

ISSUE 18 | JULY 2022

DIRECT DRILLER

MAGAZINE

THE FUTURE OF YOUR SOILS

Predicting Harvest 2022

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DIRECT DRILLER

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INTRODUCTION

MIKE DONOVAN, EDITOR

There's quiet confidence in farming at present, and it looks like there will be more money than normal available for investment. Andersons 'Loam Farm', their virtual 600ha of combinable crops, is forecast to have a business surplus of £840/ha (on an output value of £1966/ha) this year compared with £573 in 2021 - but their forecast figure drops to just £161 in 2023. In addition there is money from the Farming Investment Fund - three farmers at Cereals told me they had secured funding - two for drills and one for a shallow cultivator.

The question is whether to use the available cash and/or £25k grant to buy a better machine than you had budgeted for, or use the fund money to take the sting out of the purchase. Pub talk suggests that, when it comes to equipment, the adage "you get what you pay for" applies to complexity rather than reliability, which is of-course the

one thing which everyone needs.

Not too many farmers calculate and add up the cost of breakdowns, and if they did I think there would be much greater emphasis on pre-season preparation. Doing the preparation job properly means replacing parts such as belts and bearings which are still performing as they should, as well as buying in spares of those liable to pack up. Spares are expensive and there's a temptation to restrict the pre-season to a oil and filters, worn belts and rumbling bearings, and hope it holds together. Chats with dealers and farmers with the same machines can help list the 'at-risk' components. This where forums such as thefarmingforum.co.uk can be so valuable.

Not many farmers would go to the extreme of giving their worn out drill - a Vadersatad 30S - a complete dismantle, repair, paint and rebuild like Jamie

Hawkins did last winter. I featured the job in Farm Ideas issue #120. The full refurb cost less than £10k and Jamies knows the 30S suits his existing tractor and field topography - being mounted it goes across slopes better than trailed drills.

The record business surplus predicted comes at an uncertain time. The Ukraine cereal prices are a market aberration (those millions in desperate need of food may describe it differently) which is likely to settle. Farmers across the globe have an amazing ability to respond to change, and in the fullness of time the situation will stabilise. Meanwhile good wishes and good health to all our readers.



THE PROBLEM WITH VEGANS

CHRIS FELLOWS

Getting a confession out the way. About a third of my meals are 100% vegan. But in balance, an evening dinner rarely doesn't contain meat. I like to think this is normal. Nutritionally balanced. A healthy diet, that supports a healthy farming ecosystem of arable and livestock. What's not to like about that?

Well, everything if you are vegan. My diet is completely unacceptable. I am uncaring, without empathy, blah, blah. This labelling tends to push me towards believing that outspoken vegans are nutters, who just like the sound of their own voices. But this is really the problem with vegans:

They only care about life above the ground. Sheep matter, worms don't. Cows matter, soil microbiology doesn't. Pigs matter, organic matter doesn't

This being a solid health magazine first and foremost, you can see where I am going. Grazed land has some of the best soil microbiology. "The golden hoof" has been written about many times in these pages. Farmers look to bring in as much manure as possible, as with it comes the biology needed to grow healthy, nutritious and sustainable food. Livestock are an essential part.

Yet vegans are usually oblivious to this argument. Because what goes on below ground doesn't seem to matter to them. Fields of soy / corn rotations are what's needed to save the planet. Grown with lots of herbicides and synthetic fertiliser in soils that have lost all their fertility. That is how to get to net-zero. Despite the glaring issue of it not being sustainable or closed loop or near to net-zero.

Soil isn't sexy, it's hidden away, out of sight. It's hard to understand the massive impact of what below the ground can have in the world. But it is critical to the argument. Beans, rye, brassicas are all good to have in the rotation. These crops grown on regenerative farms should be the staple purchases for the like of Huel (the vegan health food). But many vegan food companies seem have little interest in regen ag. Unfortunately, being vegan is enough for them. However, their products could be even kinder to the planet if products were sourced from regen farms.

These companies should represent the main sales channels for regen farms - as their goals align with what we can deliver. However, that is not the case currently. But it should be our aim to supply them (at a premium).



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FEATURED FARMER

PHILIP ROWBOTTOM

Philip Rowbottom, is a 3rd generation farmer arable farmer from West Yorkshire.

Some of you may know him as @golfnshoot on Twitter, so it may not surprise you to learn he also owns Woolley Park Golf club and represents team GB in Clay shooting.

Here he explains his transition over to Direct Drilling from a conventional plough-based system and how he's already seeing the improvements across his farm.

"The farm covers around 500 acres just south of Wakefield. Today we farm 300 acres, with the golf course covering the remainder.

The diversification into the golf course was pivotal in how we farm today. Over breakfast one morning, way back in 1991, my father announced we should build a golf course. None of us played golf, or had any real interest in golf, but that's what we did and that's what we've done for the last 30 years. Built, operated and expanded the golf side of our business.

Sport has always been part of my life; I've always been competitive. I got involved with the local shooting club, mainly as a way to get away from the farm for a few hours. As I improved, it became more and more competitive and I've been very lucky to represent the country, shooting clays around the world.

The farm is still very much part of our business. Being right on the border of a livestock/arable region, we've traditionally sold all of our straw, it was becoming increasingly clear to me that our sandstone land needed something putting back. We needed to improve the organic matter, so we stopped selling it and began incorporating it.

The change of legislation around disposal of domestic garden waste opened up an opportunity to access compost locally. Over winters we were able to bring 2000-3000 tonnes of compost onto the farm, over a period of five to six years.

I knew we were beginning to see very subtle changes to our soils.

Our soils are incredibly abrasive, you go ploughing on the wrong day and you can see the metal wear. Watching how



the industry was changing, min- till, zero cultivation, changes in weather patterns, wet seasons, I knew we needed to do something different.

In 2020 I bought a subsoiler, we'd never had one on the farm, the wet autumn of 2019 and warm dry spring of 2020 baked our sandy soils, consequently, our wheat yields crumbled. We used the Phillip Watkins Tri-till to establish our oil seed rape crop in 2020, possibly our best yielding rape crop we've ever grown.

Subconsciously, I knew I was going to do something differently. Technology has moved on, watching the farming press for a couple of years Direct Drills have moved forward from the Bettison DD we had here 50 years ago, I looked at a few different options, and without having a demo I decide that the Opico Sky drill offered me everything I needed from a Direct Drill.

Aside from the benefits mentioned above another factor in the decision making was the looming reduction of the BPS payments, we've always done a bit of contracting, I saw an opportunity to be able to offer Direct Drilling service locally. It would be a way of filling that loss of the BPS, its first year has seen around 500 acres with the drill, the hope is to increase that acreage this autumn.

In two seasons we'd gone from plough-based crop establishment, to min- till with the Phillip Watkins Tri-till to having an 4M Opico Sky Drill on farm for autumn 2021 and growing cover crops!



I believe the transition across to Direct Drilling is something I've been working on for a number of years. By incorporating chopped straw and adding the compost, changing the soils structure has allowed me to take that step to go down the direct drill route. You often hear farmers say they've tried cover crops twice and they've failed, so it doesn't work, it won't in two years. It takes three to five years, it takes time and perseverance, finding the correct plants for your soils and not just planting one or two varieties either.

Between my agronomist and seed supplier, we decided that to grow a six-way cover crop, 40ha into rape stubble, including vetch, clover, radish, rye and phacelia.



Rye was a mistake, especially in milling wheat, I'll admit. I bottled it, I sprayed it all off, barring a couple of patches in different fields, cover crop varieties are something we need to look at differently this year

Slugs were a bigger problem than we've experienced on this farm before, yes we maybe should have put slug pellets on at the time of drilling, the Sky drill is all set up to do that, but I'm pretty certain it's down to the mat of chopped straw, which in previous years would have been moved or buried mechanically, I went straight in with the drill.

I've invested in a 2nd hand straw rake for this year to see what difference that makes, I'm very happy to admit that I'm still learning, it's still a bit of a journey of discovery!

We compromised the farm's rotation when we built the golf course, the rotation of rape, wheat, wheat is what we've grown

and will continue to do so moving forward, for the time being, while trying to improve the soil quality with cover crops and using the Direct Drill to establish our cash crops.

The farm is only part of my business and it needs to be easy to manage, the direct drill has already freed up time, reduced inputs, certainly on fuel costs, by as much as two thirds already. That is before you add in the wearing metal cost from previous systems and I believe we'll continue to see reduced costs as the soil health and organic matter improves.



It's very difficult to quantify, but I'm already starting to see a change to the ecology on the farm, as an SFI pilot farm, the first time we've ever entered into an environmental scheme, the wildlife on the farm seems to be increasing from not ploughing, from having green cover on fields between harvest and planting.

We're still learning, we tried broadcasting clover into a wheat crop, sadly it didn't grow, but we'll try again this autumn but with the drill as a companion crop.

So far, the results have been very encouraging, the crops look as well as they have ever done on the old system, the Skyfall wheat looks fantastic and the oilseed rape looks much better than I hoped it would be.

As ever in this job, the proof will be when it comes off the combine and over the weighbridge.

I look forward to updating you on how our first direct drilled harvest turns out later in the year."



WHAT'S YOUR COLOUR?

With three trade shows coming in quick succession this year, LAMMA, Cereals and Groundswell, the question of which colour you like your steel painted comes into focus once again.

Written by James Warne from Soil First Farming

Along with the rise of the Conservation Agriculture techniques being adopted on more and more farms across the UK, the choice of zero-till drills seems to grow day-by-day. Significant government support incentives also has an involvement in driving this growth, but without the most sensible outcomes. Machinery manufacturers are showing their ability to design ever more sophisticated machines, mostly based around a disc style opener. Machines are becoming every larger and heavier and demand a greater draft requirement. Very few tine-opener machines are available and are clearly not in favour, which needs to be addressed in our opinion.

As usual at this time of year, with wheat now full in ear across the country, the variation in crop establishment can now be seen. Consistent with the last few years a lot of thin zero-tilled crops are evident. The push for later and later drilling exacerbating this effect. This is the disc drill fallacy.



Typical disc drilled thin wheat crop

With many soils in the UK now very low in organic matter it has lost the glue which binds it together. Low organic matter soil has generally has poor structure, and tends to slump and compact easily. Without the glue

and the structure soil no longer has the porosity for air and water to move freely within it. In our maritime climate there are times when our soils have to cope with prolonged periods of excess water. A lot of focus is put into sorting out failing drainage systems. While this is important, if the soil porosity is not connected to the drains its largely irrelevant.

Too often we see soils which have slumped due to low organic matter, and excess water, being late drilled with a disc drill. More often than not these crops tend to come through the winter low in plant numbers and are unable to tiller adequately to compensate, resulting in thin crops now being visible.

Narrow knife style tine openers tend to operate better in the early years of zero-till on low OM soils. Tines will create a little tilth to improve seed to soil contact, whereas discs do not create any tilth. When the soil is moist a disc will actually smear the seed slot it creates further reducing drainage and restricting crop rooting. Seed slots created by disc drills in wet conditions may appear closed at the time of drilling but will open again as the soil dries in the spring exposing the root crown to the air.

With second cereals disc drills can also be problematic when drilling into chopped straw. Do not underestimate the effects of hair-pinning on the subsequent crop. Thin or small-eared second cereals seen now could be a result of the actions taken at drilling. It may not be the fault of a firm soil or lack of moisture or nutrition, it may simple by the wrong choice of drill for the situation.


Overcoming chemical imbalances within the soil can also help alleviate the effects of a soil with poor structure. The water retaining properties of magnesium are well understood.

Magnesium can hold onto 18 molecules of water when fully hydrated. Magnesium also has a relatively large charge density compared to other common soil elements like calcium so water has a greater attraction to magnesium. This tends to keep soils wetter and then dry rapidly, giving greater shrinkage when it finally dries. This shows when the slots open as the soil surface dries as mentioned above. It can also help with structure and porosity improving water movement and infiltration. Understanding how the magnesium and calcium balance is affecting your soil can lead to better decision making around drilling and crop establishment.



Typical slot opening in spring on moderate magnesium soil

In our opinion a tine drill is critical for success in the early years of zero-till. Simple, uncomplicated, low draft requirement tine drills can have a very big impact on the success of zero-till adoption in the UK. The choice of disc versus tine drill at the point of drilling is a critical control point many growers are overlooking. Simple tine drills give great opportunities and low draft requirements even with large output potential.



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ANDY HOWARD



From Drought to Deluge

I am sitting here today (May 24th) listening to Thunderstorms outside. In the last 6 days we have had around 50ml of rain which has been very appreciated. This time last week it was 26 degrees, and the crops were wilting and looking very drought stressed, amazing the difference a week makes. It can stop raining now though!!

Last week I started "Operation Zero Tolerance" for Blackgrass. Apart from a couple of fields our BG levels are fairly low, but for the levels to remain low, I believe the only way forward for us is to not let any plants go to seed. It is a lot of arduous work, which I do not really enjoy but it has been very satisfying to see certain fields that were once a bit of an issue in the past, now have such low levels. There are a couple of benefits spending lots of time out in the fields. Firstly, it gives you time to think and reflect on what you have got right and wrong this year and then secondly, is that you get a chance to really inspect the wheat crops and notice things you would not from the sprayer. One thing that has been noticeable is that our wheat variety blend has coped better with the drought than the straight Crusoe (see picture). For this reason and the fact that Crusoe is so prone to Brown rust, it has made me think we should be using a variety blend instead of straight Crusoe going forward, let us see what the combine says first.

Talking of Brown Rust brings me onto another subject. At the beginning of the season, I was hoping that we could go all year without using fungicides, unfortunately I have not managed that feat. A couple of fields of Crusoe had brown rust fairly early, which we have had to treat. There is always a reason a plant gets disease and after a sap analysis we discovered that these fields had a shortage of Magnesium and Phosphate which allowed the rust to develop. I probably have not been tissue testing regularly enough this year and did not pick this deficiency up early enough, lesson learnt for next year.

This year we have been using Silica as a foliar nutrient and again we have learned lessons for next season. I was hoping



Silica would help us avoid the use fungicides but so far this has not been the case. I have seen silica suppress disease but not to cure it. It seems that once the disease is established in the crop, you must use fungicides. The silica is useful to keep disease out. Where we went wrong was not putting any silica down next to the seed with the drill last Autumn. Also, this spring, we started with the foliar Silica rates too low. Another point, if the rest of the plant nutrition is not balanced, you cannot expect the silica nutrition alone to keep disease out.

This spring I have been experimenting with low Nitrogen rates on wheat. One field has only had 70kg/ha/N of solid N and will end up with two foliar N sprays, so far you cannot tell the difference compared to the rest of our wheat and I am hoping the combine cannot tell the difference either, then I will not need to buy another load of overpriced fertiliser.

The spring crops have established well into what was mostly dust at the time. The Bean/OSR intercrop is coming together (see picture). I have failed several times with Spring OSR, but we changed the agronomy this year and it seems to have established better. The linseed with its' Oat companion is looking great. Finally, our lentil/camelina intercrop is just visible in the rows (see picture). I have never grown Camelina so this could be interesting!!

Hopefully, since this rain we can look forward to this harvest after a couple of difficult years. Long way to go yet though!



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MY NUFFIELD JOURNEY AND BEYOND

It's amazing how one book can change your life. For 2022 Nuffield Farming Scholar Emily Padfield, this one book was *For the Love of Soil* by Nicole Masters.

Many describe having their 'eureka' moment whilst undertaking their Nuffield Scholarship. Although I am only at the start of my Nuffield journey (having undertaken only a few visits). I believe my 'epiphany' occurred before I had applied for my Scholarship.

I was standing in the lambing shed in March 2021 (only just over a year ago), busily filling a syringe with Pen and Strep to inject all lambs at birth as we had had an outbreak of joint-ill in our early lambing bunch. I had also sourced a probiotic to then give to each lamb to replenish the gut bacteria I was busily killing with the injection.



At the same time, I was listening on Audible (other audio book providers are available) to 'For the Love of Soil' by Nicole Masters. The more I listened, the more I realised that what we were doing had some fundamental flaws.

To each problem in my life, whether it be animal or crop health, financial, emotional or human health related, I had always looked for a solution, a cure, a 'quick fix'.

What this book made me realise was that we were looking at everything the wrong way round. We needed to stop the problems happening in the first place, or at least understand why they were happening so we could try to prevent them happening at all.

From that moment on, my partner Mark (whose family farm we work together) and I started realising there was a different path we wanted to follow.

Never one to hang around (again one of my many flaws) I started to read everything I could about this 'new' way of doing things: Regenerative Farming. The more you read, the more you realise there is truth in the adage 'there's nothing new in farming'.

Mark started remembering methods and ways his grandfather had used, the number of species he had on the farm before policy and economics governed farms to specialise

and expand numbers to become more efficient and profitable. He also remembered the plenitude of life that coexisted here before the use of artificial inputs.

He recollected the masses of beetles and insects when combining in his old cab-less combine, seeing the grain teeming with life when unloading the auger. He recalled the health of the livestock without all the different products that are now sold to us at huge expense.

A NEW WAY OF THINKING

The first step we took on our journey was to get regenerative advisor and fellow Nuffield Scholar Ben Taylor-Davies to come and have a chat with us on the farm. We outlined what we wanted to achieve, and it seemed to fit with his way of thinking too. We dug holes, took in-depth soil samples, applied lime and gypsum and bought a sward lifter in a bid to get our compacted clay soils in better health.

We had re-introduced cattle five years ago by sourcing dairy beef heifers and steers, keeping the heifers we liked to establish a small suckler herd of 40 or so cows plus followers. Up until then, we had been purely sheep for several years, running 800 plus North Country Mule and Cheviot X ewes, lambing in late February indoors.

We are permanent stock fenced on most of our acreage and field sizes are between 20 to 40 acres. Mark has always loathed electric fencing, so this was a major concern for me as I knew getting involved in strip grazing could cause friction. Since our change in policy, I have since sourced some semi-permanent electric fencing from fellow regenerative grazier and Nuffield Scholar Alex Brewster at Powered Pasture and also invested in some geared reels for ease of subdividing fields into smaller paddocks.

Due to a bit of restructuring to allow Mark's sons some land to start their own businesses on, we reduced sheep numbers to around 450 ewes suit our acreage and started rotational grazing with both sheep and cattle, with regular, if not daily moves.





Emily Padfield

Our grass management fundamentally changed in this first year. No longer did we set-stock or consider short grazing the 'best' thing for sheep like we have for many years. We started to look at multi-species swards and planted our first true herbal ley (failing the first attempt, partly by drilling too early and also having an extremely dry spring).

Including chicory in pastures was nothing new on the farm, with Mark having re-established a grass ley with a herb rich ley

more than ten years ago.

I also undertook a Savory Institute Holistic Management Course through 3LM at the impressive FarmEd facility established by Cotswold Seeds founder Ian Wilkinson. Amongst many other things this helped me keep a 'holistic context' central to decision-making processes.



Early into my regenerative journey I found a small herd of crossbred goats, and later in the summer a good number of chickens. I now know you should never get these species without being fully ready and fenced for them, but you live and learn!

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Other changes in farm policy have included dropping fertiliser completely although I have to point out we applied very little to silage crops and we hope to at least reduce cattle housing this coming winter through bale grazing hay before having to bring animals in.

This year we also pushed lambing a bit later (partly due to my Nuffield Scholarship Conference being early March) and lambed much of our flock outside. We were lucky with the weather but have been extremely pleased with the results so far. I would be confident to say that unless weather turns

really ugly next lambing season we won't be bringing any sheep indoors from now on.

Rightly or wrongly this year we have direct-drilled our AB9 stewardship option, and although it's early days we couldn't have wished for better weather. We sprayed post drilling in a bid to get rid of the considerable thistle burden, and I wait with bated breath to see the outcome.

Often it's difficult to reason between traditionally conventional and regenerative methods and I have to admit to getting myself tied in knots over chemical or tillage use. But I do not think that's uncommon and there are many more established regenerative farmers struggling with the same dilemmas.

THE START OF MY NUFFIELD JOURNEY

Following encouragement from Ben Taylor-Davies, I decided to apply for a Nuffield Scholarship. I had been aware of Nuffield for many years, having worked as an agricultural journalist before meeting Mark and joining him on the farm. I had always held great reverence for anyone who had undertaken a scholarship, and I didn't expect to get through the selection process, so was ecstatic to be selected. Many Scholars talk about having 'imposter syndrome' and I am still very much still experiencing this, but the Nuffield family is such a tight-knit and welcoming one that we have a fantastic support group to rely on.

My topic is: The mob-grazed flerd: Improving soil, biodiversity and farm incomes. A 'flerd' is a mixture of species running together as one flock or herd. We haven't cracked it quite yet, although we are currently running sheep, cows and goats as one group. The chicken tractor is being built as we speak. I am hoping to visit farmers who are successfully grazing animals together like this, however I appreciate there are limitations so it's a question of whether it's even a good idea.

So far, I have travelled to Kansas to the No Till on the Plains



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WEEKLY DROP-IN SESSIONS

For those currently completing an application or whose wish to do so in the future, Charlotte will host weekly drop-in sessions from end of May through July.

While some are focused on certain aspects of applications and Scholarships, all will be open to general Q&A!

