on the neighbouring winter wheat plots which despite having received an extremely robust herbicide programme often still had several hundred blackgrass heads per square metre at harvest.

"However, the spring wheat following the black oat and vetch cover crop had less than two blackgrass heads per square metre at harvest and yielded an impressive 8.6t/ha."

A free online e-learning course*

on cover crops, sponsored by Kellogg's, has recently been released by NIAB through Artis, notes NIAB TAG's head of agronomy Ron Stobart.

"Cover cropping in arable systems is a three module course offering guidance to improve the effectiveness of your cover cropping strategies," he says.

"It aims to provide advice on the skills required to deploy cover crops on-farm using the best agronomic strategies."

Mr Stobart says users

completing the course will be better equipped to:

- Understand how cover crops deliver benefits to soils, crop management and the environment
- Choose the correct cover crop for a particular purpose
- Improve the effectiveness of cover cropping strategies

Up to five BASIS and two NRoSO points are available for completing all modules.

*www.artistraining.com/e-learning

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Trials aim to break OSR yield plateau

Groundbreaking trials being carried out by Agrovista to optimise oilseed rape establishment could help growers break through a 25-year yield plateau. Tillage magazine investigates.

Oilseed rape yields on farm have barely increased over the past quarter century and currently average just over 3t/ha. However, the crop can produce well over double that in trials and is theoretically capable of yielding over 10t/ha, says Agrovista technical manager Chris Martin.

He believes poor establishment is one of the key reasons why the crop is not achieving anywhere near its potential. "There are a lot of agronomic improvements that could be made, but better establishment could cover a lot of the yield gap."

Optimum canopy

"By getting the right plant population from the outset we stand a much better chance of achieving the optimum canopy toward the end of flowering, which is the crucial period when seed is set."

He speaks for a wealth of experience. OSR establishment

has been at the heart of Agrovista's Growcrop Gold trials, carried out over a range of sites across the UK over the past six years.

"Highest yields have tended to be achieved with lower seed rates on good seedbeds with adequate moisture, giving evenly established low plant populations in the autumn," says Mr Martin.

Growers need to think in terms of seeds per row, rather than seeds/m², especially as they move to wider rows, he explains.

Precision drilling

"We have seen some massive differences over the years, the most dramatic being when we started out looking at a little precision plot drill 10 years ago. We achieved 0.5t/ha extra yield in that first season over any other establishment technique."

"We've continued to go down this precision-sowing route while removing compaction to ensure there are no restrictions

to root development, allowing season-long moisture and nutrient availability. It's where we need to be to get to the next yield level."

This is particularly the case with wide-row crops, where competition between OSR plants in the same row appears to be more important than between rows, Mr Martin points out.

"We now know from our Growcrop Gold results that the highest yields have typically been achieved sowing 15-20 seeds per m of row to produce 12-15 plants."

Lower seed rates have achieved higher yields in trial, but are not robust enough for practical situations, he adds.

In row competition

"More than 12-15 plants tends to create too much early competition – plants fight for light and this reduces establishment, and remaining plants can tend to grow tall and spindly. We want to

Companion plants

Sowing companion plants alongside oilseed rape crop can deliver significant yield benefits on crops planted at optimal wide-row rates of 15 seeds/m of row.

Mixtures of Berseem clover and vetch typically increase OSR root mass by up to 20%, producing more robust plants going into the winter, says Mr Martin. In addition these species mop up nitrogen that would otherwise be lost, releasing it back into the soil in the spring after they die off. "The varieties have very low carbon:nitrogen ratios so they drip feed nitrogen back when the crop requires it," he explains.

"Companion crops also help suppress weeds, improve soil structure and soil organic matter and help reduce damage from pests like slugs. Evidence from the Continent suggests they can reduce cabbage stem flea beetle, though this has yet to be proven in the UK," he adds.