Referees	15 th May, 12pm
Your Video	1 st June, 6pm
Travel Timeline	8 th June, 12pm
GFPs	15 th June, 6pm
Training for Scholars	22 nd June, 12pm
Funding	29 th June, 6pm
General Q&A	6 th July, 6pm
General Q&A	12 th July, 6pm
General Q&A	20 th July, 12:30pm

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Conference (I urge you to attend if you haven't already), visited many mob-graziers in England and travelled the length of Scotland visiting like-minded livestock farmers.

I travel to Portugal in June and in October I, alongside a number of other Scholars, will visit the Savory Institute in Zimbabwe before heading to a number of ranches and facilities across the country before heading onto Zambia.

I am and will continue to be forever grateful for the wonderful opportunity that a Nuffield Farming Scholarship has given me to travel and learn how to be a better farmer. I am also passionate about communicating what I learn to others in the industry.

I hesitate to bang the 'regenerative farming' drum. I believe in all its concepts and realise it embodies so many aspects, but I am acutely aware that it is dangerous to create a 'them' and 'us' discourse amongst farmers. We are all striving for betterment together. I just want to be a good farmer. Good to our soil, our environment, our animals, our crops, our consumers and ourselves.

2023 NUFFIELD FARMING SCHOLARSHIPS

- Applications for 2023 Nuffield Farming Scholarships are now open online until 31 July 2022 and can be completed by visiting www.NuffieldScholar.org and clicking the "Apply" button.
- Nuffield are hosting a series of "open sessions" this summer for potential applicants to ask questions and get help to complete their applications.



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HOW NUTRIENT STATUS IMPACTS PLANT HEALTH

In the second part of *Direct Driller's* series exploring sap analysis, Mike Abram finds out about the science behind nutrient use in plants

Nutrients are vital for life but if they get out of balance it can cause either deficiencies or excesses that restrict plant productivity. Sap analysis is a tool to help growers understand the nutrient status of plants at the time of sampling and can highlight potential problems earlier than waiting for visual symptoms.

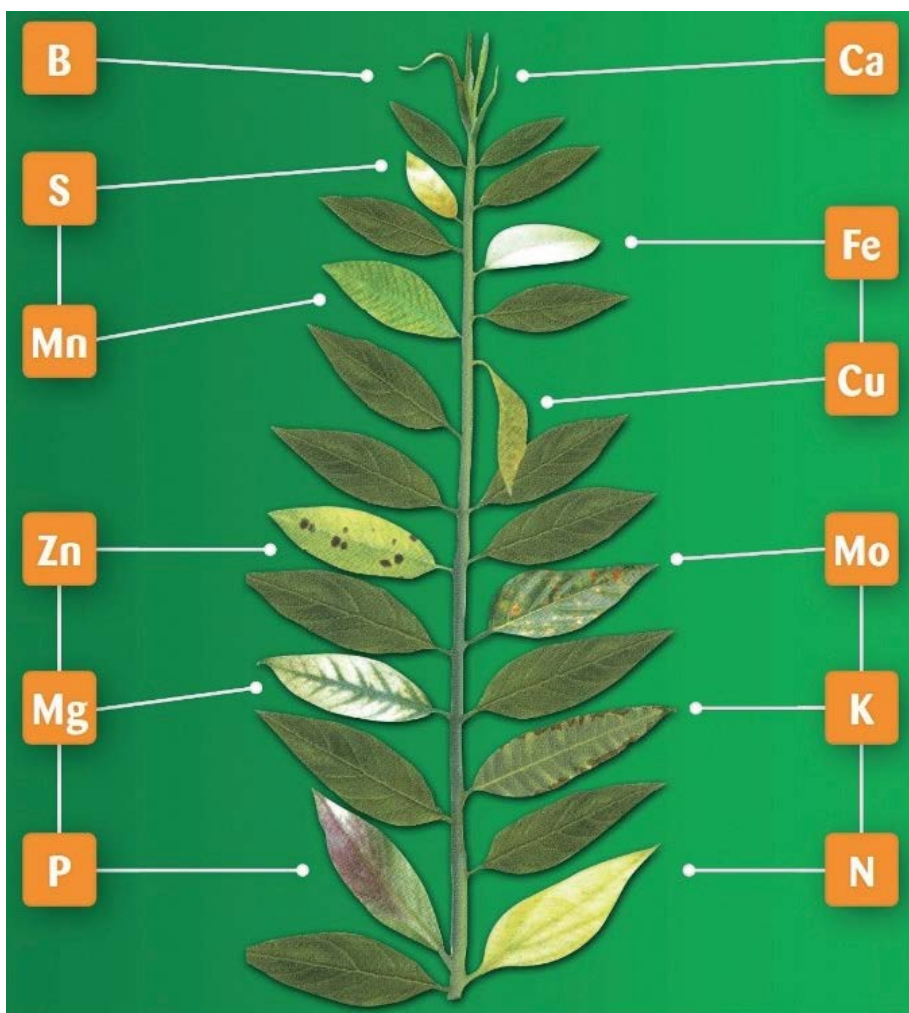
Understanding nutrient status requires knowledge of how mobile they are within the plant. One of the unique things about sap analysis developed by companies like NovaCropControl and more recently offered by Eurofins is that it compares sap from old and new leaves.

Once inside the plant nutrients are transported to where they are needed, typically the plant's growing point, explains Eric Hegger, a consultant with NovaCropControl.

But some elements in the plant are mobile, while others are immobile. The immobile ones get locked in place and do not move around, while the mobile ones can move from their original location in the plant to areas of greater demand – e.g.: the growing point.

That means deficiencies will show up first in different leaf layers depending on nutrient mobility, says Mr Hegger. "For the mobile elements, nitrogen, potassium, magnesium and phosphorus, deficiency will always show up first in the old leaves.

"At the moment there is not enough uptake of these elements, the young leaves will take them from the older parts. If you look at plant sap analysis in this case you will see that young leaves stay high enough, but the old leaves start to drop down, which



eventually gets to a deficiency level. Only analysing the middle or younger leaves means you won't see deficiency as quickly."

The opposite is true for immobile nutrients – deficiencies start to show up first in younger leaves as the plant can't remobilise reserves in older leaves.

For the medium immobile nutrients either can be true depending on different factors.

"That's why we ask for both young and old leaves as it tells a lot about every element and about nutrient transport.

"For example, if it is difficult weather, such as high temperatures or high light

intensity and the crop is suffering. In that case plant sap analysis will show levels building in the old leaves because the plant still takes up nutrition, but it can't be transported to the new leaves as the plant is protecting itself from too much evaporation."

Nutrient balance and interactions in the plant

The next important factor to understand is that there is competition between some sets of nutrients within the plant.

Calcium, potassium, magnesium, sodium and ammonium are all positively charged ions, or cations, while nitrate, chloride, sulphur and phosphate are all

Nutrient Mobility		
Mobile	Medium immobile	Immobile
Nitrogen	Sulphur	Calcium
Potassium	Iron	Boron
Magnesium	Manganese	
Phosphorus	Zinc	
	Copper	
	Molybdenum	

which nutrient to focus on. “One of the common mistakes is focusing on elements that are too low in the plant or soil, whereas it might be that element is being blocked by another one and that’s what you need to focus on, and it won’t matter how much you apply.”

Anions work the same way. Too high chloride, for example, could block nitrate uptake, while there are similar interactions for some trace elements, especially iron, manganese, zinc and to a lesser extent copper.

“Manganese can easily be too high in a plant and block the uptake of iron and zinc.”

Just to complicate the picture a bit more, there are more interactions between elements beyond just within those groups, as detailed in Mulder’s Chart.

“For example, just looking at calcium, that sulphur, manganese, nitrogen, phosphorus, boron, iron and zinc influence calcium uptake.

“Sometimes you could compare the analysis with dominoes – if one element is too low, there’s a good chance it will influence all the other elements as well.”

But while that can complicate the picture, Mr Hegger stresses that looking at the cation and to a lesser extent the anion balance is the crucial starting point.

“In 80-85% of cases looking at the

negatively charged anions.

If the uptake of all the cations is in balance, then the plant’s nutrition is balanced. But when one element’s uptake is higher than the plant needs, that will block the uptake of all the other cations, Mr Hegger says.

“For example, if you have higher uptake of potassium because of an application of manure, that will block the uptake of the other cations.”

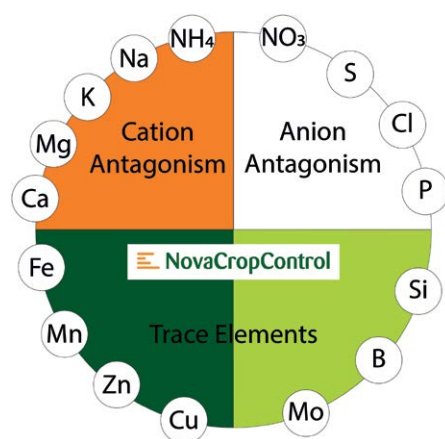
So in the sap analysis, if you see potassium is higher than the target values, and calcium is lower it’s probably because of the high potassium rather than inadequate supply of calcium, he explains.

Within the cation balance, potassium is usually the element most likely to be too high, although sodium can be too. “Potassium is like candy for plants, and is taken up very easily, whereas the plant finds calcium and magnesium harder to take up and is highly related to a healthy growing crop.”

Keeping potassium and calcium in a good balance is important for fruit

quality, he notes. Calcium is important for cell strength, while potassium for filling fruits. “If there’s not a good balance that will influence fruit quality.” For example, if the potassium : calcium balance is tipped towards too much potassium that can cause skins to split, whereas too much calcium is responsible for gold flecking on tomatoes.

Comparing the balance between the cations is important for understanding nutrient balance within the plant, and



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cation balance will be enough. Focusing on this will help get the plant in better shape.”

If the plant doesn’t respond favourably to changes in management, that’s when digging deeper might be required, he concludes.

How are the target values for each nutrient calculated?

For each nutrient in each crop NovaCropControl has a target range for sap analysis. These are calculated from

analysis of at least 500 samples from different fields and growers, Mr Hegger says.

“It’s not an average – we have a special programme working out these values based on median values, but it’s important we have over 500 samples.”

Optimum values are checked regularly, and can change, especially if growers routinely applying too much of a nutrient to a crop. One example was phosphorus in tomatoes where trials by NovaCropControl showed that lower levels than being routinely applied were better for the plant and other nutrient uptake, and the target values were updated.

The same applies for nitrate, Mr Hegger suggests. “We see in the data that nitrate applied could be much lower without effecting the growth of the plant or production.

“Very high nitrate can influence other nutrient uptake, and if you have better balance with the nitrate, the other elements are in better balance.”

What other factors influence mineral uptake?

Many environmental factors can also influence the uptake of nutrients. These should all be considered when interpreting why a particular nutrient is appearing to be deficient in the plant.

- Soil pH
- Imbalance in minerals
- Soil type
- Plant stage
- Release of fertilisers
- Soil structure
- Soil biology
- Climate – temperature, light, moisture
- Irrigation water quality

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So, we have just come back from the Cereals Event where we exhibited Winter wheat plots:

- * **Full 'Biological'** plot ie NO Nitrogen, NO Fungicides and Low Cost
- * **'Combined'** plot - Biological inputs plus ½ rates of other inputs, including 85kg Nitrogen
- * **'Conventional'** plot - Full rate conventional 220kg Nitrogen and full rate fungicides - High Cost.

We could not take our plots to yield, we had to abandon them, but we did take the heads from one square metre in each plot, just for interest. Results below. I know this is not a true yield comparison but it gives you some idea, with Wheat at £350/tonne, you have to get the yield.

We monitored these Plots throughout and posted the results on the day; we really struggled to keep Potassium levels where they should be, but it's been the same everywhere this year.



Est. Grain Yield = 10 tn/ha



Est. Grain Yield = 12.9 tn/ha



Est. Grain Yield = 13 tn/ha

The photos do not show it well enough unfortunately, but you can see the Biological plot stood up really well to the Conventional plot, although the Biological crop was a good colour green, the Conventional crop was quite blue - likely from the higher Nitrogen and Sulphate. (We can now fix Sulphate from the soils reserves).

We don't really recommend zero Nitrogen - unless you are organic, and prefer to put a 'Starter dressing' on in late February/early March, then go on with the **Bio-N** at the of end March early April.

This is the second year of commercial **Bio-N**, although we have been using it for 5 years with generally good results. Now we have improved the food source and the range of Nitrogen fixing microbes can quickly get established. However, **IT DOES NOT START WITH BIO-N**; it starts with a comprehensive soil audit from which we can build a Recommendation and formulate a Biological Programme that will *feed your soil, helping your soil to feed your crop.*

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DRILL MANUFACTURERS IN FOCUS...

VIRKAR THE FUTURE LOOKS BRIGHT

Since the release of the Virkar Dynamic DC machine back in 2018 Virkar have continued to develop the Dynamic range with the addition of the Dynamic D and C and soon to be released DD machine. This now means we have 4 coulters options to go into the Dynamics frame. All 4 coulters are designed for ultimate durability and performance and utilize the unique features of the Dynamic range, 35 cm of coulters travel, on the move coulters pressure control, maintenance free coulters and the steering rear axle. Along with many other features the Dynamic drill range offers customers with every conceivable way to establish their crops in the most efficient cost effective way possible.

New for 2022



New for 2022 the Dynamic DD

The Dynamic range has undergone more product development for the 2022 season. The machines can now operate off load sensing hydraulics that take control of the on the move coulters pressure control.

Hopper options for 2022 have also been enhanced. Alongside the split hopper of 65/35 and a third smaller micro hopper we now have the option of a second demountable 500 litre tank that resides in the back of the hopper for easy filling. This option would appeal to customers who predominantly drill just one product and require the 5300 litre hopper capacity, But may be wanting to drill cover crops and require a smaller secondary hopper. This option means the customer can have two hoppers capable of seeding up to 380kg/ha each but keep the hopper capacity of the single hopper when required.

We now also have the option for 2022 to be able to plant 2 different crops in independent rows to suit drilling certain cover crops that require seeds to be placed at different

depths this is a feature that is becoming more in demand as farmers look to utilize their cover crops in the best way possible.

Dynamic C



Dynamic C Coulters

The Virkar Dynamic C machine is a tine only coulters that is available on 19/25cm row spacings. With machine widths of 4.5 - 7 meters this machine comes with a tungsten seeding boot with interchangeable points. The coulters design keeps the 35cm of coulters travel with on the move coulters pressure control. Maintenance free coulters design

with heavy duty bushings and one simple adjustment for seeding depth per element.

The Dynamic C machine will appeal to customers who require a simple low maintenance low operating cost tine drill that is capable of drilling direct into stubbles or into pre prepared seed beds.

Dynamic DD

Launching in 2022 is the Dynamic DD double disc direct drill. This is a totally unique design that has not been seen before on disc direct drills. Instead of traditional route of having row cleaners in front of the single disc, Virkar have added a turbo disc that runs directly in front of the single seeding disc that insures even in the highest volumes of crop residue the turbo disc and seeding disc remain free of substantial crop residue.

The disc with its 7-degree running angle cleans as much of the seeding channel as possible to ensure the seed has great seed to soil contact leading to even germination and crop establishment. With the extra turbo disc, you can alter the pressure this disc operates at and can also lift the disc up out of the way when not required.

Redesigned OCEAN

With the ever increasing demand for larger wider machines where maximum work rates can be achieved in the most optimum of conditions Virkar have developed the new ocean machine that will be available Autumn 2022. These machines will allow Virkar to provide machines from 8-12



REDESIGNED OCEAN

meters allowing even the biggest of farms to have a machine that provides the ultimate in seeding technology.

The range will consist of the Ocean C, DC and D machines based on 25cm or 19cm row spacings and will feature the same coulter design as in the Dynamic range meaning you retain the 35cm of coulter travel plus the on the move coulter pressure control.

The new Ocean range has been designed from the ground

up and Virkar have really pushed the boundaries with this machine that plays host to some unique design features previously not seen on direct drills. Starting with the chassis the machine has been designed for perfect weight distribution and the tandem commercial running axles that also features a front steering axle means ground compaction is reduced dramatically. With the tandem axle design and the machine folding to under 3 meters means that it is a very safe machine to take on the roads.

With an 8000 litre pressurized hopper that will be able to be split 4 ways for ultimate flexibility in seeding different mixes. The hopper has been designed to still provide the best view possible to the rear seeding frame, great access for filling and to the metering units for calibration.

Moving on to the rear seeding frame this is where the philosophy of Virkar to push the boundaries of what is possible really becomes apparent. With the design of the frame able to accommodate the 3 different coulter options.

The drilling frame itself is designed to pivot 20 degrees either way in conjunction with the steering axle. This means when drilling round corners all rows stay the same distance apart and it reduces the strain on the frame and drilling coulters as it naturally follows the path of the tractor.

Available with limited numbers in 2022 and full production scheduled for 2023 this new Ocean machine has a very bright future in the UK direct drilling scene.



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SUSTAINABLE LAND MANAGEMENT LEARNING

Healthy soils, as the basis for healthy crops, livestock and ultimately the business, is fundamental to readers of *Direct Driller*.

Knowledge of soils, the relationship between soil physics, chemistry and biology and completing soil health assessments are principles that are often discussed in the pages of this magazine. Readers will then use the findings from analysis and in-field assessments to continually improve soil organic matter and biology along with many other areas to achieve optimum soil health.

So, would you know the correct answer to these questions below...

1. How wide should a soil pit be for carrying out a VESS assessment?
 - a) Approx. 30cm wide, 22-25cm long
 - b) Approx. 30cm wide, 25-30cm long
 - c) Approx. 15cm wide, 5-10cm long
 - d) Approx. 20cm wide, 22-25cm long
2. Which of these is a description of SQ3 on the VESS soil scoring system?
 - a) Aggregates readily crumble
 - b) Aggregates break easily with one hand
 - c) Most aggregates break with one hand
 - d) Difficult to break up

Answers at the bottom of the article!

If so, would you also be able to list the three key wildlife needs and how to identify whether you have a species-rich grassland on your farm, for example?

Farmers, land managers and advisers all have a tremendous breadth of knowledge both on arable, livestock or wider production systems balanced with optimising the environmental features on the farm to increase biodiversity, whilst maintaining healthy soils, clean water



and reducing emissions.

With the increasing importance of sustainable land management, achieving efficient food production and delivering environmental outcomes, BASIS have put together a 'Principles of Sustainable Land Management' course, to delve into these key areas in more detail.

This short course is designed for farmers, land managers and advisers and split into five modules, which cover topics including managing farmland wildlife and habitats, soil health and the efficient use of nutrients. The course provides an insight into the legislation that sits behind government ambitions, such as the 25 Year Environment Plan, public and private funding schemes available including the Sustainable Farming Incentive and considers the economics of the implementations of options.

Available as an online, self-guided interactive course with activities you can take out to the farm or local field or as in-person course from the autumn, you are able to choose the option that best suits your time and situation. Anyone interested in

gaining more in-depth knowledge of sustainable land management can then progress to the more advanced courses, such as BETA Conservation Management, the Soil and Water Management Certificate or Advanced Quality of Soils.

Whether you are starting out in the industry or keen to expand your knowledge, learning about these principles of sustainable land management will not only help you maximise the benefits which can be achieved through the new Environmental Land Management schemes, but provides an opportunity to further develop a profitable and sustainable farming business which delivers for you, the environment and the general public.

To find out more or register for the online or in-person course, visit the BASIS website: www.basis-reg.co.uk/training > Environmental courses > Principles of Sustainable Land Management.

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Answers: 1 = d, 2 = c

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THE FUTURE OF EFFICIENT CROP ESTABLISHMENT

FARMER FOCUS

JOHN CHERRY



It's an interesting time to be farming and, as readers of Direct Driller will appreciate, we all have important decisions to make about how we want to take our farms forward. The war currently raging in one of the world's key breadbaskets is focussing a lot of minds on how agricultural policies should be reframed to ensure a constant and relatively cheap supply of food worldwide. We probably all have our own theories as to how this could be achieved.

We've got a lot of talks about nearly everything to do with this at Groundswell this year, from politics with Henry Dimbleby talking about his Food Strategy one year on and politicians of various hues giving their views, to ways of farming that use resources we can grow, like woodchip, compost, soil (we can grow that too), nitrogen and so on, through to techniques and ways of farming that benefit us the farmers as well as the environment and consumers.



I won't bang on about it as by the time this comes out it'll probably be too late to secure a ticket, but I'm thrilled that we've got Dwayne Beck, Jill Clapperton and Greg Judy amongst dozens of other speakers...all helping us to see our farms in different ways, or maybe find different ways to farm. There're also a bunch of speakers telling us interesting stuff, like Lennart Olsson who's flying in from Lund University in Sweden to tell us how the research that they are conducting over there (in association with the Land Institute in Kansas) into developing perennial wheat and other crops. I'm hoping some UK institution can pick up on this.

Meanwhile, back on the farm it's been boringly dry here, we missed all the juicy storms that rattled round the country in May and April was unshowery, so spring crops look patchy at best and non-existent at worst. It wasn't just the dry, a good chunk of management error played its part: not destroying our cover crops early enough. The ground lay cold and wet over winter and I foolishly thought having a

good cover would help dry it out. It did dry it out, but rather slower than bare ground and it dried it at root depth too, which is proving unhelpful to the crops we've sown. We've made variations of the same mistake three years running and we've had three cold dry springs in a row. Back of the class for us. It's not as though no-one warned us.

This time last year I was feeling really smug about how well our winter wheats were looking having just had a programme of nutrition and no fungicides. Then the weather turned a bit rusty, as did the wheat and then a wheel fell off the sprayer so we got a bit behind and what with putting on a show and stuff we took our eye off the ball long enough to do damage to yields. Back to 1970's levels, but at least it's worth a lot.

Winter wheats look good this year too at the moment. They've had fungicide I'm sorry to say and they still look a bit thin in the rows, but nice and clean on the whole. Winter oats are a bit messy and knee height. We haven't put much nitrogen on anything, it has been too dry to spray the stuff about (at these prices) and watch it evaporate.

By now you'll be wondering why Chris has asked me to do a Farmer Focus, the sort of idiot that gives direct drilling a bad name. I'm hoping it cheers people up to know that there's someone making bigger mistakes than they are, it consoles me to think I may be spreading joy.

The cattle are doing brilliantly though, it looks like they'll be making more money per acre than the crops. Having herbal leys about the place is joyous enough even before we raise the grubby matter of profit emanating from them. I love the cattle, I love that they are making money, I love what they do to the soil and I love how they make me see 'farming' in a different way.





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THE FIGURES BEHIND THE REGENERATIVE VALUES

Written by Tom Allen-Stevens

Balbirnie Home Farms in Fife, Scotland, has been on a regenerative agriculture journey, testing aspects of this within its role as an AHDB Strategic Cereal Farm. A tour of the estate highlights its natural capital assets, helping to determine its carbon baseline and the opportunities to develop.



Standing at the edge of the 20ha field, you can see how the electric fencing has divided it into 'paddocks'. David Aglen explains that the sheep are rotated around – never kept too long on each individual paddock, so that the field is 'mob-grazed'.

It seems a sensible way forward for temporary grass. "Oh no, this isn't temporary grass, this is winter wheat," remarks David. "I'm hoping these lambs will ensure we won't have to apply a T1 fungicide or growth regulator, and also give the crop its early season nutrition and a fertility boost."

Suddenly the pale green of the closest paddock takes on an entirely different complexion. It's early March on Balbirnie Home Farms, just north

of Glenrothes in Fife, Scotland. The lambs have recently been moved to the next-door paddock, and your instinct is to worry whether the remains of the winter wheat they left behind will ever recover.

A closer inspection reveals fresh, green shoots are already coming through. The crop has lost most of its above-ground winter biomass, but this has passed through the sheep and been deposited back on the light, loam soils that lie just over 100m above sea level. It's a practice that meets the regenerative agriculture system the farm has taken on, although David admits he's not sure yet of the final effect on yield, nor whether the area was grazed for the optimum time.

Moving to the largely untouched paddock next door, he points out the lower leaves, carrying a fair amount of disease. "These were never going to contribute very much to yield, and would just be an extra cost in terms of the fungicide we'd have to apply," he says.

"What I'm interested to know, though, is the effect on the bottom line and not just financially. We're

keen to assess our carbon footprint – we want to work out our baseline and also the farm's biodiversity score. Then we want to look at the effect of the practices we're implementing, whether they help to capture carbon or lose it, and just how much we can sequester."



While soil carbon stocks take a long time to build and can be destroyed very quickly, just one year of carrots in the rotation, seen here under straw, won't put levels back to zero.

Balbirnie Farms has come on board with Sandy. This is software from Trinity AgTech that accurately assesses the carbon footprint, biodiversity and water quality of whole farm and all its enterprises on a field-by-field, crop-by-crop basis (see panel). "It's not just about the 800ha of arable cropping we have," explains David. "We have 300ha in permanent pasture or temporary grass for our 200-head herd of suckler cows. There are also forage and cover crops, land let out for root and vegetable crops and 350ha of commercial forestry."

Heading back into the estate, you pass parts of this woodland that have been left badly damaged by Storm Arwen. Owned by the Balfour family since 1642, the tree planting on the estate has been nurtured by many past generations who have developed its diversity and value, with some much-prized ornamental and exotic specimens. Today, two thirds of the commercial woodland is Sitka spruce, while the remainder consists



Wheat is mob-grazed by sheep towards the end of the winter, before spring growth gets underway.

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The youngstock of the suckler beef herd are kept outside all winter, which mitigates some of their methane emissions, but it can actually be less efficient.

mainly of Scots pine, larch and various deciduous species.

"From a farming and estate management perspective, we curse the trees royally, but now we're beginning to understand their value. Certainly as far as carbon is concerned they could prove to be a real asset," notes David. There's also hedgerow that's periodically coppiced, and another 6.5km has been recently planted.

Past the block of trees, David stops briefly by a field of carrots, sitting under a thick mat of straw. "We've progressively reduced cultivations and now everything is direct drilled, except of course for the root crops. So we want to know how much of the carbon we've captured is released by the plough."

In the next field is the youngstock of the suckler beef herd, kept outside all winter. The farm moved away from an intensive dairy unit installed in the 1970s into all arable. Now livestock has been re-introduced, again as part of the move to a regenerative system.



Manure is regularly turned, resulting in a lower volume of more nutrient-dense material which reduces synthetic fertiliser use, builds soil organic matter and boosts biodiversity.

"These animals will never see a shed, and I believe it's better for them and for the soil that they graze outside all year round. But I'm interested in what that does for our emissions," he says.

Manure plays an important role on the farm and David gestures to a heap on the way back to the farm buildings. He explains that it's regularly turned which composts it down, resulting in a lower volume of more nutrient-dense material that's spread.

In the same field there are cover crops, and here he stops and pulls a spade from the pickup to inspect the soil that lies beneath. There's no shortage of worms in the fresh earth that's eased up, revealing a matted turf of roots.

Cover crops form a major element of the arable system at Balbirnie Farms. David aims to retain green soil cover all year round, choosing vigorous, large-seeded species that establish quickly. "We feed cover crops to the livestock, drill through them in the spring and leave them as a mulch," he explains.

"We had one crop that we took through to the summer and it yielded over 90t/ha of biomass, according to the measurements we took. What I want to know now is where all the carbon goes." The farm has recently become an AHDB Strategic Farm and the cover crops form an important part of a programme of farm trials. These are run and monitored by SRUC, funded as part of AHDB's Farm Excellence programme.

Back at the farm buildings, David

parks up next to the hulking carcass of a large straw-burning boiler. "It used to dry the grain, and when we removed it and installed a kerosene burner, I finally got my life back. Removing it may be a backwards step in terms of our carbon footprint, but it was an almighty pain to run, and I've never once regretted the decision," he says.

As the farm tour concludes, he leaves the best until last – there in the shed is a 6m Horizon DSX 60-20 direct drill that's barely touched the soil since it arrived on farm recently. It lies curled up next to the farm's newly acquired second-hand 6m Väderstad Rapid. "We used to have a 4m John Deere 750A, but it was too small and we ran it too hard. Compaction was also becoming an issue. And we had a 5m Väderstad Carrier with a seeding box used to broadcast cover crops. That system was really a stepping stone to what we have now as we've gone steadily shallower with cultivations," David explains.

"Essentially, we're aiming to be 100% direct drilling, although we can cultivate with the Rapid. There were four tractors when I first arrived on the farm in 2010, and over the years we've reduced to just two. You can't dispute the benefits – we've seen a massive reduction in fuel use, likewise in our cost of production. But just how much carbon has that restored to the soil?"

Back in the farm office, David joins a call with Dr Alasdair Sykes, managing director for sustainability with Trinity AgTech. Although the farm hasn't yet come fully on board with Sandy and is yet to determine its baseline data, Alasdair can offer an insight into where the farm's practices are likely to lead.

Nitrogen fertiliser

David explains that he buys in and spreads bulk urea. While this forms the main source of crop nutrition, reliance on it has come down considerably with the introduction of livestock and cover crops. "We're also doing a trial with foliar nitrogen. The theory is that you get more uptake per kg applied, and we're hoping it could reduce synthetic N inputs by 25-50%," he adds.

Alasdair notes that fertiliser makes up by far the biggest element of

emissions for most arable farms. "It comes from two main sources: manufacture, known as Scope 3 emissions, and its use on farm, which comes under Scope 1. Gaseous emissions are measured in terms of their equivalence in global warming terms to carbon dioxide (CO₂).

"For fertiliser, about 60-70% of these is what it releases as nitrous oxide (N₂O), which has an impact 298 times that of CO₂. Urea tends to emit less N₂O during manufacture than ammonium nitrate, depending on its source, but it carries with it on to the farm a high carbon content that's then released.

"Any N applied direct to the soil and not taken up can be emitted from the field as N₂O. What's more N can volatilise, lost as ammonia gas, or leach into ground water as aqueous nitrate. Urea tends to be more prone to volatilisation – a big area of concern for air quality and public health – while ammonium nitrate leaches more readily. How and when you apply



Cover crops are grown with the aim of retaining green soil cover all year round, but the short-lived biomass is carbon neutral, although there would be massive biodiversity benefits.

fertiliser have a big effect on both the nitrogen uptake efficiency (NUE) and losses."

These metrics are accurately calculated by Sandy from records of applications, cross-referenced with meteorological, topographical and other data the software draws in. It also works out the carbon cost, broken

down into CO₂ and N₂O. The leaching losses and NUE indicate the financial effect, as well as nutrient loading, that can run into £10,000s for large arable units, advises Alasdair.

"The single most effective step you can take is to apply what the plant needs when it needs it – a little and often approach is best. Your foliar



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Taking out the large straw-burning boiler that used to dry the grain and replacing it with one that runs on kerosene may be a backwards step, but carbon emissions can be mitigated by switching to biodiesel.

application has the potential to help significantly here if it reduces the overall amount applied for the same yield.”

This is where manure can also have a profound effect, he continues. “Organic additions contribute significantly by reducing synthetic fertiliser use, as long as yield is maintained. What’s more, they build soil organic matter and boost biodiversity, so really are a win-win-win for arable soils.”

Cover crops

David’s keen to know how these are contributing to the various elements of the system. “Surely the cover crops are capturing N so less goes down the drains, and then they’re also

sequestering carbon into the soil?”

Alasdair agrees to a point. “Cover crops can take up a significant amount of N that would otherwise leach and they capture carbon as they grow, both in the leaf and the roots. This carbon is transient, as it’s then breathed out by grazing livestock, deposited as manure or released as the dying leaves decay. This in turn feeds the soil, so can be captured as soil organic carbon which can add to carbon stocks, depending on how you manage your soil.”

Here he points out the ability of Sandy to accurately model a crop’s N and CO₂ capture, drawing in data from management software. “This is where Sandy comes into its own and means

you don’t need to take laborious and costly samples, although we’ve now built in the ability to improve accuracy with actual soil analysis data. The added advantage in Sandy is that all data, whether modelled or measured, links through giving results in both the carbon calculator and water module.”

The cover crops held through to the summer add little to the farm’s carbon stock, however. “You may have captured more than 2t/ha of CO₂, but short-lived biomass is carbon neutral, in the same way as cash crops, as the carbon captured is released. They will have had a feed value, however, and there would be a massive biodiversity benefit for wild birds and pollinating insects, and that has considerable value in itself.”

Livestock

David is convinced of the benefits of livestock in the rotation, but beef and sheep in particular get a bad rap in carbon calculations. So where does the carbon go?

“Grazing with livestock, and particularly managed grazing, works well,” explains Alasdair. “There’s a trade-off because the grazing removes some carbon, but the manure is spread just where you want it in a really usable form that helps the soil sequester carbon long term.

“Carbon is also captured into the roots of the grass or fodder crop

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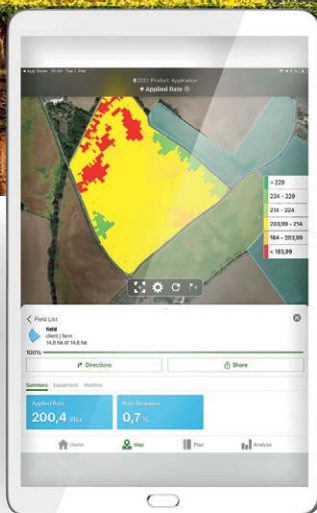


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The aim with the 6m Horizon DSX 60-20 and the Väderstad Rapid is to move to 100% direct drilling, which could capture 500-1000kg/ha CO₂ per year.

– permanent pasture, with grazing well managed, has tremendous sequestration potential, up to 3t/ha CO₂. Forage crops and mob-grazing arable land aren't quite as good, but poorly managed grazing can actually have quite a poor carbon performance."

The downside with livestock is the methane (CH₄) they belch and that released from manure, with 1kg of CH₄ equivalent to 28kg of CO₂. "These are also factored in within Sandy and measured according to two standards: GWP100 is the basis used by IPCC, but GWP* is one that is supported by many scientists. GWP* takes a higher initial CO₂ equivalence value for CH₄ but this is reduced over time, which reflects what methane does in the atmosphere.

"Cows and sheep emit relatively large amounts of CH₄ over their average lifespan. Grazing outdoors mitigates some of these through the carbon sequestered, and also cuts feed costs, which also have a carbon footprint. But if that means you have to extend the life of the animal for the same liveweight gain, that can actually be less efficient in carbon terms."

Cultivations

David worries that the carrot enterprise with its intensive cultivations lets down his system that's otherwise no-till.

"The carbon model within Sandy very accurately assesses the carbon balance on a field-by-field basis, informed by the record of your cultivations," says Alasdair. "Tillage acts as a catalyst for other inputs and keeping the soil in place and undisturbed builds the soil biota, which raises carbon stocks. It varies a lot, but a no-till field could be capturing 500-1000kg/ha CO₂ per year.

"Soil carbon stocks take a long time to build and can be destroyed very quickly, but just one year of carrots won't put levels back to zero and you can still build stocks overall across the rotation."

Forestry

As well as the commercial forestry, David is planning to put up to 40ha of the arable cropping into agroforestry. He's keen to explore the carbon potential of the estate's woodland and hedgerows.

Sandy captures and accurately records all types of woodland, including hedgerows and there's a specific

agroforestry module, Alasdair points out. "The forestry is doing the heavy lifting in terms of the estate's emissions mitigation, and could provide a healthy surplus that can be traded," he notes.

"The woodland blocks will be capturing 3-10t/ha of CO₂. Hedgerows within an arable system are tricky – they have the potential to sequester carbon, but much depends on their management. They have a significant biodiversity value, however.

"Take care with leakage when planting new woodland, or any land use change. Food production displaced from Balbirnie will have to be sourced from elsewhere, which may result in higher emissions per kg of food produced. This would be taken into account if you choose to trade carbon.

"But agroforestry presents the best of both worlds – carbon capture in the trees without taking a significant area out of production. It also has great potential to boost biodiversity."

Renewables

Putting back the biomass boiler is off the cards, but just how much does grain-drying contribute to emissions?

Alasdair estimates an upper limit of around 10-20% of arable emissions will be fuel use, and only some of that

will go to grain-drying. "So it's unlikely to knock the farm the wrong side of net zero, but it's not insignificant. Switching kerosene to biodiesel, if you can source it, will drop the emissions contribution to around 20% of its current level," he suggests.

The verdict

David feels he's on the right path, but it's time to gather the lessons learned and to focus. "We've been experimenting with a number of different aspects of regenerative agriculture and we know now what works in a practical sense. It'll help enormously to put the figures on these and to establish our overall baseline. It takes time though – we've been on this journey for seven years and we're still learning, so there's plenty of scope to adapt and develop."

The optimisation tool within Sandy is set to help here. Once David has the baseline data, he can set specific goals he wishes to reach and Sandy will suggest changes to the management practice that'll help him achieve them. If the business is reducing emissions or sequestering carbon and retaining carbon stock levels, this can be traded through Trinity Natural Capital Markets.

"If we're sequestering carbon, we should trade that – carbon is cash.

But equally that shouldn't come at a cost to our overall production. The farm output has dipped across the rotation with our move to regenerative agriculture – not massively, but I'd like to bring it back up, sustainably, and that remains the priority," he concludes.

Farm Facts

Balbirnie Home Farms, Fife, Scotland

- Farming: 1200ha mixed farm with 800ha of arable crops, 200 suckler cows and up to 1000 store lambs over winter
- Rotation: winter wheat, spring barley, oats, spring beans, land let out for root crops and brassica vegetables
- Woodland: 350ha commercial forestry, mainly Sitka spruce + parkland with exotic and ornamental species
- Annual rainfall: 900mm
- Soil: Light sandy to heavier loams.



What is Sandy?

Sandy is a digital assistant – a computer software tool developed by Trinity AgTech – that measures and manages all your natural capital. It helps you take control of the woodland, hedgerows, streams, ponds and ditches, pasture, margins and wildlife habitats as well as the cash crops and livestock on your farm.

It does this by calculating, evaluating and measuring both carbon emissions and sequestration of all the main farming enterprises, including woodland and glasshouse production. Sandy assesses these from data drawn from farm management software and has live links to Gatekeeper and Greenlight, for example.

Uniquely, Sandy also measures your farm's biodiversity, scoring for each field and the farm as a whole, using tried and trusted scientific methodology. It looks at five aspects: farmland wildlife, pollinators, natural enemies, conservation score and soil biodiversity. Sandy also accurately assesses the nitrates you leach into the water that passes through your farm, and your nitrate uptake efficiency.

Once you have established your farm's natural capital baseline, you can then plan using scenarios within Sandy to understand which actions are best to improve environmental performance and generate carbon credits. It links to Trinity Natural Capital Markets which is a platform that not only trades carbon, but also offers additional, biodiversity and water protection co-benefits, and biodiversity tokens as these markets develop.



Alasdair Sykes notes that Sandy not only accurately assesses carbon captured and emitted from data drawn from farm management software, it also uniquely measures a farm's biodiversity value and assesses nitrate use efficiency.

WATER FOCUS

AFFINITY WATER SPONSOR GROUNDSWELL 2022

Written by Shaun Dowman, Agricultural Advisor at Affinity Water

Affinity Water are a public water supply company, serving over 3.5 million people in the south-east of England.

For the 5th year running, Affinity Water will be the headline sponsor of Groundswell, something that's become an important date in our diary.

It will be no surprise to many of you that the relationship between soil and water is important, not only for your farming system but also the environment. We have all seen images of soil laden water running off agricultural fields straight into rivers turning them muddy brown. Luckily these sorts of incidents are relatively rare but can happen if soil health is not given the priority it deserves. I am sure you have also seen how regeneratively farmed soils respond under the ever-increasing heavy downpours that we experience and will continue to experience at greater frequency. These healthy soils act more like a sponge, accepting the rainfall and directing it down into the soil and aquifers rather than running off the surface. Walking over these fields a few hours later your boots stay clean and evidence of the heavy shower becomes a distant memory. Compare this to a ploughed field, low in organic matter where the impact of one heavy rainfall event can last a whole season where the soil remains capped and is less able to accept water when the next inevitable downpour rattles by. Improving water infiltration is not only good for the rivers and groundwater's but also for your farming system.

As heavy downpours are becoming ever more frequent, so are the extended periods of drought that risk your crops, water supplies and the environment. If you build organic matter in your soil, then you hold onto more water that may help you through the next period of drought.



You all know this, and I believe it is a big part of the motivation for many farmers going down a regenerative route, building resilience in an ever-changing climate. This soil/water relationship is explained with far greater impact and eloquence than I can do with words by the rainfall simulator that is demonstrated at Groundswell. Five different soil pans, under different management are exposed to a simulated heavy rainfall event and you get to see how much infiltrates and how much runs off the surface, taking valuable soil with it. If you haven't seen it, I would highly recommend attending one of the sessions at this year's event in the big top.

But Groundswell is about more than soil and water with sessions and stands that focus on biodiversity, health and well-being, nutrition, community, and climate change but at its core Groundswell is a show by farmers for farmers. We, as sponsors, can only hope to bask in the reflected glow of Groundswell, but I hope that through us supporting and backing this event we help build its credibility and help spread the messages both within our industry and beyond.

So, if you are attending Groundswell this year do come and see us at the Affinity Water catchment hub which will be by the Big Top. Again, we'll be handing out our free souvenir water bottles, and we will also be displaying





our latest soil research projects and we will be joined by Freestation who will be demonstrating their soil and environmental monitors. I am also chairing a session on Multi-species cover crops at 4pm on the Wednesday in the Kellogg's Origins Soils Tent. I'll be joined by three excellent speakers: Tom Sizmur from the University of Reading, Ian Gould from Oakbank and Ian Waller from Hampden Bottom Farm, do come and join us.



With less than a month to go I know the Groundswell team are busy putting together the final touches to the programme, which looks the most interesting and extensive yet. Groundswell really is the friendliest, most interesting, and fun farming show out there, so if you've not been before I'd recommend you breath it all in, keep an open mind, pull up a pew and have a fantastic two days.

Shaun Dowman, Agricultural Advisor, Affinity Water

Podcast

Scan this QR code to be directed to a podcast featuring Shaun Dowman, Paul and John Cherry as they walk around the farm and discuss regenerative agriculture and Groundswell.



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FARMER FOCUS

TOM SEWELL

Staying sane in a crazy world!

Every time I sit down to write my contribution to Direct Driller the world seems to be in a more crazy place. Who would have thought a year ago that we would be selling new crop wheat at over £300/ton and paying virtually double for fertiliser and fuel? It's certainly not a dull existence now being a farmer!

Up until a week ago our land and crops were very dry. With only 100mm falling in the first 4 months of the year travelling on land to apply fertiliser and sprays as well as spring drilling has not been an issue. In the last 2 weeks though we have received another 47mm which has certainly helped. Crops look healthy and clean and I feel our move to an agronomist who values plant and soil health has reaped rewards even before harvest. We have used considerably less fertiliser, fungicides and growth regulators preferring instead to apply nutrition and trace elements which have kept the plant healthy and growing at a steady pace. That's not to say we are without our problems! There's plenty of blackgrass about in wheat which we will have to try and manage out-of-crop over the autumn and winter and then by delayed drilling and spring cropping going forward.