"Overall results do look very impressive. Cover crops typically produce yield responses of 0.33-0.5t/ha over the two years we've been studying them. Our trials

encourage a more natural prostrate plant structure that branches from the bottom."

As a rule of thumb, 40-60 seeds/m² is fine for conventional drilling at 12.5-25cm spacing where normal establishment is expected. But at 50 cm row spacing, 60 seeds/m² would result in 30 seeds/m of row length, twice the number actually required, he notes.

"Growers should decrease seed rates when they move to wider rows," says Mr Martin. "But some actually raise the rate when sub-casting to compensate for the fact



OSR plants drilled with Great Plains 00 planter alone

show companion plants have no adverse effect on establishment and often improve it."

Companion plants are sown at the same time and can even be mixed in with the OSR. They then grow alongside the OSR harvesting sunlight, which would otherwise be wasted, converting it into organic matter.

The Berseem clover dies off during the winter, even when frosts are scarce. Vetch takes a bit more killing – a run of hard frosts will do the job but it may



Great Plains 00 Planter + berseem clover/common vetch companion crop (5kg/ha) banded in row

need a dose of clopyralid to finish it off in warmer winters, he adds.

"Berseem clover is an amazing plant – its tap root goes straight down, no matter how tough the soil. They act as pathfinders for OSR roots and help drain water away from the crop rooting zone."

The vetch creates more biomass, which provides additional root exploration capacity for the crop, he adds. "Overall this gives a 20% increase in root weight, which translates into additional yield as well."

plant canopies that benefit – growers' pockets will too, says Mr Martin.

"As plant breeding improves more traits will be introduced into seeds, which will become more expensive. Seed dressings will cost more too, so we need to create the perfect environment for every seed to give confidence to cut rates."

Results to date show there is often no significant difference between drills tested so far, provided steps are taken to alleviate any compaction where needed.

The OSR drill line up

This year, the attention is focusing even more on precision drilling and the best way forward in practical terms on farm, says Mr Martin. “We know the spatial arrangement required to optimise canopy structure, and we now want to find better ways of delivering that.” There are six drills on test this year, including two newcomers – the Great Plains 00 Planter and the Vaderstad Tempo.

Amazone EDX



This is essentially a precision maize drill set up at 50cm row spacings, sowing a seed every 6.6cm, exactly 15 per metre of row, which equates to 30 seeds/m². “It is the ultimate in precision drilling,” says Mr Martin. “However, it does not cultivate the soil so we need to find some way of relieving compaction beforehand.”

“This year we are looking at strip tilling ahead of the drill, using GPS so that the coulter places the seed along the exact same line that has been cultivated.”

The aim is to only go as deep as necessary, as with any operation aimed at opening up compacted soils, he explains. “We want to lift the compacted area – going too deep will only squeeze it.”

Vaderstad Spirit C Strip drill



This is probably the most practical type of drill for farmers in the trial, says Mr Martin. “It sows OSR seed 33cm apart, which we think is the ideal spacing – 15 seeds/m of row equates to 45 seeds/m². And, by altering the coulter system, you can use it for cereals at 17.5cm.”

This means farmers don’t need access to a specialist drill to optimise OSR establishment, he adds. “However, it does not go very deep so it needs some prior cultivation where deep compaction is a problem.”

Vaderstad Tempo



Another premium precision drill from the Swedish manufacturer, the Tempo is primarily designed for maize and will help benchmark the performance of other drills in the trials.

“It is the complete precision drill, and we are using it to obtain perfect distribution to assess any benefits this may bring,” says Mr Martin. The version being used in the trials has 40cm row widths, whereby 15 seeds/m of row equates to 37 seeds/m².

Vaderstad Topdown with following coulters



This arrangement has been used for several years and continues due to the popularity of such systems in farms. Seed is sown via following coulters carried behind the machine in 25cm bands behind the tines. Sowing 15 seeds/m row length equates to 60 seeds/m², the upper end of the range. Reducing this to 10 seeds has had no detrimental effect on yield in trials, Mr Martin points out.