I'm convinced that very few of the answers to our problems lie in a can of product applied to a crop. Just take a look at the problems associated with a new fungicide which is keeping o-ring manufacturers in business! I can't begin to think of the effect that's having on the plant, soil biology and the wider environment.

This time of year can quite often be a time for a breather after a busy spring getting crops planted, fertiliser applied and crop protection and nutrition sprayed. I was very fortunate to have some time off the farm recently and travelled to Brussels and Wageningen in Holland with my Institute of Agricultural Management Leadership Programme for a week. We heard from leaders, officials and lecturers and visited farms to see just how intensively farmed some parts of Europe have become. Last week my 2008 Worshipful Company of Farmers ACABM cohort met up for our annual reunion in Suffolk. Superbly organised we visited diverse farming businesses as well as one



Farm of the future! In Holland

of the leading racehorse studs in the world! We saw a robot planting parsnips into some very dry Breckland sand which perhaps gives us a glimpse of the future?! It was good to be able to meet up again after a 2 year gap and compare who had paid the most for their fertiliser and who had sold the wheat for the lowest price!!

Now the focus is back on the farm, in the run-up to harvest. We have had a good clear-out of surplus machinery, grain equipment and have just got permission to add another grain store extension at home. Cash flow in the next few months will undoubtedly become tight for many of us even with the 50% BPS advance due in July. Knowing when to buy key inputs like fertiliser and fuel will have a big impact on farm businesses going forward. Fortunately in a reduced tillage or no-till scenario the fuel impact is fairly minimal for many of us! Our fertiliser use has been drastically slashed this year too and I expect that to be the case going forward with Nitrogen coming now from a number of different sources, not just from a bag!

It's also the time of the year when we all make the annual pilgrimage to Groundswell! I really enjoyed last year and felt that one day wasn't enough. The line up of speakers looks fantastic and it will be good to catch up with friends that I've not seen for a while.

I wanted to finish by paying a special tribute to Caroline Drummond who sadly passed recently. She was an inspiration to those of us who had the pleasure of knowing her. As the head of LEAF she was at the forefront of sustainable farming practices across all sectors of the industry for many years and her passing will be felt by many for years to come. She will be irreplaceable. I was blessed to meet Caroline when on my Nuffield Scholarship in 2013. She was part of our year group and I had the privilege of sitting next to her on an 8 hour flight to Canada. She was genuinely interested in what I had to say and would question why. She was fun, bright and enthusiastic about our industry and I can't quite believe she has gone! My thoughts are with all those at LEAF, her family and all of you who like me called her your friend.



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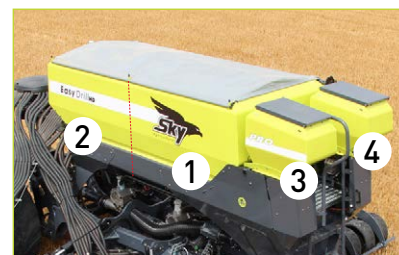
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DRILL MANUFACTURERS IN FOCUS...



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When it comes to what's currently trending in crop establishment, the focus is very much on plant nutrition and the targeted application of N & P fertilisers along with the seed to bolster root development and to enable the plant to grow away strongly from pests and diseases. Multi-hopper seeders now offer that flexibility of being able to combine different seed types, add a starter fertiliser or the addition of slug pellets or a micro-granular herbicide simultaneously with the drilling operation. Seeding depth can be split into different zones as well by the addition of a second or third material entry point.

In the area of reduced tillage drilling, three drills stand out strongly in the AMAZONE range, all featuring that multi-hopper format: the Condor direct tine seeder, the Cayena tine seeder and also the Primera DMC



Grain and fertiliser option for the Primera 600-2C

Since the late 1970's, AMAZONE have pursued their chisel opener philosophy when it comes to reduced tillage seeding systems. After numerous field trials in those early years, Dr. Heinz Dreyer, father of current joint owner of the AMAZONE Group, hit upon his successful formula of running a hard-faced chisel opener to place the seed in the ground rather than using a disc. This avoided crop residues being hairpinned into the seed slot and generated a slight tilth which improved seed/soil contact as well as mineralising some nitrogen in the seed zone to improve plant development.

The principle of the NT chisel opener continues today in those Condor, Cayena and Primera drills. The Condor, with three stagger of coulters and a row spacing of 25 cm or 33 cm, makes it ideal for inter-row mechanical weed control and comes in working widths of 12.0 and 15.0 m. The Cayena, again with three stagger of coulters, a covering harrow followed by a targeted reconsolidation, is widely renowned for its low horsepower requirement and ability to run in many conditions, is in 6.0 m only whereas the Primera DMC is available in either 3.0 m or 6.0 m widths.

Featuring at Groundswell this year will be the Primera DMC 6000-2C

The Primera 6000-2 DMC is more than just a direct drill as does what it says in the name, DMC – direct, mulch, conventional. Huge underbeam clearances, and the openers in banks of four rows, mean that copious amounts of straw and cover crop can



Hoop rollers ensure the optimum seed/soil contact after the chisel opener

pass through the drill without any fear of blockage. Each chisel opener closely follows the ground contours via a parallel linkage – guided by individual hoop rollers behind the coulter with the depth set mechanically on a spindle. The narrowness of the chisel opener means that little soil is disturbed but the seed slot is left clean for good seed / soil contact and the micro-tilth generated by the chisel action can then be pushed back into the groove by the angled hoop rollers following. On the rear, a choice of either the Roller harrow, for light dry conditions or in the spring where moisture conservation is crucial, or the well-known universal Exact harrow, is used to finish off the seedbed profile. The 4,200 litre split hopper, carried on flotation 700/45-22.5 tyres with its twin electrically-driven metering systems, can feed both seed and fertiliser down to the coulter. The Primera 6000-2C weighs in at just 6,500 kgs and pulling power is a modest 180 hp for the 6m drill and, due to the little amount of soil-engaging parts and the robustness of the construction, the drill suffers from little wear and tear.

New for 2022 is the option of the GreenDrill 501 catch crop seeder box which now can be added to make a third hopper. The GreenDrill can be specified to broadcast seed on the soil surface ahead of the Roller harrow or can apply a third material down the sowing coulter. The electrically-driven metering system is combined with the other two hoppers and is controlled via the ISOBUS software and can be run off a third VRA application map. On the headlands the three hoppers can switch off at different times using the unique Multi-boom software.

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DRILL MANUFACTURERS IN FOCUS...

HORSCH

INDIVIDUAL PLANT DETECTION – CAMERA SYSTEMS WITH A FUTURE?



Camera-based plant protection – the technology already exists but where do we stand when it comes to using it in practice? HORSCH LEEB has been carrying out tests in this respect for quite some time. Theo Leeb tells us about the challenges and the chances.

What is the state of technology with regard to individual plant detection?

Theodor Leeb: At the Agritechnica 2019, some start-up companies already presented camera systems for spot spraying weeds. This made the expectations of customers, manufacturers and also of political decision-makers rise.

In the past few years, we tried to shed light on this topic and to test where we actually stand. To begin with, spot spraying with optical sensors or cameras is not basically new. This method has already been used for about 20 years in the



typical no-till regions with low rainfall like Australia, Russia or Kazakhstan – namely in the “Green on Brown” sector. Another method is “Green in Green”. So the technology

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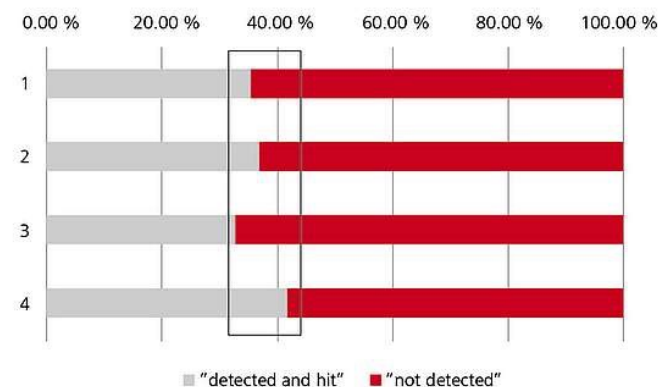
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already exists. The question is which system really makes sense when and where.

What does “Green on Brown” and “Green in Green” mean?

Theodor Leeb: There are two principles: “Green on Brown” and “Green in Green”. Brown corresponds to the arable soil and green to the plant – whether cultivated plant or weed. The topic Green on Brown has been existing for quite some time. Among others, some manufacturers offer systems for the application of glyphosate before sowing. This method is mainly used in no-till regions. With the Green in Green method, you have to differentiate between cultivated plant and weed. And partly you also get the information what kind of weed it is. With regard to the question how far we have come with this topic: We carried out some tests this season and also last year. With regard to Green in Green we for example tried to spray thistles in wheat. Thistles normally appear in nests and not on the whole field. This would be a typical application for spot spraying. With the test, we wanted to find out how exactly the system detects the thistles and what hit rate we would achieve. We basically can only say that the system works. The thistles were detected but only partly. The hit rate ranged between 40 and 60 %. The question, of course, is if this is enough. In my opinion, it still is far from being field-ready. Moreover, as a farmer you wonder about the weeds that still are on the field – are they tolerable or not? This, of course, also depends on the kind of weed, but it should be clarified.



plot	"detected and hit"	"not detected"	Sum
1	29 35.37 %	53 64.63 %	82 100.00 %
2	140 36.84 %	240 63.16 %	380 100.00 %
3	80 32.65 %	165 67.35 %	245 100.00 %
4	66 41.77 %	92 58.23 %	158 100.00 %

In the Green on Green test the detection rate of the system was worse as soon as colour or shape and light intensity varied. Moreover, it only detected thistles that were higher than the population

Were the thistles not detected or did the system not react fast enough and the thistles, thus, were not hit?

Theodor Leeb: In the test, we differentiated between “detected but not hit” or simply “not detected” and



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logically not hit. But this also is a question of the calibration of the system. At a 36-metre boom there are a total of 12 cameras which are mounted every three metres facing forward with a slanting angle. And the nozzles are assigned to each camera according to the spatial arrangement. It is a rather complex procedure to calibrate the individual camera positions to make sure that the appropriate nozzle opens at exactly the right time.

But the real problem rather is that the thistles indeed are not detected by the system. The biggest challenge are the different lighting conditions. I.e. there is a difference if it is cloudy or sunny, if you have to work with or against the sun etc. And the weather conditions in turn influence the shape of the thistle. The leaves for example roll up a little bit in case of a high solar radiation resulting in a significantly lower detection rate. So what we found out was that there still is need for optimisation.

How could the system Green in Green be improved to make it work?

Theodor Leeb: You have to know that there is an AI behind it. An incredible amount of training data is required to make sure that the system always detects the thistle. You need photos and data from thistles in all shapes, in all lighting conditions, growing stages, from all different thistle varieties etc. We are talking about thousands of photos that have to be analysed and labelled manually. Every pixel has to be assigned correctly. This is an enormous manual effort and finally the crux of the matter. The more labelled photos there are, the more exactly and reliably the system will work.

And a thistle is rather easy to detect compared to other plants.

Theodor Leeb: Exactly. The human eye can detect it rather easily and a human can also differentiate it. The difference between monocotyledonous and dicotyledonous plants is quite obvious. But if you want to differentiate for example black-grass from wheat it is getting difficult. This is where we possibly reach the limits of what is feasible.

But there are further technical restrictions. An important point is the spot size, i.e. the smallest possible area that can be sprayed. In theory, the biggest savings potential would be if we treated every little weed with an effective spraying area of for example 5x5 cm. However, as we work with sprayers where the nozzles are mounted with a spacing of 50 cm or 25 cm, there is minimum spot width of approx. 60 cm respectively 35 cm depending on the nozzle layout. As the nozzles cannot switch infinitely fast, the spots in the direction of travel are about 50 cm long. If the distance between the weeds is smaller than 50 cm, the system will not turn off. Thus, for the savings potential the ratio of spot size and weed infestation is essential. Physics respectively optics are two other limiting factors. Let's take beets as an example: It is important to detect weeds at an early stage, i.e. when the size is one centimetre or even smaller. In theory, it is possible to detect this tiny plant with the system if you drive very slowly and can really look at it from all sides. But in practice, operational speeds of 10 km/h and more are common. To achieve a sufficient reaction time, the cameras face forward at a slanting angle. But if there is a large clod in front of the small weed or if another bigger plant hides



As thistles do not grow in the whole field but in nests, they are ideal to carry out tests with spot spraying. In the test, we analysed the hit rate of the system and if the thistles were detected.

the weed, the camera will not be able to detect it. So you cannot achieve a hit rate of 100 %. Now the question is what is acceptable. Are 90 % enough? At the moment, we simply do not know.

As thistles do not grow in the whole field but in nests, they are ideal to carry out tests with spot spraying. In the test, we analysed the hit rate of the system and if the thistles were detected.

So at the moment the topic is limited by the training data and physics.

Theodor Leeb: Yes, but there is another exciting question we have to clarify. In many row crops it is good professional practice to apply a soil herbicide after sowing. This guarantees a basic protection for a certain time. The weeds that emerge after two to three weeks then are treated with foliaceous agents. If you decide to do without the soil herbicide you logically have to wait until the weed has grown so that a camera can detect it. Let's assume that we use the spot spraying method to apply a foliaceous agent on the emerged weeds: The problem is that the foliaceous agents affect the development of the cultivated plant. You cannot avoid spraying on it if the weed for example is close to the beet. Moreover, new weeds are constantly emerging all along. So the question is: How often do we have to spot a certain area to make sure that for example a beet field remains clean? We have not yet tried to do without the soil herbicide. But in my opinion, for beets, it does not make sense to do without it. A reasonable solution would be a combination, i.e. a soil herbicide as the first measure and the other treatments with camera-based spot spraying systems. Another rather exciting idea is to accept a certain economic threshold respectively to tolerate certain weeds that are classified by the camera as they do not pose a problem in the next season due to a cleverly chosen rotation or because they are easy to treat. I think this might provide the

biggest savings potential. However, it still requires a lot of development as the weeds do not only have to be detected but also have to be classified.

You have just been talking about herbicides. Can you image other sectors where this method could be used?

Theodor Leeb: In case of plant illnesses for example you could apply fungicides or even growth regulators in cereals in a site-specific way. However, this does not require such a finely itemised spot spraying system as in this case we are talking about a larger area. For this application we use our pulse system PrecisionSpray with a variable application rate per 3 metre boom section. But there are approaches to use the cameras to detect illnesses. The question rather is if it is not too late at that time. In my opinion, the approach via biomass and weather models would be more productive.

How does "Green in Brown" work?

Theodor Leeb: Together with a manufacturer from France we carried out tests. The method is based on a mere differentiation of colours, i.e. you have a camera image and analyse which pixels are green or brown, thus plant or field. The green areas are sprayed. This worked quite well, however this system is not of major importance in Central Europe as we usually carry out tillage and as the conditions are wet.



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Could you explain this in more detail?

Theodor Leeb: On the high-yield sites stubble cultivation is usually carried out after the harvest to mix in the straw. After a few days or weeks volunteer crops and weeds emerge. I.e. the field more or less is green all-over. Spotting does not make sense as the plants are too close to each other. So you would have to treat the whole area and could not rely on point application. In dry regions where no-till farming is very common this is different. There is no tillage after the harvest. As it is very dry there are little weeds or catch crops. And in this case, you can – instead of spraying all over – work with a camera system in a targeted way for example to save costs when using glyphosate for spraying the individual plants.

In addition to Green on Brown and Green in Green there is another differentiation: offline and online methods. What I have described so far are online methods, i.e. the camera is mounted on the boom and while driving the system decides whether to spray or not.

With offline methods you get the information by means of a previous scanning. You normally fly over the field with a drone that is equipped with a high-resolution camera and scan the field from a height of approx. 20 m. At the moment, an algorithm is used to differentiate weed from crop in the high-resolution photo. This system provides an application map with the sections that are to be sprayed. This information then is loaded into the terminal of the machine and the field is treated. It works similar to the application maps for fertilisation.

Together with a start-up company we also have made tests with offline system for quite some time. The system basically works, but there also are a few obstacles. For example if you want to spray you have to have current data. There is little point in flying over the field with the drone 14 days in advance as in the meantime the weed infestation will change. The other obstacle is a physical one. Because of the offset method the spots have to be larger to hit the weeds as the GPS tolerances of the drone and the sprayers add up. Larger spots in turn mean that the sprayed area is larger, too, and thus there is less savings potential.

The extremely high data volume is an additional challenge. Endless gigabytes per hectare are generated that are sent to a server for calculation. This often takes the current internet connections to their limits. On the other hand, the application maps have to be sent back to the terminal of the farmer. Depending on the number of polygons (spots) the current ISOBUS terminals only allow for applications maps with a size of less than 5 hectares.

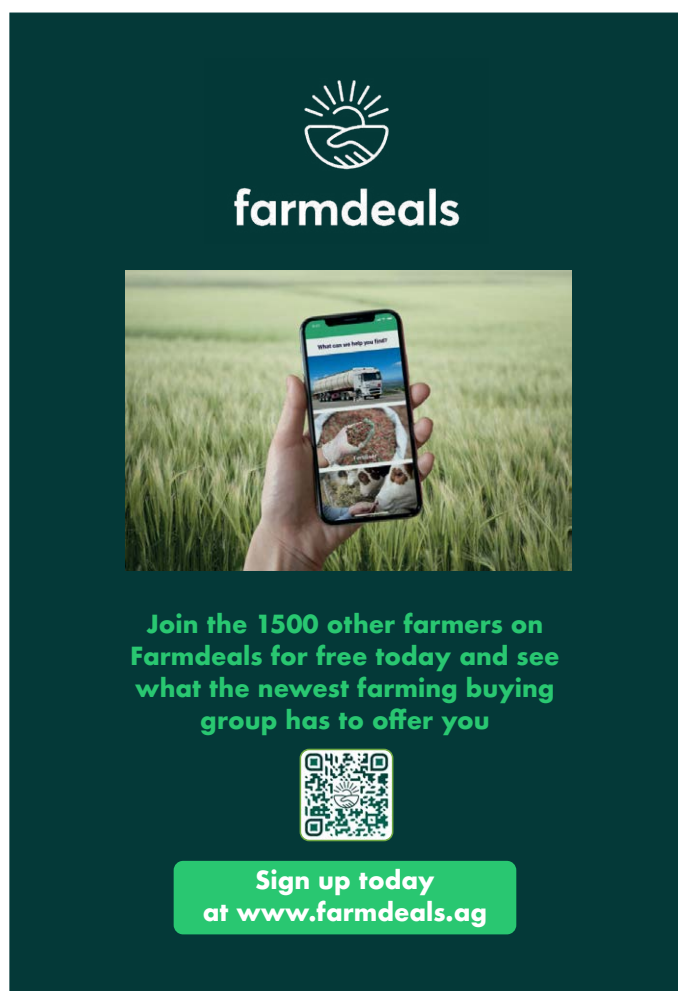
This means: From a technical or technological point of view the offline method can be displayed. For practical use, however, some more time is required to optimise the processes. And first of all, we need solutions for the high data volume. We possibly even have to find a parallel solution to ISOBUS.

What is your summary?

Theodor Leeb: In my opinion, spot spraying is the next logical step to meet the future requirements with regard to Green Deal, environmental protection and sustainability. Consequently, we come from an all-over treatment over band application to small-area spot spraying. The objective always is to apply the agent only where it is really required. In this respect, a camera-based system – whether online or offline – can make a valuable contribution.

We are intensely working on an optimisation of these systems and we will continue to carry out tests to gather more experiences. Our task is to transfer everything that is possible from a technological point of view into practice in such a way that the farmer can safely and simply use these methods in his everyday working like. Thus, spot spraying can become another component with regard to the optimisation of conventional crop care. But I also see the limits of what is possible as in the field we do not have standard, industrial and constant conditions.

My summary is: nature still will be nature. And nature cannot be constrained by industrial or digital standards.



The advertisement for Farmdeals features a dark green background. At the top, there is a white logo consisting of a stylized sun with rays above a pair of hands, with the word "farmdeals" in white lowercase letters below it. In the center, a hand holds a smartphone displaying a website with images of a farm, a truck, and a field. Below the phone, the text "Join the 1500 other farmers on Farmdeals for free today and see what the newest farming buying group has to offer you" is written in white. Underneath this text is a square QR code. At the bottom, a white button contains the text "Sign up today at www.farmdeals.ag".

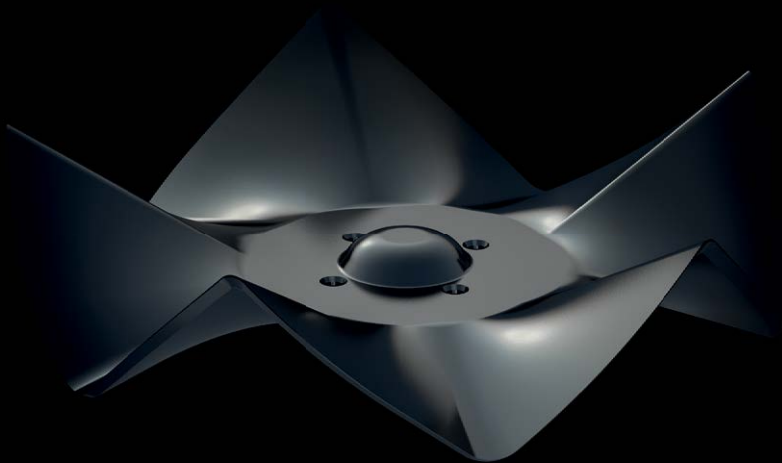


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Direct drilling into heavy clays is a battle still to be won

Eight years of trials with cover crops and direct drilling has prompted more questions than answers.

The soil advisers at Agrii like to remind me that there is more to direct drilling than simply placing the seed into uncultivated ground. "You have to earn the right," they tell me in reference to the need to first get the soil in to a condition where it will perform as expected. In my experience, 'earn' is an understatement. When the day comes that I am truly happy with how my direct drilled crops look and with the financial returns they deliver, it will be because I have battled hard to create that situation.

This is not to say that I cannot grow crops by the direct drilling method. I can. In some years the financial returns are even reasonable, but as yet no direct drilled crop on this farm has produced a net return better than that sown after the ground was first cultivated with the Simba Solo. This is the root of my frustration.

I started on this journey to identify a direct drilling approach that worked on my heavy clay soils eight years ago. I selected a 22-acre field close to the home farm at Leadenham because it was near enough that I could monitor it regularly and at my convenience. The soil type, structure, and everything else was typical of many of the fields on my 1600-acre farm half of which is 50%+ clay. I've used this field to investigate a range of establishment regimes, species of cover crop and following crop options. Some have worked better than others, but I've also had two complete crop failures. This is turning out to be an expensive exercise, but I'm also relieved not to have followed the crowd and gone 'all in'.

In harvest 2021, the long-term cover crop/direct drilling field produced a net return that was £180/ha less than the field immediately next to it which serves as the yearly comparison and where the crop is produced following the farm standard regime. This poorer financial performance reflects the cost of an additional pass to sow the cover crop, the costs of the seed itself, one or two applications of slug pellets and the lower yield of the spring barley crop.

It amuses me that DEFRA is offering to pay £40/ha to farmers to sow cover crops. This is only a small contribution to the true cost these crops have within my business and I for one will not be signing-up for any of the cover crop options on offer as part of the sustainable farming incentive.

Like many, my motivation for direct drilling is to cut costs and save money. If I need to invest in new machinery, extend the rotation or bring in cover crops, then so be it. So far, my experience is one of 'two-steps forward, one-step back'. This is far from the resounding success that many preach.



Cover crops are a case in point. After several years of seemingly making good progress and a small but noticeable improvement in soil condition, disaster struck. Come the spring, the ground was rock hard, and the spring barley crop suffered at best 15% germination. It was abandoned.

We soon learned that without a gentle cultivation in the autumn to create a fine tilth, there is little chance of successfully establishing a cereal crop come the spring.

We've also tried lightly grazing the cover crop with sheep – two to three days at a low stocking density – only to find they tread the ground too much and you lose the friable tilth. This neatly sums up my experience: direct drilling into heavy soils carries a high risk. The friable tilth created in the autumn needs to be preserved until the spring.

Having tried drilling cover crops directly into stubble and broadcasting the seed with a pneumatic spreader before rolling in, on the advice of others, I moved to a wide-row system. We had modified an old Simba Solo for use as an oilseed rape drill and fitted it with low-disturbance tines designed by Philip Wright of Wright Resolutions. The seed is sown in 45 cm rows before a Simba Unipress fitted with spring tines is pulled behind. This approach seems to be working well, so far.

Maintaining output

In most years, the clay soils tend to produce the highest-yielding crops, but also require more work and horsepower. This is my dilemma: I want to maintain the output of this land but reduce my reliance on big tractors and heavy equipment.

I willingly concede my Simba Free-flow drill has its limitations. This is not to say that I haven't used it successfully to sow direct-drilled crops. I have and most of the crops that followed have been good, but it is not suited to drilling directly into cover crops or into autumn stubble where there is a thick layer of trash. In contrast, it works better where the ground has been lightly cultivated with the Simba Solo

or in overwintered stubbles when the straw is less fibrous and partly decomposed.

It's not that I can't direct drill on heavy soil. In spring I can, but I'm finding direct drilling in the autumn on my heavy soils to be a challenge. By adding another, more suitable drill, to my list of implements I fear I will incur higher establishment costs, which need accounting for, and lower output. This is not a proposition I find acceptable.

It is my desire to find a drill that I can use in the autumn, perhaps after beans and oats, to direct drill a cereal crop in to standing stubble and a cover crop. Such machines already exist. Those from Weaving, Amazone, Horsch and Horizon are all capable of drilling directly into stubble as well if not better, than my Simba Free-flow.

I need a mounted drill, probably a 4- or 6-metre, that complements my setup and gives me another option. My issue is the cost. I've lost count of the times I've heard someone say they've spent £150,000 on a drill only to claim they're saving money. In contrast, I paid £19,000 in 2016 for my 8-metre Simba Free-flow and I would argue that my crops are more profitable. I can cultivate many acres for £150,000 and not suffer any yield penalties! I plan to keep this drill going for as long as is practically achievable. If in time, carbon credits are as valuable as a tonne of wheat then I realise my system will need to be reviewed.



Good soil structure

All soils suffer from compaction and while I have seen instances that some soils will 'self-structure', it is my belief that some form of intervention such as that involving a tine

or sub-soiler is required periodically. This is especially so on the heavier soils. On the light and medium land, we grow sugar beet while elsewhere we sow oilseed rape using the modified Simba Solo, so it could be argued that remedial action of the sort I consider necessary is performed on a periodical basis as part of the rotation.

Some of our land destined for spring crops is cultivated in the autumn using the Simba Solo. Once there is a good flush of weeds it is sprayed off ahead of the winter.

While my system works, I realise that to successfully sow through a cover crop in the autumn and in high trash situations, I need another drill.

To find a drill that could work in my system, this spring I hosted a drill demo in association with Agrii. The day attracted about 280 visitors, so clearly there are others like me. The demo field will be taken through to yield to see if the different drills were affected more or less by the conditions than the Simba Free-flow. Behind the demonstration drills, we made a pass with a straw rake. This is a reasonably inexpensive attempt to improve seed-to-soil contact, improve water penetration and promote the efficacy of residual herbicides. It is already clear that on seven out of the 10 drills in trial, this tactic has increased germination by up to 15%.

I am also mindful of the continuing loss of plant protection products seen as essential to the profitable production of crops. I'm not suggesting that direct drilling will reduce the need for fungicides. It may even increase the incidence of certain diseases such as net blotch given that infected stubble is the primary source of inoculum, but I believe that the need for certain herbicides can be reduced. We rely heavily on glyphosate and although I have got on top of a black-grass problem, we are now seeing worsening situation with Sterile brome. We cannot continue to rely so heavily on herbicides to keep on top of problem weeds. Moving the soil less frequently should run down the weed seed bank and gradually reduce the amount of herbicide needed. Our current strategy has enabled us to achieve 99% black-grass control for £90/ha mainly through a move to roguing which has led to a 30% reduction in herbicide use.

It irritates me that for some of my industry cohorts, 'direct drilling' has become a new religion. The vitriol and other comments I have seen directed at some who question the merits of this approach is shameful. It stifles open debate and is bordering on abuse.



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EARLY COVER CROP BENEFITS: WHAT CAN YOU EXPECT IN THE FIRST YEAR?

Written By Laura Barrera and first published on AgFuse.com

In 1995, Pennsylvania farmer Steve Groff was speaking at an event when he asked the audience the question:
Do cover crops pay off?



Grasses like cereal rye are a good species for beginning cover crop users as they grow fast and have fibrous roots. Photo by Stephen Ausmus, USDA Agricultural Research Service.

His thinking at the time was that he had been no-tilling since 1982, and maybe if he no-tilled long enough, he wouldn't need them.

Ray Weil, a soil ecologist with the University of Maryland, happened to hear his question and approached Groff about doing a cover crop study on his farm. It turned into a 12-year project, from 1995 to 2007.

It was in 1999, four years into it, Groff got the answer to his question. That was the year he had a drought, and the corn that was grown on previously cover-cropped ground out-yielded the corn on non-cover cropped ground by 28 bushels per acre.

"That's all I needed," Groff says. "Ever since that I'm totally committed to cover crops."

Talk to most farmers who have been using cover crops and you may get a similar story. They're a long-term practice for protecting and improving the soil, which may also translate into protection and improvements for cash crops. The longer you use them, the more likely you'll see a return on investment.

But what about the short-term? Are there benefits growers can experience in their very first year of using cover crops?

The answer is: it depends. A variety of factors can influence the early benefits of cover crops, including the soil's current health and conditions, tillage practices, species selection and overall management.

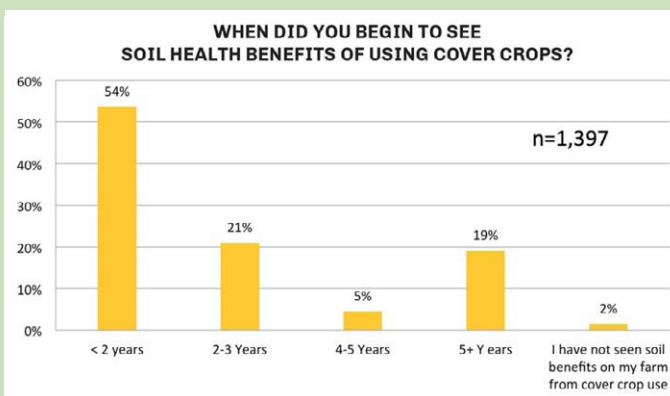
The poorer the soil, the faster the results

One of the fastest changes that can occur from cover cropping is the improvement of soil health. In the 2016-2017 Cover Crop Survey Annual Report, 54% of farmers said they believe that soil health benefits from covers began in the first year of use.

While covers can help any soil, Groff, who now runs a cover crop consulting business, says that cover crops seem to help a poorer soil quicker.

"If you have 3-foot deep topsoil in Illinois, you're not going to see a dramatic difference in the soil as you would in maybe another soil that's on a hillside, or rocky, or sandier," he says.

Eileen Kladviko agrees. The Purdue University agronomist says that one of the earliest changes farmers may see in their early cover-cropping years is an improvement in soil aggregation, especially in soils with low soil tilth and organic matter, such as 1.5% or less.



Another potential early benefit is less soil crusting, which can result in better seedling emergence and uniformity.

"It depends on the year, it depends on the soil," she explains. "If you have a severe thunderstorm shortly after you've planted and before your seedlings have emerged, having something like a cover crop on the surface can reduce that issue."

That goes in hand with preventing erosion, especially for those growing low-residue crops like tomatoes, corn silage or seed corn.

"And those are also places where cover crops are easier to fit in because they have more time after harvest," Kladviko says. "You can actually get more growth and different kinds of cover crops, because you've got a longer window in the fall to get things established than if you do if you wait until

after field corn harvest to seed the cover crops.”

She notes that some of these possibilities would be more obvious for farmers who are tilling than for no-tillers.

“If they’re in no-till and they don’t have any significant erosion problems, then they may not notice that kind of benefit.”

Preventing rills and gullies pays off

While it’s difficult to calculate a return on investment for most of these early cover crop benefits, one effect that can result in a direct economic benefit is the prevention of rills and gullies.

One farmer told Kladivko he usually had to fix the beginning formation of rills and gullies on his highly erodible soil. But just one year of cover crops prevented them from forming, saving him time and fuel.

“Even if you don’t worry about how much soil is washing down the river — how much of that \$10,000 an acre soil you just let leave your farm — the fact that you had to actually go and do something with the beginnings of a gully, to this farmer was worth time and money,” Kladivko says.

Trapping nitrogen now for future crops

Kladivko admits that this does not pencil out for a farmer who is renting land and is looking for a return on one year of cover crops. But for those who own land or will be farming ground for several years, cover crops can keep nitrogen from leaving the field and build up their soil nitrogen bank account.

“If 20 pounds of nitrogen was just going down the drain, now you’re keeping it in the field,” she says, adding that covers can scavenge up to 30 pounds of nitrogen. If you’re growing a legume, it’s even more.

Unfortunately, growers can’t “withdraw” from that soil nitrogen bank in the first three years. Most of the nitrogen is recycled into the soil organic matter, Kladivko says, but at some point there will be enough built up that farmers can cut back on their nitrogen.

“It’s certainly going into that account, they just can’t draw on it.”

Cover crop top growth can aid water availability and weed control

It depends on how much cover crop growth there is, but if farmers end up with a good mulch from it, that can increase soil water infiltration rates, Kladivko says. It can also reduce evaporation rates from the soil, which means there’s the potential for greater water availability for the cash crop at some point in the summer.

“The rainfall that you do get will last you a little longer,” she says. “That’s a potential benefit in year one, depending on the year and on how much topgrowth they allow.”

The amount of cover crop topgrowth can also help in the fight against weeds, particularly those that may be herbicide-resistant.

“I know some of our weed scientists at Purdue get very



The advertisement features a large, dark tractor with orange accents, pulling a tillage implement, working in a field under a dramatic, cloudy sky. The Acres Insurance logo, consisting of a stylized green plant and the text 'Acres INSURANCE', is centered in the upper half. Below the logo, the text 'WE WILL HELP COVER YOUR SEED' is written in large, white, bold letters. Underneath that, 'CALL FOR GOOD HONEST ADVICE' is written in smaller white letters. At the bottom, a dark red banner contains the contact information: 'HELLO@ACRESINSURANCE.CO.UK', 'TEL: 01536 607070', and 'WWW.ACRESINSURANCE.CO.UK'.

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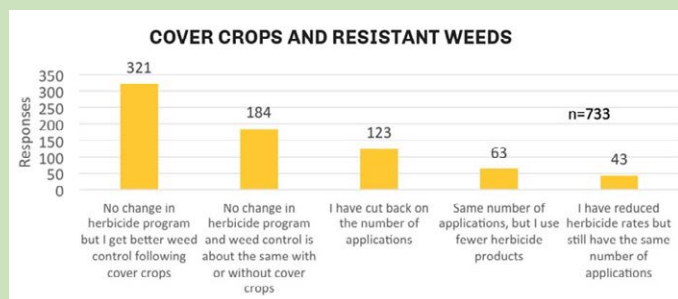
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concerned with people saying ‘You’ve got cover crops, you don’t need any kind of herbicide or weed control, that’s all you need,’ she says. “But they say it can provide another tool for weed control in addition to herbicide. For winter annual weeds, I think in general they think they can be pretty effective.”

In the 2016-2017 Cover Crop Survey Report, 44% of farmers said that while they’ve made no changes in their herbicide program, they’re getting better weed control following cover crops.



Best cover crops to begin with

For farmers who are hoping for benefits from the get-go, Kladvko says grasses like cereal rye, wheat or barley, are good ones to start with because they grow faster and have fibrous roots.

“Something with a fibrous root is going to help hold that soil together and help provide good cover,” she says.

For growers looking for some additional weed control, Groff says that cereal rye before soybeans is a good fit. In fact, the Cover Crop Survey Report specifically asked respondents about their experience with cereal rye on herbicide-resistant weed control, and 25% said they always see improved control following cereal rye and 44% reporting “sometimes.” The remaining 31% said they never see improved control.

Groff also recommends pairing oats with radishes, calling them the “cover crops with training wheels” because they’re hard to screw up. They also provide tangible benefits to the soil early on — the word Groff most often hears from growers is “mellow.” That mellowness is more noticeable with radishes because their deep taproot help alleviates compaction, but oats will also improve the soil tilth as its roots die in the spring.

Kladvko recommends that radishes not be used alone because their size can leave the soil erodible.

Management of the two is easy because they’ll both usually winterkill, so farmers don’t have to worry about having to deal with a living crop in the spring.

“It’s easier to plant into, you don’t need special equipment on your planter,” Groff says.

But they do have to be planted on time — at least 6 weeks before your average first killing frost — to achieve decent growth, which may be a challenge for farmers with later harvests in northern locations.

Black oats are another good beginner option that can be easily terminated with Roundup or a roller/crimper and

decompose quickly for easy planting conditions.

Legumes are another species Kladvko recommends for improving the soil structure, but unless they’re established early — in a corn-soybean rotation, they would need to be seeded before either crop was harvested — then they won’t achieve much growth in a fairly short window. In that situation, a grass is a better option.

4 tips for succeeding with cover crops from the start

Groff warns that while cover cropping is a simple concept, being successful with it is very complex. Below are some tips he has for setting yourself up for cover crop success.

1. **Treat your cover crops like your cash crops.** In all aspects, which includes preparing to plant them, knowing when to plant, and understanding that in some years it’s not going to be as good as others.

“Cover crops are just like cash crops,” he says. “Some years they’re phenomenal results and some years they’re lacklustre due to weather and mismanagement.”

He adds that cover crops will make a good farmer better and a bad farmer worse.

“Just because you have a bad year of cover crops doesn’t mean that you’re a bad farmer,” he explains. “It just takes another level of management. If you treat your cover crops like your cash crops, you’ll stand a much better success rate of making them pay and making them work.”

2. **Create or fulfill an existing planting window.** Farmers who take wheat off in the summer and don’t follow with a double-crop have the easiest way of jumping into cover crops because they have a wide window of planting and cover crop growth. But for farmers who are growing something like full-season corn and soybeans, their options — and chances for cover crop success — become more limited.

“Maybe you need to plant a field of shorter season corn or shorter season soybeans — take them off a week sooner, you’re setting yourself up for success then,” Groff says. “Because we’ve got good varieties out there now that are short-season, you’re not going to really sacrifice yield if you get the right one. You’re setting yourself up for a timely planting where you can actually see a difference. Success depends on management.”

3. **Find a mentor.** Anyone starting out with cover crops should find a mentor, and that doesn’t necessarily have to be a personal relationship, Groff says. Instead, farmers should look for the people who are achieving what they want to achieve and follow what they do.

4. **Choose your own way.** Everyone wants a cover crop recipe, but Groff says that like all other aspects of farming, farmers have to figure out their own road map.

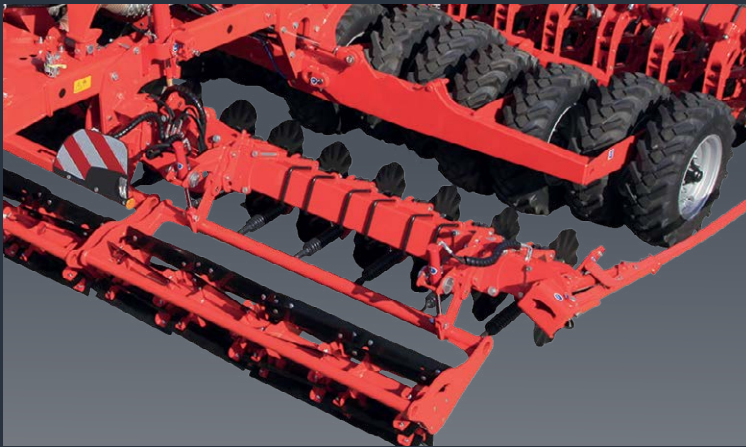
“Just like you choose the corn hybrid you plant, the soybean varieties you plant, you don’t plant the exact same thing as your neighbour probably,” he says. “Eventually you’ll do what works on your farm, and that goes from species to seeding rates to creative ways to get them planted sooner.”

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TARGETED & BROADCAST SPRAY - Combat herbicide resistance

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We have added to the previously launched See & Spray, to allow in crop targeting of weeds (See & Spray was for fallow ground only). See & Spray Ultimate currently only detects weeds among corn, soybean, and cotton plants. It uses cameras, processors, a carbon-fiber truss-structure boom and a dual product tank. It enables targeted application of non-residual herbicides on weeds within corn, soybean and cotton fields. It can also be used for traditional broadcast application, as well as targeted and traditional spray combined.

This strategy reduces crop stress by providing an effective weed-kill strategy, eliminating the chance weeds will rob plants of valuable nutrients and moisture, thus enabling crop roots to thrive. Plus, when using AutoTrac™ technologies, the sprayer will stay between rows and off the crop further reducing potential crop damage.

The dual-tank configuration lets you apply targeted spray and traditional broadcast at the same time, combining two passes in one to save you time and money. Target spray weeds and broadcast fungicide, or better manage weeds by applying a non-residual targeted spray and residual broadcast, all in one pass.

Using Targeted Spraying to kill weeds, it can be done at a lower cost by applying only what you need – when and

where you need it. Or, with the dual-tank capability of See & Spray Ultimate, use different chemical mixes independently of each other and at different target rates – all on the same pass. Plus, the amount of herbicide saved during Targeted Spraying can be used for a second and third pass during the growing season to address weed control all season long.

MEET SEE & SPRAY ULTIMATE

The cameras and processors are just the beginning. Discover how this See & Spray technology works.

Vision Processing Unit

Multiple processors across the boom use camera vision technology and machine learning to detect weeds from plants, and activate sprayer nozzles all within 200 milliseconds.



Cameras

36 cameras mounted across the boom scan more than 2,100 square feet (195 m²) at once.

Dual Product Solution system

The tank is split in two, with either 1,000 gallons (3,785L) or 1,200 gallons (4,542L) total capacity. Use two independent



tank mixes simultaneously with targeted spray and traditional broadcast spray, or a single, combined tank mix for either targeted spray-only or broadcast spray-only.