Great Plains 00 Planter



This uses a subsoiler type approach, and allows accurate seed spacing and depth placement in two rows at 20cm spacing (10cm either side of the tines). “The tines are fitted at 58cm centres. With 15 seeds/m of twin row length, equating to 28 seeds/m², this provides an excellent spread of seed, whilst maximising seeds in the good rooting zone,” says Mr Martin.

Establishment is further enhanced by a bespoke spaced roller, which consolidates only 280mm behind each tine. Soil between tines is left untouched.

Great Plains YP drill



The YP (Yield Pro) drill uses a similar concept to the 00, precision-sowing seed either side of low-disturbance legs carried in front of the drill. However, seeds are placed in a zigzag pattern about 10-15cm either side of a low disturbance tine with centres around 76 cm. “This allows more seeds to benefit from the leg without increasing competition in the row,” he notes.

Trials results

Morley 2013/14

Technique	Row spacing (cm)	Seeds/m ²	Seeds/m row	Fresh green matter (t/ha) 26 Nov	Fresh green matter (t/ha) 15 Mar	Yield t/ha
Great Plains YP planter	Twin rows (20cm centres) with side of 76.2m leg	20	7.5	14.8	13.5	4.78
		30	11	15.3	12.7	4.91
		40	15	12.1	8.3	4.84
Vaderstad Topdown + coulters	25	30	7.5	15.7	10.3	4.7
		40	10	13.2	15.0	4.55
		60	15	13.3	12.4	4.66
Amazone EDX precision drill	50	30	15	14.0	10.9	4.47
		40	20	15.2	11.7	4.58

Site drilled 15 August 2013; variety Harper

Brechin 2013/14

Technique	Row spacing (cm)	Seeds/m ²	Seeds/m row	Green area index 31 Oct	Green area index 14 Mar	Yield t/ha
Great Plains Simba DTX	55	40	22	1.19	0.75	5.33
	55	28	15	0.79	0.57	5.50
Vaderstad Spirit	33.4	45	15	1.52	0.64	6.00
	167	90	15	1.46	0.76	5.67
	167	45	7.5	1.22	0.72	5.83

Site drilled 22 August 2013; variety Harper

"There has been little to choose between the drills so far, on visual assessment at least, says Mr Martin. "Establishment has generally been very good – certainly all look to have fantastic population counts. This is where we need to be – they all produced the type of

stand we were looking for."

However, one-pass systems can save precious time during such a busy period, can also save labour, fuel and machinery costs and can be achieved with no detriment to yield, he notes.

"The truth is growers can make most of these machines work, provided they are set up right,"

says Mr Martin. "We now have establishment methods that perform well from year to year across a variety of different soils.

"I would urge growers to come along to one of our Growcrop Gold open days to talk things through – it could be a big step towards breaking through their own yield plateau."

Establishment methods at 2014-15 Growcrop Gold sites

Site	Great Plains	Vaderstad	Amazone
Morley	00	Tempo	
Croft	00		Spirit EDX
Doncaster	00	YP	Spirit EDX +/- strip till
Hanchurch	00		Spirit
Berwick	00		Spirit
Stoughton	00		
Suffolk			
Cirencester		Tempo Topdown	

Results from Morley and Brechin last year (see tables) are typical when establishment is good, says Mr Martin.

"Morley was favoured by adequate soil moisture and the mild autumn/winter. Establishment method had a big impact, with a strong trend for deeper working implements to result in plants with bigger roots," he notes.

Differences between treatments were smaller than expected but confirmed the strong trend from previous seasons that lower-than-normal seed rates tend to produce higher yields. "The Great Plains YP plots yielded slightly more than the Topdown plots, which in turn yielded more than the Amazone EDX plots – this may be related to working depth

and consequent crop rooting differences."