ExactApply™ Nozzle Control System

Individual nozzle control with ExactApply offers precise droplet sizing for a consistent targeted spray that also reduces over-application and off-target drift.

Carbon-Fiber Truss-Style Boom

The new, 120 ft. (36.6 m) carbon-fiber truss-style boom is lighter than steel, providing the stability needed to enable targeted spray.

BoomTrac™ Ultimate Height Control

BoomTrac Ultimate ensures consistent height control when traveling across uneven fields for precise application, with 25% better spray accuracy* than the next best manufacturer.

*Based on Iowa State University testing; scores represent composite data over a variety of terrains at factory-calibrated settings. Performance varies based on user-specified settings and adjustments. BoomTrac Ultimate tested on MY 2023 412R Sprayer with 36.6-m (120-ft) truss-style carbon fiber boom; NORAC installed on MY 2022 John Deere 4 Series Sprayer with 36.6-m (120-ft) steel boom; Raven AutoBoom XRT installed on MY 2022 John Deere 4 Series Sprayer with 36.6-m (120-ft) steel boom. Operated at 12mph and 30-in.



See & Spray™ Ultimate Agronomic Trial: Target Spraying with Dual Product Solution System for Waterhemp in Soybeans at V5 growth stage

Our study was conducted in an Illinois soybean field at the V5 growth stage to target spray for waterhemp in the summer of 2021. Using an enhanced herbicide program consisting of both targeted spray (non-residual) and broadcast (residual) tank mixes, and with higher sensitivity settings to study



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Results of Illinois soybean trial of See & Spray Ultimate with dual product system

Treatment	See & Spray product(s)	Broadcast product(s)	Weeds controlled
Single Tank Broadcast	NA	Dicamba Glyphosate Dimethenamid DRA, VRA	77 percent
Dual Product See & Spray	Dicamba Glyphosate DRA, VRA	Dimethenamid Glufosinate NIS	84 percent

Treated area was statistically equal for all See & Spray treatments. Broadcast assumed to be 100 percent hit rate.

weed efficacy, See & Spray Ultimate delivered 7% better weed control with 47% less herbicide volume used. These results are made possible by the dual product system,

green on brown soil. See & Spray Select can also spray both targeted spray and traditional spray in one pass, with a single tank mix.

	See & Spray Select	See & Spray Ultimate
Fallow use	X	X
In-season use		X
See & Spray + Broadcast	X	X
Single Tank	X	
Dual Product Solution System / Split Tank		
(NOTE: ability to combine tanks to use as full capacity See & Spray or broadcast)		X

which eliminates in-tank herbicide antagonism that reduces herbicide efficacy.

Our agronomic and product experts have and will continue to partner with state universities on additional trials, plus we'll continue to conduct our own strip trials to ensure our products and technologies help you gain improving yields, cost efficiency, and profitability in your operation.

Questions:

What's the difference between See & Spray Ultimate and See & Spray Select?

See & Spray Ultimate detects weeds among corn, soybean, and cotton plants. It uses cameras, processors, a carbon-fiber truss-structure boom and a dual product tank. It enables targeted application of non-residual herbicides on weeds. It can also be used for traditional broadcast application, as well as targeted and traditional spray combined.

See & Spray Select is for use in fallow ground only. It uses a colour-detecting technology to identify and target spray

Reference chart above for features:

Can I add See & Spray Ultimate to my current Sprayer?

No. See & Spray Ultimate is factory installed on new Sprayers only. It is not available as a Performance Upgrade Kit.

What model Sprayers is See & Spray Ultimate available on?

See & Spray Ultimate is only available on the 410R, 412R and 612R Sprayers.

What boom sizes are available on See & Spray Ultimate?

The 120 ft (36.6 m) carbon-fiber truss-style boom is the only boom size available for See & Spray Ultimate.

What are the dual tank split sizes available on See & Spray Ultimate?

The 410R Sprayer has a 1,000 gallon (3,785.4 L) tank with a 650/350 gallon (2,460.5/1,324.9 L) split. The 412R and 612R Sprayer have a 1,200 gallon (4,543 L) tank with a 750/450 gallon (2,839.6/1,703.4 L) split.





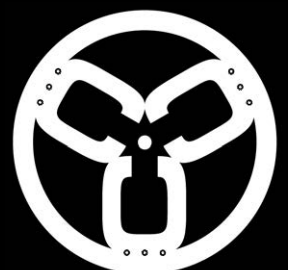
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GEORGE SLY - MANAGING DIRECTOR



FARMER FOCUS

JOHN PAWSEY



Since my last submission to Direct Driller Farmer Focus was September, I owe you a report on what we have stuck in the ground for harvest 2022 and how it's looking at the time of writing.

Buoyed up by my harvest 2021 organic oilseed rape crop, I planted a further crop in August but was persuaded that my previous mix of rape, fenugreek and beseem clover was not the way to go and that rape, buckwheat and a more frost intolerant variety of Tabor beseem clover was a more reliable option. Quite why I didn't ignore that advice given that my previous crop did so well is beyond me, as the new mix offered my oilseed rape to the flea-beetles for breakfast. It pretty much didn't even manage a true leaf. I visited David White in Little Wilbraham late in the autumn and his flea-beetle free diverse mix of all-and-sundry plus rape looked amazing. The organic grower can only plant companion species that will be taken out by a frost, whereas David can plant a much more diverse mix to confuse said insect and then tickle the unwanted plants up with a light dose of herbicide. David (all-the-tools-in-the-box) White as I affectionately call him.

I should point out at this juncture to save the younger reader from Goggling the word "frost" an explanation. In the 1970s sometimes the temperature would dip below freezing overnight (I know, it seems crazy. We wore real fleece from sheep in those days, not a pretend one made with petrochemicals), and when we woke up in the morning the grass was all white in the garden because the water on the leaves had frozen into beautiful crystals making everything look like fairy land. Also, the ground froze meaning that there was a huge amount of resistance in the soil and so we could take a 20 tonne tractor and a massive cultivator onto our ploughed fields to do some cultivating without damaging the soil. Now kids, Google "oxymoron".

My failed oilseed rape crop was re-drilled with vetches which looks fantastic.

We planted our usual amount of spelt which I love as it grows so tall by this time of the year it is taller than any of our weeds which makes the farm look amazing from the road. The same applies to Millers Choice heritage wheat which has the same positive visual effect for my farming neighbours. By the way reader, if you are thinking of growing any spelt, the only variety to grow is Zollernspeltz. Don't be persuaded otherwise by your seeds-person. If they try and tempt you to grow spring spelt, cancel your account with them immediately as they are idiots or ask for an extra gear on your combine harvester which you won't be able to afford the repayments on.

We have also planted 25 hectares of Wildfarmed Grain for musician turned farmer Andy Cato. Andy came to Shimpling Park Farm last year and annoyingly he was charming, handsome, knowledgeable and extremely tall. He also has



a full head of hair which I always hate on a man. I invited him for lunch and I am afraid to say that Alice Pawsey let herself down and her family down by swooning all over the poor chap. It was pathetic. He then broke one of our kitchen chairs by the simple act of sitting on it. I suggested to Alice afterwards that perhaps he was a little fat but she assured me it was muscle built up during the days when he worked his French farm with horses. Said chair is still broken because, "Andy sat on it". See what I mean?

I had the absolute pleasure of going to Andy's farm in Coleshill a couple of weeks ago and what he is doing there is truly inspiring and I seriously urge you to go if you ever get the chance. It's mind blowing. I travelled down to Andy's farm with Alex and John Cherry of Groundswell fame or as I tell my friends, I rode to Wiltshire with Regenerative Royalty.

All our winter wheat this year is a 50/50 mix of Extase and Siskin and all our winter beans have been sown with the same varieties with Vespa as a bicrop. Our harvest 2021 bean/wheat attempt was a little light on beans due to a low germination in the beans of 75%, so when it came to separating them in November last year, we had almost exactly one third beans to two thirds wheat but managed to raise the wheat grain protein by a percent which was encouraging. This year's bicrop has a much better bean establishment and looking at them today I would imagine that the ratio will be reversed. It will be interesting to see what that increased bean yield has on the quality of the wheat.

I've been pestering Josiah Meldrum from Hodmedod's for a number of years to grow some of their exotic pulses for them. Apart from Josiah also having a full head of hair (see Cato), he is a really nice man to deal with. There are some companies that whenever you work with them growing novel crops, you get the niggling feeling that you have taken all the risk and the price you get in the end from them didn't really reward you for your labours. I get a warm feeling when talking to Josiah and so we have got a bicrop in the ground of camelina and



lentils for him. Josiah said that the lentils will use the camelina as architecture to prevent them from going completely flat at harvest time making their August gathering a joy and I believe him. To be honest, even if it doesn't work, I will forgive him and grow more next year because he is such a lovely man.

Another great man to grow for is Peter Fairs from Fairking. Peter is the man we grew the first crop of organic chia for last year. If you are interested, it was the first crop of organic chia ever grown in the history of chia growing in the whole of the United Kingdom (just saying). It actually did incredibly well, and although it was relatively uncompetitive with weeds initially, we hoed it carefully once and then it grew up like a forest. I think we harvested it late September and Andrew Fairs (it's a family company), also having a Claas combine, (they have harvested chia on their own farm but it wasn't organic, hence my above undisputed claim), texted through the ideal settings and we roared through the standing crop with no problems. I put some hessian down on our ventilated grain store floors (it's a teeny tiny seed) and piled the chia in about a metre high and blasted it with ambient air for a

few days and then sent it off for cleaning. Anyway, we are growing some more for Peter this year in the same field as the camelina/lentil crop. The field in question is on a south facing slope (riotous laughter as I mention slope and Suffolk in the same sentence), so if they come on flower at the same time, the blue flowered chia below the yellow flowered camelina, means I will have sown a massive Ukrainian flag. I will be charging for photos.

We've managed to inter-row all of our crops once, which is all we ever do, apart from the spelt (see above) and all the under-sowing of fertility leys has been completed. Although we have had very little rain this spring to date, our crops still seem to be getting some moisture from our clay soils but the shallowly sown small seeded under-sowings could do with soft refreshing rain to get them going.

As you know, we organic farmers do a bit of cultivation to mineralise some of the goodness we have built up in our leys and to deal with some weeds. This year all of my spring sown crops were established after a green manure, grazed by sheep over the winter and then with three light and shallow passes with a cultivator we managed to get our crops in with much less soil disturbance than usual. You'd be proud of me.



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AGRONOMIST IN FOCUS...



CHRIS MARTIN FROM AGROVISTA

Industrial farming has been an incredible success story when it comes to increasing production. But many people, including me, believe this era is coming to an end. It is time to rethink the way we go about producing crops.

For the past few decades UK agriculture has become increasingly reliant on the can to control grass weeds, diseases and pests, and on heavy machinery to beat soil into submission to create seed-beds.

We've been fighting mother nature for the past 70 years, and we now need to work with her. The silver bullets we once had to control all manner of ills are not coming along as often and, when they do, they tend to break down more quickly to resistance pressures.

The ongoing degradation of biodiversity and soil fertility we have experienced is making agriculture increasingly reliant on these synthetic inputs to prop up the system. It will get worse and, at some point, it will fail.

Putting things right won't happen overnight. We need to wean ourselves off this industrial approach and adopt a hybrid model that incorporates the best holistic methods backed up by effective chemistry. We need to switch from degenerative to regenerative approaches.

Done correctly, this will result in:

- Better soil health to help optimise crop health and yield
- Maintained or enhanced crop yields to underpin returns and drive down production costs
- Improved farm profitability through targeted inputs and reduced establishment costs
- Enhanced carbon sequestration to tackle climate change and offer potential new income streams.

Regenerative agriculture has shot to prominence over the past couple of years in the UK, but many people are unsure what it entails.

I define it as a system of farming principles and practices that aims to reverse the errors created by previous unsustainable methods.



Cover Crops



Soil health

It works alongside nature to increase biodiversity, improve soils and protect the environment, while delivering benefits to humans through an improved natural environment and healthier ecosystems.

The journey towards regenerative agriculture can appear very daunting. However, I cannot emphasise enough that it is not prescriptive – how far people want to go down the more sustainable farming route is a personal choice. It doesn't have to be all or nothing; very useful effects can often be obtained from quite conservative tweaks, depending on the farm's current practices, and the process can be undertaken at a pace that suits the individual.

Some people might opt for a complete reboot, reassessing their system and introducing wholesale change. For others, it may be as simple as dropping a pass with a power harrow, or amending the rotation. There are plenty of stops where you can get off along the way.

Full-blown regenerative agriculture is based on five key principles:

1 Limiting physical and chemical disturbance of the soil

Reduced tillage can bring several advantages, including improved soil structure and stability, increased drainage and water-holding capacity and reduced risk of run-off and pollution of surface waters. It also results in significant savings in energy consumption and lower CO2 emissions.

Options will depend on a range of factors, including regional suitability, soil type and drainage, along with soil biology and chemistry, harvest residue management, resistant grass weeds and plant nutrition.

2 Keeping soil covered

Providing the soil with armour by employing cover and catch crops to maintain plant cover/residues at all times will protect the soil from adverse conditions, greatly reducing wind and water erosion and compaction, whilst preventing moisture evaporation and germination of weed seeds.

3 Keeping living roots in the soil

Ensuring living roots are always present will help improve soil structure and nutrient capture, while reducing soil erosion and building soil fertility and nutrition. Living plants are also essential for harvesting sunlight, our greatest resource.

4 Plant diversity

Increased diversity can be achieved by intercropping cash crops, improving crop rotations and using multi-species cover crops.

Growing a range of plants across the farm helps to improve crop resilience and optimise yields over time. A good mix of species will build a healthy soil microbial population and improve soil biodiversity, supplying plants with the nutrients they need, which greatly reduces the need for synthetic fertilisers.

5 Integrating livestock

This practice benefits soil health, animal health and the environment. Grazing animals after annual crop harvests aids in the conversion of high-carbon residues to low-carbon organic manure. Grazing on cover crops can allow more nutrient cycling from crop to soil and carbon sequestration into your soils.

By adopting some or all of the above principles to varying degrees that best fit a farm's individual circumstances, growers can start to improve the sustainability of their systems, building long-term soil health and functionality whilst maintaining farm yields and improving overall farm profitability.

So where do we start? There are several things we need to ascertain before any decisions are made: what is the current soil health status; what does the grower want to do; how can we enable that vision; how can we ensure progress remains on track?

"The journey towards regenerative agriculture is not prescriptive – how far people want to go is a personal choice"

- **What is the current soil health status?**

We must first understand the relationship between a soil's physical structure, its biology and the chemical processes within it. These are the keys to creating and maintaining healthy soils that are essential for crop and livestock production.

The whole process starts with a comprehensive soil test. If you don't measure, you can't manage. You have to know the starting point for the physical, biological and chemical properties of your soils.

- **What does the grower want/need to do?**

What is the main driver – is it long-term soil health, carbon capture, compliance with support schemes, or improving the legacy of the farm, for example?

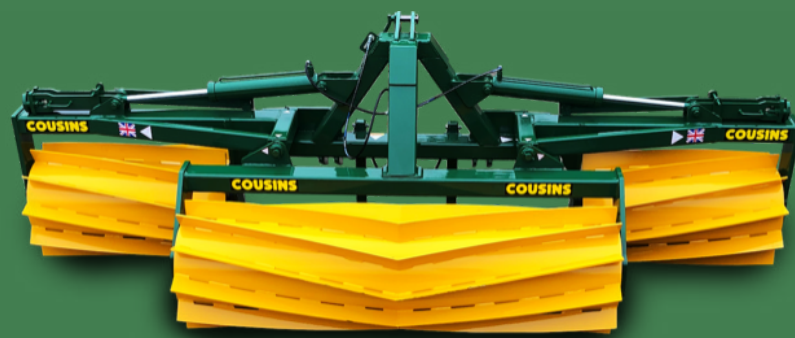
Where is the farmer in terms of the journey and where does he or she want to go? Most importantly,

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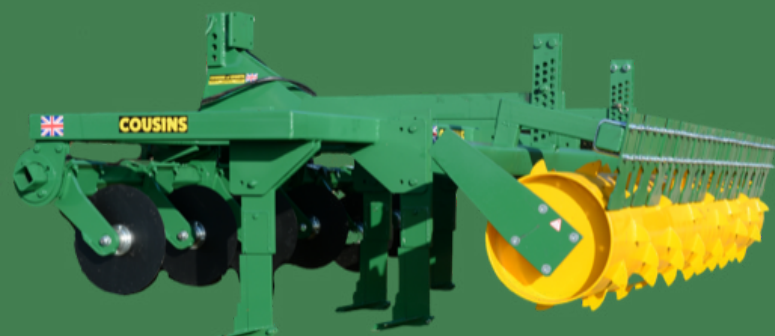
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be realistic. Is the land capable of delivering those aims? And what about the bottom line? The financials are often overlooked. Throughout this process, the farm must still make money. Many people say you have to take a hit in the first few years – buy a direct drill and the benefits will come. I fundamentally disagree – if you are not making money, the process will eventually fail, and you are putting your business at unnecessary risk.

• How can we enable the vision?

We can now decide what action to take, by examining how various farming practices affect soils and what needs to be done to deliver the desired changes.

Do we need to rethink the farm's machinery policy? Is the current rotation suitable to achieve the goals we have set? Do we need to rethink the whole production system?

There is no black-and-white answer – any advice must be tailored to an individual farm's needs, its ability to deliver, and the timeframe involved, based on the balance of probability of achieving the best outcome.

• How can we ensure progress remains on track?

We need to ensure we are using useful key performance indicators that are, above all, practical. Using definitive numbers may look and sound good, but they are often of limited use. The soil is a living, dynamic medium and I've yet to find a soil test that provides a definitive numerical figure that is both meaningful and fully repeatable. We need to be looking for trends to ensure we are going in the right direction, whether that be financial or physical.

There is no blueprint for success. We need to bridge the gap between the science and practical farming, and a degree of flexibility will be key.

Groundswell provides a great opportunity to explore the techniques outlined in this article, where you can hear about the theory and investigate the practical applications to improve your soil health and the resilience of your farming system.

Above all, choosing the right partner who can deliver the right advice based on sound knowledge and experience is a great first step to take. We at Agrovista are here to help you succeed.

Whether you are mildly curious or have already embarked on the journey, please do come along to our stand at Groundswell for a friendly chat and to see whether we can help you make the right choices to deliver your goals.

* Agrovista's Regenerative Agriculture Guide is available at www.agrovista.co.uk/agrovista-downloads. Other Agrovista guides including Cover Crops Guide 2021, Soil Health Guide 2020 and Guide to Cultivations and Drills for Combinable Cropping are also available to help growers explore sustainable farming principles.

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DRILL MANUFACTURERS IN FOCUS...



HIGH HOPES FOR HARVEST



With crops on the farm showing great promise, output prices at record levels and the family's agricultural machinery business operating at capacity, Suffolk arable farmer and inventor of the Opti-Till® direct strip seeding system Jeff Claydon is optimistic for the months ahead. But it is tinged with caution, the watchword in today's topsy turvy world.

25.05.2022

Whilst drafting my last article for Direct Driller, Russia had just invaded Ukraine, provoking military conflict and war in the country. Almost three months later, the catastrophe and humanitarian crisis continue with thousands killed, homes and cities destroyed along with millions displaced and seeking refuge. Global supply shortages have caused sky-rocketing prices with far-reaching and dramatic impacts.

In the agricultural sector, global uncertainties and a tightening of exportable surpluses have pushed combinable crop prices to previously unheard-of levels, with wheat currently trading at north of £300/t and oilseed rape over £800/t. Whilst this will benefit the arable sector, those in the livestock and poultry sectors are struggling.

Higher prices are quickly being reflected in the cost of food in the shops and if there is any positive to come out of the current situation it will be to make consumers reassess the importance of farming and what they eat. Back in the 1970s food accounted for a substantial proportion of a typical family's budget, but over the years governments of all persuasions have prioritised cheap food and it has fallen down the list of most people's priorities. For decades, the public has given little thought to food security, where it comes from or how it is produced; perhaps this will provide a wake-up call and encourage them to focus on the things in life which really matter.

Global agricultural production is forecasted to need to increase 60 per cent by 2050 just to keep pace with population growth. But, even as governments around the world stress the need for farmers to produce more, the legislation which they and other bureaucrats devise and sanction is restricting

our access to inputs and stifling yield growth. During the last decade production has plateaued and the current UK five-year average wheat yield is just 8.3t/ha, so something has to give.

A busy time

So much has happened here during the last three months that it is difficult to know where to start. Having just looked around the building site outside my office which will shortly form the new production and assembly area of the Claydon factory that is a good place to start.



With demand for Claydon products at record levels and our order books full for months ahead, I am delighted to see work on the new building progressing apace. Just this morning, for example, the four 3.2t gantry cranes which will move components and completed machines around the factory were delivered and installed.

Measuring 36m x 36m, the clear-span building will add 1300m² to our factory space and double production capacity. The plan is for it to come on stream in the summer, but we will announce that nearer the time. In the meantime, I would like to thank all our customers for their continued support and enthusiasm for the Claydon Opti-Till® System which has helped to generate additional customers and created the need for the new building.

Invest in the future

With production costs skyrocketing and inflation at its highest level for more than four decades, farmers are looking to reduce costs whilst maintaining or increasing production.

Rather than squandering any windfall from higher prices by continuing to operate inefficiently, forward thinking businesses recognise the need to invest in equipment and techniques which produce lasting benefits to help secure their future, so

interest in Opti-Till® is increasing.

This was confirmed at the start of the week when I and my team welcomed representatives from our distributors in Denmark and Germany who brought with them 25 existing and potential customers to see Claydon products being manufactured and tour our farm. This visit follows a series of visits by our importers and customers from Lithuania, Romania, and Poland. It was organised by Simon Revell, our Export Manager, and was at an ideal time of the year for visitors to see how well Claydon-drilled crops are looking.



As part of my presentation, I showed our guests a slide based on information produced by Harry Henderson, AHDB's Knowledge Exchange Manager – Cereals & Oilseeds, showing the cost of establishing winter wheat on 20 AHDB Monitor farms and the yields achieved by various approaches. Farm 12, with one of the highest yields of milling wheat but lowest establishment costs, was Rick Davies, a long-standing Claydon customer, who invested in a 3m Claydon Hybrid drill (upgrading to a 4.8m Hybrid in 2015) and a 7.5m Straw Harrow in 2010. Costs will have increased considerably since this data was produced but the proportional costs are really telling the story.

When discussing his reasons for switching to the Claydon System in an article published in Crop Production Magazine during 2015 he summed up a number of points so well that I have quoted him in the paragraph below.

"It is no exaggeration to say that the Claydon System has transformed the way we think about farming and how we actually farm. Having used conventional cultivations and become used to seeing perfect-looking seedbeds for so many years, moving to the Claydon System was a huge leap of faith and it took time to get used to the idea that it would look different. But the results prove that you cannot judge a crop by its initial visual appearance and what really counts is how much goes into the combine tank. Now that we have experienced the benefits we continually ask ourselves why we did not consider the move earlier. But had we not done so when we did we would not be in such a strong position today. I am very pleased that we made the transition voluntarily rather than being forced into it by a lack of profitability, as I suspect some will."

With some customers savings around £250/ha on their establishment costs and enjoying a yield benefit of up to 1.5t/ha the advantages are obvious. On the Claydon farm our goal is to achieve the highest outputs at the lowest cost, but that does not mean skimping on inputs; far from it in fact. Rather than spending vast amounts on unnecessary tillage we invest wisely in inputs which enhance and protect the potential value of our farm and crops.

This season all winter sown crops were drilled by mid-October, helped by the fact that Claydon Opti-Till® enables us to establish the crop in 20% of the time, at a fraction of the cost and using 10% of the fuel (<15 l/ha) compared with a plough-based system. High productivity counts for a lot when the weather is catchy, the window of opportunity is limited, and the number of drilling days are limited, while saving fuel has become essential at today's prices.

A dry start to the year

2022 has brought with it a very mixed bag of weather. Between New Year's day and today our farm weather station has recorded less than 170mm of rain, much lower than the farm's long-term average, while April brought more days with overnight frosts than without, slowing the crops' growth. Despite very little rain since 1 April, they have caught up well, highlighting the benefits of establishing good rooting structures to make best use of the moisture which is in the ground.

Whilst driving around the farm this morning I called in at '80-acre', a field which has been managed using the Claydon Opti-Till® System for 20 years and featured in Direct Driller throughout the season. All of it is into LG Skyscraper winter wheat, which despite the lack of rain continues to look very good. To date it has received just 180kgN/ha, plus the T0 and T1 fungicides, but holds great promise.

In the last issue of Direct Driller, I highlighted the importance of drainage and talked about an issue in the corner of that field where a decades-old tile drain had collapsed during the winter, resulting in a significant area becoming waterlogged. I had planned to sort it out after harvest, but the very dry weather allowed local drainage contractor W. R. Suckling & Sons to come in a couple of weeks ago and install new plastic pipes at a depth of 1m. They did an excellent job, and we will cross mole the area in the autumn if conditions allow or go through the following crop of spring oats early next year.

I also called in to check on the progress of our DK Excited hybrid oilseed rape which was drilled within three days of harvesting the previous crop of winter wheat on 15 August. We went directly into chopped straw and stubble using a pre-production version of our new Claydon Evolution drill and a seed rate of just 2.7kg/ha..

Experience has shown that the sooner we can drill oilseed rape behind the combine the better, as the plants are stronger and more able to fend off the Cabbage Stem Flea Beetle. The damp weather and slightly cooler temperatures after drilling, combined with the extra vigour of the hybrid seed, resulted in excellent establishment. Despite having received just 150kgN/



Jeff gives this crop of DK Excited oilseed the thumbs up.

ha the crop has developed exceptionally well and looks set to deliver a very high yield at harvest. With rapeseed prices currently around £800/t that would produce a very attractive margin.

This season's spring oat area is taken up by Lion, a new variety which, according to its breeder Elsoms, combines excellent kernel content and hullability, together with stiff straw and good agronomic package. With seed in short supply, we drilled the crop on 15 March at just 100kg/ha and to date it has only received 50kgN/ha, although another 50kgN/ha will go on shortly taking the total to 100kgN/ha.

'Lion', a new variety of spring oats, looks good despite a sowing rate of just 100kg/ha and little rain when this photograph was taken on 18 May.

Even with very little rain since it was drilled the crop looks excellent and last week I went through with a Claydon TerraBlade inter-row hoe to take out grassweeds growing between the band-sown rows before they had a chance to develop and compete with the spring oats. Growing conditions have been much the same as last year when this low input crop achieved over 7t/ha with excellent margins, so I am optimistic that it will produce excellent results.



Blackgrass growing between the band-sown rows of spring oats (above) was taken out by the Claydon TerraBlade inter-row hoe. After a few days it has completely died off, leaving the space between the rows clear.

And finally!

After 44 years' service the roof at Gaines Hall, our Grade II listed 16th Century farmhouse, is being rethatched, this time with wheat straw supplied by accredited master thatcher Harry Roberts of Harry Roberts Thatching Services.

Harry is one of the very few who grows his own straw, enabling him to offer a comprehensive field to roof service and ensuring the quality of materials is as high as it can be. He uses straw from Maris Widgeon, now a heritage variety, which was



Master thatcher Harry Roberts (left) working on the roof of Gaines Hall.



The straw is from a crop of Maris Widgeon which was established using the Claydon System.

originally developed in 1964 by the Plant Breeding Institute at Trumpington near Cambridge and has traditionally been used for thatching in the UK.

We chose Harry to do the job because he specifies that his straw crops are drilled with a Claydon drill. When I visited the farm which his brother-in-law Sam Clear owns to see it being produced Harry explained that sowing the crop in bands results in the wheat stems being much thicker, more resilient and of higher quality than those drilled at the conventional spacing. The crop is cut with a binder, stood in stooks for two weeks, then threshed in the traditional way to produce the best quality straw for thatching.

Harry is due to complete the work at Gaines Hall in June, so I am looking forward to seeing the final result. I will include a photograph of the finished product in the next issue of Direct Driller, as well as discussing the harvest and our plans for the season ahead.

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FARMER FOCUS

JULIAN GOLD



Following directly on from my January ramblings , I was lucky enough to have a couple of frosty nights in early Feb which allowed me to roll 30 Ha of cover crops with our 10 m roll on the controlled traffic wheelings. I got pretty well 100% kill on everything rolled in the early hours before the temperature climbed above about minus 2. The later areas rolled after daybreak did not fully die back and I had to re-roll them on the next (and last!) frost of the season to finish the job off.

After thinking for the last few seasons that I was getting negative effects in spring barley following grazed cover crops it was useful to be able to compare the two scenarios properly. The spring barley on both grazed and ungrazed blocks was from the same batch of seed drilled at the same time and the same seedrate with the dale drill. Establishment was approximately 50-60% in the grazed fields and 70-75% in the ungrazed fields and the crop on the ungrazed block has grown away better . I will be surprised if the yield is not significantly higher (will report back in due course after harvest)



Rolling on the frost

enough to get accurate yield data from the combine to see whether yield is affected.

This year we have grazed a much bigger area alongside ungrazed in the same field so should be able to get yield data. (NIABTAG were involved in a similar trial grazing wheat and sent leaves away for disease inoculum testing which showed massive reductions in Septoria and yellow rust infection in the grazed areas)

My thinking is that the most appropriate place to use sheep may be in this winter cereal grazing scenario , giving a number of possible benefits :

- Reducing disease inoculum
- reducing growth regulator use
- no detrimental effect on establishment (like we are seeing in spring barley after grazed covers) as crop already established before grazing
- possibly allows crops to be drilled earlier in September in good soil conditions and then use sheep grazing to obtain benefits of later drilling by removing pretty well all above ground leaf area and hence reduce Septoria and BYDV problems????

I am afraid my penchant for collecting drills is continuing .Following on from my thoughts in my last article we have ordered an Horizon disc drill complete with row cleaners to hopefully prevent the bad hair pinning we have previously experienced when using disc drills.

We have also purchased a Weaving IR drill to fulfil a large annual contract we have got undersowing maize with grass



Weaving IR Drill

Going forwards I am now thinking that fields destined for spring barley will be subsoiled straight behind the combine and then immediately sown with frost susceptible cover which will not be grazed and will be direct drilled into good soil conditions after frost/glyphosate destruction.

I can hear all the die hard "regen aggers" screaming what about livestock integration but luckily you will all be pleased to hear that I still see a need for livestock integration but maybe grazing winter cereals rather than cover crops.

For a number of years we have experimented fencing small areas in Winter Barley fields and mob stocking them sheep for a few days . Results have been favourable in that the crop has had less disease through the season and has ended up shorter at harvest time (good for us as we plant OSR into chopped Winter Barley straw so don't want much of it !)

Unfortunately, the areas involved have never been large



Factory maintenance in action

seed. Looking at the drill has also given me an idea for experimenting with it to sow inter row cover crops/clover understoreys in winter wheat in late spring. It already has a spare air outlet on the distribution head and with the purchase of one extra coulter we could space the units at 25cm to match a 6m drill planting cereals at 25cm row spacing. (presently have the Horizon ordered on 20cm row spacings but wonder if I should be re-thinking that??)

Moving to wider issues I am concerned that the current worldwide food crisis is starting to trigger comments in the media that UK agriculture should be binning environmental works and concentrating on out and out food production as if the two things were mutually exclusive.

I have an analogy that I like to use: Industrial businesses that have a production process housed in factory premises make their profit from goods rolling off their production line. They then divert some of their profit to maintaining the factory premises .They do this without grants or subsidies or

inducements because it is obviously good business sense to ensure the roof doesn't cave in and destroy the production process.

Similarly Agriculture is working within natural ecosystems that I see as the "Factory premises" For too long industrial agriculture has concentrated on the food production line and ignored the "factory premises" The reality is that we should all be prepared to divert profits towards "Factory maintenance" whether or not we are being paid by DEFRA to do so .(Hard Hat on !)

We are trying quite hard to carry out "factory maintenance" at Hendred Estate. One of our efforts is to try to bring as much diversity and habitats onto the farm to sit alongside profitable crop production. We have experimented for a number of years with companion cropping and clover understoreys but have found that there are a lot of practical problems and I am struggling to see how to roll these techniques out on a large scale at the moment. (Although I applaud the hard



100% kill of cover crop after rolling

work people like Andy Howard and others are doing to make these cropping systems more economically viable)

What we are doing is trying to bring habitats and diversity into fields by planting wildflower strips within fields. To further enhance these strips we have planted an experimental area within one north /south strip with Native hedging and Hazel coppice as a type of Agroforestry system. This should stretch the availability of pollen and nectar for beneficials as well as providing more habitat and carbon capture.

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TYRE MANUFACTURERS IN FOCUS...



TYRE TECHNOLOGIES TAKING SOIL PROTECTION TO THE NEXT LEVEL



With farm machinery getting increasingly heavier, tyre manufacturers are having to work harder than ever to ensure their products are keeping damage in the field to a minimum. Here we speak to Gordon Brookes, Customer Engineering Support Manager at Michelin, to learn more about the latest tyre technologies and why getting the set-up correct is so important.

Do you think agricultural operators are paying more attention to their tyres than they have in the past?

In a word, yes. It's no great secret that farmers with the optimum tyre and wheel configuration, set-up correctly, can reap many benefits over those that tend to overlook this crucial area of their machinery. After all, those large black, round, rubber things at the bottom of your tractor, harvester or sprayer are the only point of contact between the vehicle itself and the ground it's working on.

At Michelin, we have been championing the importance of tyre choice and running the correct tyres for the job, set at the right pressures for many a decade. Today the farming community is arguably better educated about these decisions than at any time previously, and most farmers understand the huge impact their tyres can have on the soil and the productivity of their fields.

Soil damage can hit your yields hard; it increases the risk of disease and can require major regeneration work to put right. For instance, ploughing or de-compaction consumes considerable fuel and time, ultimately hitting you in the pocket. The consequences of rutting can be equally bad, if not worse – nothing grows in a rut! They also encourage water stagnation, which can asphyxiate plants and encourage the development of disease.

The latest generations of high technology tyres on the market can really help farmers to reduce soil compaction and minimise rut formation – so it just makes perfect economic sense to opt for these over standard tyres.

What are the key things to consider when choosing your agricultural tyres?

The first step in the process is making sure you pick the right tyres for the application. You need to consider; where is the tyre going to be working – is it going to be mainly used in the field, or will it be doing a lot of road work? Other things to ask yourself, include; how big a tyre do you actually need for the power of your tractor, what loads will you be carrying, what implements do you intend to use, how are they operated in your system and how much load is required to transmit the power?

Once you've considered these main points, you'll be in a better place to make your selection although other considerations may still be required.

If possible, it's always worth specifying your preferred choice of tyre as original equipment. Although it may cost a little extra, getting the right tyre on your new machinery is worth the additional expense. Often, when people buy a new machine, it won't arrive with the most appropriate fitment for the job they want to use it for.

Not every tyre offered by the manufacturer is necessarily suitable. For instance, it may be able to handle the tractor in its naked capacity, but as soon as you stick a big heavy plough on the back, you may find that the tyres are not big enough to support that piece of equipment.

Getting it right at the start is definitely cheaper in the long run. If the tyres can't cope with the power, for example, then you can end up shredding the rubber in next to no time. Those tyres may have been a few hundred pounds cheaper than the ones you needed, but they've suddenly become a very expensive mistake!

How has tyre technology changed and moved forward in recent times?

It is approaching 40 years since Michelin first introduced flexible wall radial tyre technology into agriculture and since then, with the debut of even more flexible products including the Michelin EvoBib, CerexBib and AxioBib ranges, Michelin Ultraflex Technology has proved that tractor tyres can serve more than just one purpose.

By using Ultraflex Technology, the tyre can not only be used to improve tractive performance and reduce compaction in the field, but also it can significantly improve ride comfort, handling and fuel-efficiency on the road.

But, perhaps most importantly of all, running the right tyres at the right pressures will also minimise soil damage, which

subsequently improves your yields. Indeed, it has been scientifically proven by the agricultural experts at Harper Adams University that farmers utilising Michelin Ultraflex Technology tyres can improve yields by 4 per cent in comparison to standard tyres.

While the price of these premium fitments may be a little more costly than a standard agricultural tyre, the study also found that any increase in the initial outlay would be paid off within 12 months. And so effectively, once you have paid for your tyres in year one, you've recovered your investment, and typically farmers would be running those tyres for a lot longer.

Are there high-tech, low pressure tyres available for all agricultural applications?

Since the first Michelin Ultraflex Technology tyres were introduced to the market in 2004, we have been constantly developing and upgrading the portfolio to bring further improvements to performance and expanding the size range of these fitments, allowing them to work on more and more machinery.



Michelin's Ultraflex range is designed to cover the entire crop growing cycle, the full line-up available in the UK and Ireland includes AxioBib, AxioBib 2, EvoBib, XeoBib and YieldBib tyres for tractors, CereXBib and CereXBib 2 tyres for combines and forage harvesters, FloatXBib for self-propelled spreaders, SprayBib fitments for high-clearance sprayers, plus TrailXBib and CargoXBib High Flotation tyres for trailers.

These products have a larger footprint than conventional tyres, spreading the weight of the machine over a larger ground area. Increasing contact with the ground improves traction and decreases wheel slippage, which in turn allows farmers to spend less time in the field; improving productivity and saving fuel.

Ultraflex Technology tyres really can make a huge difference to soil protection. To put the 4 per cent yield improvement proven by the team at Harper Adams into perspective, the study suggested that if all agricultural vehicles in the main wheat-growing areas of the world fitted Ultraflex tyres, 23 million additional tonnes of wheat would be produced each year – that's a pretty significant figure!

What are some of the latest products from Michelin to hit the market?

In 2020, the Michelin TrailXBib was launched – enabling farmers to equip their entire tractor and trailer combination with Ultraflex technology tyres, with the choice of AxioBib 2,

XeoBib and YieldBib ranges for the tractor, and now TrailXBib for the trailer – meaning users can optimise the efficiency of their operation throughout the crop cycle.



Earlier this year, the Michelin SprayBib CFO was introduced to complement the non CFO SprayBib. Designed for sprayers or other applications that require narrow tyres, the SprayBib CFO offers increased load capacities of up to 14 per cent compared to the previous generation in cyclic field operation at 30 kph. While a reinforced casing allows added axle loads of up to 1.3 tonnes (depending on tyre size) at up to 65 kph.



Both ranges – as with all of Michelin's latest generation Ultraflex Technology tyres – benefit from a robust VF (Very High Flexion) casing. The VF rating sets new standards in the market, allowing the tyre to carry 40 per cent more load at the same pressure than a standard tyre.

By opting for these latest generation Michelin tyres, farmers can also utilise central tyre inflation systems (CTIS) – such as the MICHELIN Group owned PTG CTIS technologies – allowing them to easily adapt the pressures they are working at, at the touch of a button.

It's these constant upgrades that keep us ahead of the game when it comes to supplying the best agricultural tyres on the market. Huge amounts of time and money has gone into the research and development of these products, with the overriding focus to help farmers and contractors to get the absolute maximum performance from their machinery.

We understand the challenges faced by those working across the agricultural sector and are committed to playing our part to create a sustainable and responsible future for the industry.

FARMER FOCUS

NEIL WHITE



As I write I am sure we are all looking forward to Groundswell, getting off the farm is an important thing for many reasons. I still tell people about last years' experience and how much I learnt.

What a time to be a farmer, who could have predicted the chain of events leading up to this point, and I can't see anybody being able to confidently predict the next 12 days never mind 12 months!? Events have brought production costs and margins into sharp focus and the increased cost for many systems will be prohibitive. Its times like this I'm glad I looked at and started down a direct drilling route. Cutting out any prior cultivation means that although my Mzuri does move some soil and create tilth it establishes crops on my ground as efficiently as possible. I do still plough around 10% of my ground after drainage work or potatoes but that is also sown mostly with the Mzuri as this allows variable seed rate and placed fertiliser at sowing. I am up to 90% direct drilled now as the two systems, plough/power harrow drill and direct drill, run together for years were producing similar yields at very different margins.

This year I tried a winter cover crop consisting of Phacelia, farm saved beans and buckwheat. I looked at various mixes but following lots of American research, went for a simple 3-way mix. The research shows that below ground a 3-way mix can add as much as any larger mix and I was able to cheapen it further by using farm saved spring beans. This mix was sown Sep 3rd at 12kph one pass after the previous wheat crop was removed. In Scotland we are usually waiting for ground to dry enough so we can get on sowing, so an open cover was essential. The cover got a great start and finally the frost killed the buckwheat around Dec 1st, the cold also checked the beans enough to keep them manageable, the roots had lots of nodules, so job done. Everything was

then sprayed off, hen muck spread, and then Canyon oats for Quaker sown variable rate into the cover. We had a dry spell after sowing and while the oats emerged well, they maybe didn't tiller quite as much as usual, I don't know if this was just the dry or maybe something from the cover, but the ground conditions at sowing were ideal. The roots of the cover had kept the soil moist and loose, and the worm action made it appear like a grow bag mix. I only added 60kg of bagged N and today they look good. If the yield is good, it is something I will try again but maybe with a further reduction in applied N.

I did a few contract jobs for this harvest. Two of them were wheat direct into grass leys and then an interesting trial involving the Hutton institute. The trial, sown in April, was for a poultry farmer who is looking to grow home grown proteins in the mix making up his ration. This will be cut in one go with his combine. First sowing pass, beans 3 inches deep, and



either side out the coulter 1-inch-deep spring wheat. 2nd pass I nudged the GPS between the rows and at 1.5 inches deep the peas and either side 1 inch deep, Lupins. No peas on the tramlines, then plots of each individual crop. It got off to a difficult start capping a little in some wet then very dry weather, but I think this will be very interesting to see how it develops, I must admit combining it could be the real challenge.

Back at home I held an open day on behalf of NFUS and it turned out to be a big success. We had 60 people in the shed and field walk, all looking at my system and crops. I think we were all ready to come out and kick some tyres again. Some good questions, from glyphosate use to mistakes I've made in the past. I do wish I had taken photos of the terrible spring barley or osr that I had at the beginning. At the time I was just glad to learn and move on, not expecting to be telling others about it later. There is a huge interest in reduced tillage, and this magazine, I think Groundswell and honest feedback has helped me a lot, my concern is the Scottish government, and many others are becoming experts on what is best for my farm. Knowledge transfer must be run with a farmer-to-farmer focus, not just 'experts' or industry advisors at inflated prices. I still don't believe we have a reliable and standard way to measure farming's carbon footprint, but we are pushing on with grants, audits and soil testing not knowing ultimately what they hope to achieve! We face a dwindling choice of chemicals; I am practicing reduced use and IPM but a lack of choice usually compromises the effectiveness of a spray program. Like the improvements I have made on my farm, success comes through a combination of many methods, plant breeding, new chemistry, soil health, knowledge and tech must all be invested in and properly explored to maximise output on reduced inputs thus reducing our environmental footprint.