At Brechin, initial growth was slow but did not reduce establishment – plots drilled with the Vaderstad Spirit showed

significantly improved establishment. Highest yields came from wider spacings at 15 seeds/row m, tying in with previous Growcrop Gold results, says Mr Martin.

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Amazone gears up new products for Cereals 2015



Certos heavy compact disc harrow

Changing rotations, with cover and catch crops now becoming more prevalent as well as maize stubbles leftover from AD plants, means that there is an increasing demand to incorporate higher levels of organic matter at a relatively shallow depth.

The need still exists to minimise any deep-down disturbance that may end up promoting grass weed problems and the new Certos heavy compact disc harrow, available in working widths of 4.0, 5.0, 6.0 and 7.0 metres, comes into the range alongside the existing Catros and the Catros+ compact disc harrows which are designed

with shallower work in mind.

The Certos, with its 660 mm diameter scalloped discs, staggered with an offset of 350mm, offers an angle of attack of 22° in the first row and 17° in the second to ensure a very aggressive operation, an intensive mixing and a good penetration force into the soil. In this way, even on soils with plenty of surface organic matter, an intensive mixing operation is possible.

The integrated centre running gear, equipped with 550/45-22.5 or 400/60-22.5 tyres ensures an excellent manoeuvrability of the machine, both in the field and on

the road. The position of the running gear guarantees good weight distribution and allows the use of any of AMAZONE's following rollers – this means the most suitable roller depending on the soil conditions can be utilised. When equipped with an air braking system, it is approved for speeds of up to 40 km/h allowing for quick road transport.

Depth control is carried out via a combination of the rear consolidation roller and the front guide wheels and is adjusted hydraulically, on the move, from the tractor seat. An optional Crushboard can run in front of the discs to level ploughing ahead of the cultivation discs.

Fitted to the 5.0 metre Certos 5001-2TX model which will be on show at Cereals will be the new Matrix 650 KW M wedge ring roller with its ultra-large diameter cleated rubber rings that offer a high degree of targeted consolidation and crumbling as well as an improved self-driving ability to help reduce the level of horsepower needed in the field.

The GreenDrill 500 catch crop seeder box will also feature strongly on the Certos as the machine is ideal for sowing intermediate crops following the combine for encouraging blackgrass germination pre-autumn drilling as well as helping with 'greening' options for cover crops through to the spring.

Dal-bo attacks blackgrass

Dal-bo will be showing for the first time in the UK its new Maxiroll with front harrow sections at Cereals 2015. Based on the standard 6m and 8m Maxiroll frame it has been designed to optimise the germination of blackgrass. Dal-bo states it is very important to work as close as possible behind the combine to create a shallow seed bed, mixing the soil with the blackgrass seed, then consolidate it by rolling.

The Maxiroll consists of a tine frame mounted at the front of the roll with 4 rows of 16mm tines and independent depth wheels followed by either

Cambridge/Breaker, Crosskill or Cross Combi roll choices.

While rolls have always been used for consolidation after drilling to ensure good seed/soil contact, increasingly, with the addition of cracker boards, rolls are now being used as an aid to seed bed preparation.

Dal-Bo will also be showing for the first time a 12m Maxiroll with crackerboards combining the features of a 12.5ton roll with the additional benefits of a front mounted, hydraulically adjusted, soil working cracker board which increases the overall weight to 13.7 tons.

Flexible Horsch Joker RT and new coulters at Cereals 2015



Horsch will be displaying the recently launched Joker RT with levelling board and new TurboDisc seed coulters will also be on display.

The 6m or 8m Joker RT features a hydraulically operated levelling board to enable stubble and ploughed land to be cultivated with the same machine.

The Joker RT features a longer frame to provide room for a double packer while more space behind the cultivation discs provides more time for the soil to settle. The transport wheels have been moved from

the rear to the centre for a more balanced machine when moving on the road.

TurboDisc seed coulters

A new TurboDisc seed coulters has been developed for all seed drills with a double disc coulters. Key features of the new coulters design are the development of a new curved seed tube and a shallower angle of the Uniformer to reduce the drop angle of the seed. This results in a smoother and more accurate seed placement and more even seed germination.

The improved design also allows impact forces to be distributed more evenly. In addition, the press wheel tyre is now softer and has a larger diameter, which prevents soil from sticking to the press wheel. The new scraper is slightly inclined and can be adjusted quickly and easily.

Kuhn Min-till drill - faster drilling with lower power



This year's Cereals event will be the official launch of a new 6m minimum-tillage drill that's capable of being pulled by a 200hp tractor and drilling accurately at forward working speeds up to 17km/hr.

"Forward operating speed is a key priority when drilling, to ensure all crops are sown in a timely fashion while making the best use of optimum conditions," Kuhn UK sales manager, Duncan McLeish, said. "But this speed should never be at the expense of accuracy. Nor should it compromise overall operational efficiency, which means horsepower requirements should also be a consideration."

Kuhn's new Espro minimum tillage drill has a 6m working width and has been designed with an equal focus on three key aspects of the drilling process: speed, accuracy and efficiency. The new machine uses the best of Kuhn's existing seed drilling technologies and expertise as well as a selection of innovative design elements.

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Michelin unveils innovative concept tyre

Farmers of the future could be specifying tyres with original tread patterns, following the unveiling of what might become the next generation of agricultural tyres from Michelin.

The LIFE BIB VF 710/70 R42 concept tyre stands out for featuring a tyre pattern in the shape of an ear of wheat, presenting an alternative to the traditional V-shaped or herringbone-shaped tread which is familiar on farm machinery all over the world.

Drawing its inspiration from nature, the tyre's unique tread pattern is a celebration of the life cycle, and emphasises how the Michelin Ultraflex range can be used throughout the entire crop cycle, from the sowing to the harvesting of the product.



The wheat concept features a central rigid rubber block formed by the wheat grains, as well as side tapering for maximum precision, guidance and traction.

Mike Lawton, Commercial Director of Michelin's agricultural tyre division in the UK, Ireland and Nordics says: "Changing needs, practices and uses push us to continually innovate. Farmers of the future face the substantial challenge of feeding ever increasing populations with less arable land available to them. As a result, tyre and machinery choice is going to become ever more important in order to maximise yield.

"Michelin researchers are exploring all avenues to develop the tyres of the future; this latest concept is evidence of this work in practice."

The new concept tyre has been developed as part of Michelin's annual investment of more than €600 million in research and development.



Kubota First Choice for Ploughing Champion



Doncaster-based farmer, Mick Chappell has been ploughing since the tender age of ten. Born into a farming family, Mick followed in the footsteps of his father and grandfather – both former British ploughing champions – completing on both the national and international stage.

In September this year, Mick will go toe-to-toe with the best in the land in his bid to reclaim the crown of British Champion when he competes in the 65th British National Ploughing Championships. A runner up in 2014, Mick hopes to go one better this year and once again scoop the coveted ploughing title; following in the long family tradition.

2015 has already got off to a good start for Mick, winning the South Yorkshire Charity Ploughing Match and

coming runner up in the Thorne Ploughing Match.

Last year, Mick decided to upgrade the kit he uses for events, moving over to a Kubota M60 Series tractor, a machine he felt was better equipped to compete with the best in the field. The move to using the Japanese manufacturer has so far been a huge success; so much so, Kubota has supplied kit again this year as part of Mick's year-long fixture of events.

"When you're ploughing, good vision out of the cab is crucial, and Kubota's M60 Series tractors are the perfect balance of excellent vision, compact size and power. To date I've used a Kubota M8560, a tractor that impressed me with when I first tested it at my local dealer, Farmstar of Doncaster.



This autumn we consider how to repair damaged soils, alongside an in depth look at Rubber track developments with new ways of repairing, renewing and retrofitting track drive units.

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- All moving parts integrated into the beam.



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