As a final note I must add, as a follow on to my January column that this area continues to look as good as it has ever looked. Winter and summer crops look great, they are at least 10 to 14 days ahead of last year but have lots of potential. I just hope we can harvest that potential and create a buffer in our businesses for whatever comes next.



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DRILL MANUFACTURERS IN FOCUS...



STRIGER STRIP-TILL FOCUS



Chris Platt

In response to the growing interest in minimal tillage cultivations, KUHN has developed its Striger strip-till range and will be showing the machine at Groundswell 2022.

Available from 4 to 12 rows, the Striger 100 is designed around a parallelogram system that allows all elements to operate independently, ensuring excellent ground following characteristics.

To achieve the optimum conditions for seed germination within the cultivated row, the Striger 100 comprises six key elements:

1. Ground following is achieved using the hydraulic parallelogram and the gauge wheels, with each element being independent of the frame and the other elements.
2. The opening disc cuts through any plant residues and creates a slot ready for the leg. As an option, a corrugated disc can be fitted which offers a better expansion of the furrow before the leg passes through.



3. Debris clearers remove any residue from the seed furrow to provide a clean seedbed. They can be lifted out when work is resumed in spring.
4. The leg and point cracks and loosens the seed furrow to allow good development of the roots. Working depth can be adjusted between 7 and 30cm without tools. To prevent soil ingress from the inter-row, the leg is independent from the deflector discs.
5. The deflector discs channel the flow of soil while creating a fine tilth. The inter-row remains intact and weed emergence is significantly reduced.
6. The rear press wheels reconsolidate the seedbed and avoid cavities in the seed furrow. The pressure is adjustable, and the press wheels can be raised during a pre-winter pass.

The Striger 100 can be adapted to work effectively in all conditions and can accommodate liquid, solid or slurry fertiliser applications. It can be used with varying inter-row widths and with a wide choice of working parts and equipment. It is available in 3m, 3.50m, 4.40m and 6m formats.

Yorkshire farmer, Chris Platt has improved soil health, reduced labour and fuel and saved time by choosing to strip-till his land. He has also introduced a way to use the machine to inject liquid digestate from his anaerobic digester before drilling maize.

Using the Striger, he makes only one pass before drilling maize which has brought huge time, fuel, and labour savings to the farm. "It is our primary crop, so any economies we can make



will all be seen when it comes to harvest. We used to spread the digestate on the land first then plough and then do another pass with a power harrow before being able to drill.

To drill he uses an 8-row KUHN Maxima TI L-E and alters the row spacings to enable it to follow the 6-metre Striger. "I can easily alter the row spacings from 750mm to 500mm. I have found this increases yield because the crop is competing for space, but still dies off in time for harvest. In the season to come we are going to use 12 rows rather than 8. This will make it slower, but we will still do more in the same time. 12 outlets

will make it easier to regulate the slurry too because we will have more outlets to apply into."

The one pass system also conserves moisture which is important when he moves from the water-hungry rye to maize in the summer. Making decisions on the farm has been made increasingly difficult by fluctuations in the weather. "2018 was dry, and we had to irrigate immediately after planting the maize. However, the one pass system conserves ground moisture, reduces machinery and cuts the reliance on labour by four men. This means I no longer need to work in slurry after a contractor has applied it, which helps to keep moisture in the soil."

The Striger has also helped Mr Platt to reduce the amount of diammonium phosphate (DAP) that he uses, because he is able to apply liquid digestate more accurately. "By using more liquid digestate we have reduced our DAP inputs. 30 cubic metres per hectare was the figure we settled on and my agronomist was very impressed with the way the Striger got the strips just right. He subsequently calculated that when we were spreading conventionally, we were losing 30% of the digestate compared to injecting it with the Striger."

In the future he is looking to further utilise the Striger for oilseed rape (OSR) cultivation. "Growing OSR is becoming more attractive, and it will make use of the Striger in the autumn. I can use it to cultivate a harvested wheat field, and OSR can take more slurry which will help us to be more efficient as the windows for applying slurry are shorter," he concludes.

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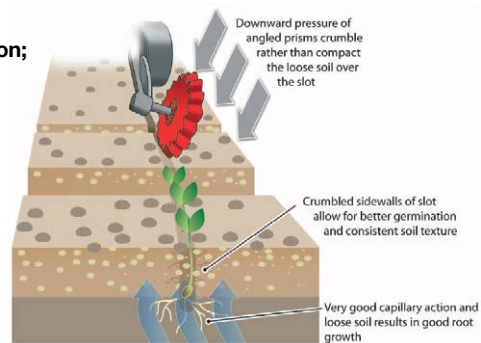
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NITROGEN FERTILISER APPLICATION STRATEGIES EXPLORED



Written by Mark Topliff - Lead Analyst: Farm Economics

It's been a challenging time for growers wondering what to do around their fertiliser buying and application strategies off the back of higher prices over the last few months. However, using one of AHDB's virtual farm models, analysis of the most common approaches shows that you won't go far wrong with any of them.

Five scenarios were explored based on three main approaches:

1. applying at the usual economic recommended amount in 2022 and 2023,
2. apply 75% of the typical application rate each harvest year 2022 and 2023
 0. using July 2021 and 2022 fertiliser prices or
 1. using November 2021 and 2022 fertiliser prices
3. apply 50% of the typical application rate each harvest year 2022 and 2023

0. using July 2021 fertiliser prices or
1. using November 2021 fertiliser prices

The virtual farm crops 428ha with 66% down to feed and milling winter wheats, 8.5% winter beans, 7% winter oilseed rape and 18.5% spring feed barley. The analysis used this rotation to examine five potential nitrogen (N) fertiliser strategies.

Results were calculated as total crop output minus total fertiliser cost – margin over fertiliser. The figures also took into account the impact on yields and futures prices of grains and oilseeds.

Yields were predicted to fall 2% under the economic optimum for winter feed wheat compared to 11% if AN (ammonium nitrate) fertiliser was applied at half rate. For winter rape this was a decline of 3% under the economic optimum and a fall of 9% if AN applied at 50% of the typical amount.

When averaged over 2022 and 2023

harvest years there was no real difference between the margins over fertiliser for the three scenarios where AN fertiliser was bought on July 21. Between £1,871 to £1,885/ha. The highest margin being due to higher use of N fertiliser in OSR and barley and hence less impact on yields. It was no surprise that scenarios 2b and 3 b's margins at £1,814 and £1,769/ha respectively were lower if fertiliser was bought at the higher prices in November 2021.

The right strategy will depend on the attitude to risk to yields and where you feel fertiliser and grain prices will go over the next 18 months or so. However, according to this scenario analysis, there is no significant difference between these expected common approaches. So whether fertiliser was purchased before the higher prices of late or not, some judicious reduction in application rates will pay off.

The timeline of the five scenarios investigated



Harvest year	Apply at economic optimum over the next two years	Split July 21 bought N fertiliser 75:25 over next two years plus top-up amount for 2023 harvest year	Split Nov 21 bought N fertiliser 75:25 over next two years plus top-up amount for 2023 harvest year	Split July 21 bought N fertiliser 50:50 over next two years	Split Nov 21 bought N fertiliser 50:50 over next two years
2021	Buy 1 season's worth of AN fertiliser at July 21 prices	Buy 1 season's worth of AN fertiliser at July 21 prices	Buy 1 season's worth of AN fertiliser at Nov prices	Buy 1 season's worth of AN fertiliser at July 21 prices	Buy 1 season's worth of AN fertiliser at Nov 21 prices
2022	Apply full amount of AN in 2022 harvest year Buy another season's worth of AN fertiliser at July 22 prices	Apply 75% of AN in 2022 harvest year Buy another 50% of season's worth of AN fertiliser at July 22 prices	Apply 75% of AN in 2022 harvest year Buy another 50% of season's worth of AN fertiliser at Nov 22 prices	Apply 50% of AN in 2022 harvest year	Apply 50% of AN in 2022 harvest year
2023	Apply full amount of AN in 2023 harvest year	Apply the remaining 25% of 2021 N fert plus the additional N bought in 2022	Apply the remaining 25% of 2021 N fert plus the additional N bought in 2023	Apply the remaining 50% of AN in 2023 harvest year	Apply the remaining 50% of AN in 2023 harvest year

Predicted impact on crops yields (average of 2022 and 2023 harvests compared to a 2021 baseline)



Crop	Apply at economic optimum over the next two years	Split July 21 bought N fertiliser 75:25 over next two years plus top-up amount for 2023 harvest year	Split Nov 21 bought N fertiliser 75:25 over next two years plus top-up amount for 2023 harvest year	Split July 21 bought N fertiliser 50:50 over next two years	Split Nov 21 bought N fertiliser 50:50 over next two years
Winter feed wheat	-2%	-4%	-4%	-11%	-11%
Winter milling wheat	-2%	-5%	-5%	-12%	-12%
Winter OSR	-3%	-4%	-4%	-9%	-9%
Spring feed barley	-4%	-4%	-4%	-9%	-9%

Note: Yield response based on ADAS reports: Review of how best to respond to expensive nitrogen fertilisers in 2022 (part one) and Review of how best to respond to expensive nitrogen fertilisers in 2022 (part two)

Margin over fertiliser* by scenario (£/ha)



Harvest year	Apply at economic optimum over the next two years	Split July 21 bought N fertiliser 75:25 over next two years plus top-up amount for 2023 harvest year	Split Nov 21 bought N fertiliser 75:25 over next two years plus top-up amount for 2023 harvest year	Split July 21 bought N fertiliser 50:50 over next two years	Split Nov 21 bought N fertiliser 50:50 over next two years
2022	£2,146	£2,085	£1,942	£1,988	£1,885
2023	£1,596	£1,685	£1,638	£1,757	£1,654
2022/23 average	£1,871	£1,885	£1,790	£1,873	£1,769
AN fertiliser quantity applied as % of 2021 rate (2022/23 average)#	87%	75%	75%	50%	50%

*Total crop output minus total fertiliser cost. Rotation average of winter feed and milling wheat, winter oilseed rape, spring barley and beans.

#The 2021 application rate is the typical RB209 application rates for the crops found in the AHDB virtual farm

About the figures

- According to fertiliser delivery patterns in the last 2 years, July and Nov are the most common for straight nitrogen on arable farms. Source: AIC
- Fertiliser prices in 2020 and 2021 are sourced from AHDB's monthly fertiliser prices survey Fertiliser information | AHDB
- AN fertiliser prices for July 2022 and November 2022 are assumed to be £900/t based on recent energy price increases which are assumed will remain high for the remainder of 2022
- Grain and oilseed prices and futures are sourced from AHDB market prices Cereals and Oilseeds markets | AHDB

Fertiliser prices used:

o Imported AN prices

- July 2020 @ £200/t
- July 2021 @ £311/t
- Nov 2021 @ £638/t
- July/Nov 2022 @ £900/t (AHDB forecast)

o TSP

- July 2020 @ £251/t
- July 2021 @ £559/t
- Nov 2021 @ £715/t
- July/Nov 2022 @ £745/t (AHDB forecast)

o MOP

- July 2020 @ £307/t
- July 2021 @ £474/t

- Nov 2021 @ £525/t

- July/Nov 2022 @ £665/t (AHDB forecast)

Futures grain and oilseed prices as at 29 April 2022:

o Feed wheat

- Nov 2022 @ £299/t
- Nov 2023 @ £262/t

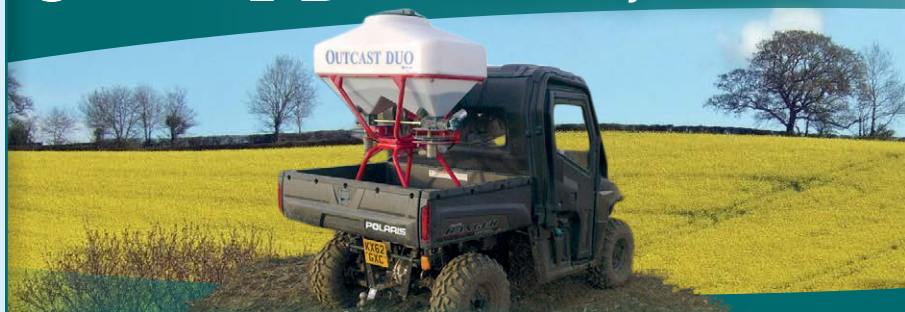
o Milling wheat

- Nov 2022 @ £320/t
- Nov 2023 @ £292/t

o Feed barley

- Nov 2022 @ £289/t (£10 less than feed wheat)
- Nov 2023 @ £252/t (£10 less than feed wheat)

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WHAT COULD THE IMPACT BE ON HARVEST 2023 FROM HIGH INPUT COSTS? AHDB

Written by Vikki Campbell - Arable Market Specialist Manager



I have looked through the impact Mark's nitrogen fertiliser application scenarios (previous article) could have for harvest 2022. But what about harvest 2023?

We looked at gross margin calculations for harvest 2023, the reality showing that, unsurprisingly, margins could well be squeezed to a greater degree next season due to the higher input costs. These higher input costs could see some either reduce their nitrogen applications, reduce their cropping areas, or both. These adjustments could be necessary for businesses to optimise their margins, or because of a less liquid cash flow. So, for harvest 2023, there are a couple of variables we need to consider. Firstly, there are the adjustments in nitrogen fertiliser application. Secondly, there are potential reductions in area of certain crops. The scenarios below outline the potential implications of these variables on production for the 2023/24 marketing year.

Introducing the different scenarios

Four different options have been considered for this modelling work.

The first would be a benchmark i.e. assuming there is no difference in area for harvest 2023 than that estimated by the Early Bird Survey for harvest 2022.

The following three scenarios all see key cropping areas reduce by a set percentage. Wheat is assumed to see the greater area reduction, due to the higher input costs. Area reductions are taken against the area forecast in the Early Bird Survey for harvest 2022.

Against these different area scenarios, the following nitrogen fertiliser application strategies are overlaid.

These options, originally explained by Mark's analysis, would see fertiliser either applied at the economic optimum, 50% of typical application rates or 75% of typical application rates. A point to note here is that the higher input costs for next season would see a yield reduction in all three cases.

If we take a no change in area to be based upon the planting intentions for 2022 outlined in the Early Bird Survey this year, the rise in input costs mean that if fertiliser is applied at the economic optimum, a reduction in production is seen across all crops.

So, what could the impact be on production for harvest 2023?

The table below highlights that, in all circumstances, we could see a production decline in wheat, barley and oilseed rape (OSR) for harvest 2023. The most minimal impact would, unsurprisingly, be felt if no area change is seen on the year and fertiliser is applied at the economic optimum.

Moving down the scenarios, the greatest impact is felt with the largest area reductions and at 50% application rate of fertiliser.

However, there are several key points and caveats that need to

Scenario descriptions



Scenario	Description
No change	Areas remain the same as EBS 2022 planting intentions
Scenario 1	Wheat area reduces by 1%, no change to barley and OSR
Scenario 2	Wheat area reduces by 3%, barley and OSR area reduce by 1%
Scenario 3	Wheat area reduces by 5%, barley and OSR area reduce by 3%

Nitrogen fertiliser application scenarios - yield impacts



Crop	Apply at economic optimum for harvest 2023	Split July 21 bought N fertiliser 50:50 over next two years (application rate @ 50% typical)	Split July 21 bought N fertiliser 75:25 over next two years plus top-up amount for 2023 harvest year (application rate @ 75% typical)
Winter feed wheat	-4%	-11%	-4%
Winter milling wheat	-4%	-12%	-5%
Winter OSR	-6%	-9%	-4%
Spring feed barley	-8%	-10%	-4%

be taken into consideration with this modelling work. Firstly, these production figures are assuming average yields. Obviously, there is a lot of time and weather between now and harvest 2023 that can affect growing conditions. Secondly, there is the fluctuation of fertiliser price and availability, particular over the coming months when it will be being purchased. The most recent anecdotal quotes for nitrogen fertiliser are around £705/t, a fall from the £839/t being quoted in March. However, availability remains challenging and

further price volatility is not off the table, especially considering the current natural gas forward prices. Thirdly, there is the price of grain itself, and the potential margin it could offer for growers. UK Nov-23 futures closed yesterday at £270.65/t. This is a rise of £96.60/t since the contract opened last July and £106.15/t more than where the Nov-22 contract sat at this point last season. And fourthly, if farmers cut area in the light of higher input/fertiliser costs, they will normally cut least-productive land first. This could mitigate the yield

impact from fertiliser application reduction to some extent.

What could this all mean?

All the while the global supply shocks continue, driven by the conflict in Ukraine and weather worries in global exporters, volatility in both input and output costs will remain. As ever, margin is a key element when considering planting intentions. However, the availability of cash flow could be a hurdle for some when looking to optimise crop potential.

Production percentage change from harvest 2022

AHDB

Thousand hectares	EBS Forecast 2022	Average yield 2017-21*	BAU production*				50% of usual application rate				75% of usual application rate			
			No change	Scenario 1	Scenario 2	Scenario 3	No change	Scenario 1	Scenario 2	Scenario 3	No change	Scenario 1	Scenario 2	Scenario 3
All wheat	1,805	7.95	-4%	-5%	-7%	-9%	-13%	-14%	-16%	-19%	-5%	-6%	-8%	-10%
Winter barley	421	6.90	0%	0%	-1%	-3%	0%	0%	-1%	-3%	0%	0%	-1%	-3%
Spring barley	687	5.71	-3%	-3%	-5%	-7%	-4%	-4%	-6%	-8%	-2%	-2%	-3%	-5%
Total barley	1,107	6.13	-1%	-1%	-2%	-5%	-2%	-2%	-3%	-5%	0%	0%	-1%	-3%
OSR	359	3.31	-6%	-6%	-8%	-10%	-9%	-9%	-10%	-13%	-4%	-4%	-6%	-8%

Source: AHDB, Andersons, Defra

*BAU = applying fertiliser at the economic optimum



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ANALYST INSIGHT: HOW ARE MARGINS LOOKING FOR HARVESTS' 22 AND 23?



Written by Megan Hesketh - Senior Analyst - Arable



We are fast approaching harvest 22 and looking now to harvest 23 for cropping decisions, but the cost and margin picture looks very different to this time last year.

UK feed wheat new crop futures (Nov-22) closed yesterday at £340.10/t. This is almost double the price from this time last year, where new crop futures (Nov-21) closed at £178.75/t (18 May 2021). A tight supply and demand balance for grains across the board, intensified by the outbreak of war between Russia and Ukraine, has driven values to record highs in recent months.

Though input costs have been rising too. This season-to-date (Jul-Apr), UK produced AN (34.5% N) prices have averaged £601.00/t, up 138% (+£349.00/t) from the average over the 2020/21 season.

Today, I explore how this changing picture has impacted on gross margins.

The aim of these figures is to not directly indicate how much profit can be made by each crop, because variable costs will differ by farm. It is more to understand a difference in profitability by year, and to support

	Gross margin £/ha	Yield	£ output per £ VC*	Rank	Change on harvest 21
Winter milling wheat	1759	7.95	2.93	1	Unchanged
Winter feed wheat	1617	7.95	2.96	2	Up 1
Winter OSR	1511	3.31	2.89	3	Down 1
Winter feed barley	1341	6.90	3.02	4	Up 1
Spring malting barley	1258	5.71	3.52	5	Down 1
Winter milling oats	1207	6.14	4.54	6	Unchanged
Spring feed barley	1160	5.71	3.32	7	Unchanged
Winter feed beans	1065	4.20	3.94	8	Up 1
Winter rye	1062	5.90	2.89	9	New entry
Winter triticale	1044	5.35	3.17	10	New entry
Spring feed beans	980	4.00	3.57	11	Down 1
Spring milling oats	943	5.37	3.29	12	Down 4
Spring feed oats	881	5.37	3.14	13	Down 2
Winter linseed	808	2.20	2.58	14	New entry
Spring linseed	730	1.90	2.78	15	New entry

*£ of output (yield x price) for every £1 of variable cost
Source: AHDB Analysis, The Agricultural Budgeting and Costing book, Industry contacts, Defra

	Gross margin £/ha	Yield	£ output per £ VC*	Rank	Change on harvest 21
Winter milling wheat	1561	7.95	2.41	1	Unchanged
Winter feed wheat	1449	7.95	2.46	2	Up 1
Winter OSR	1346	3.31	2.40	3	Down 1
Winter milling oats	1207	6.14	4.54	4	Up 2
Winter feed barley	1205	6.90	2.51	5	Unchanged
Spring malting barley	1165	5.71	2.97	6	Down 2
Spring feed barley	1067	5.71	2.80	7	Unchanged
Winter feed beans	1034	4.20	3.63	8	Up 1
Winter rye	952	5.90	2.42	9	New entry
Winter triticale	950	5.35	2.65	10	New entry
Spring feed beans	949	4.00	3.31	11	Down 1
Spring milling oats	858	5.37	2.73	12	Down 4
Spring feed oats	797	5.37	2.61	13	Down 2
Winter linseed	706	2.20	2.15	14	New entry
Spring linseed	656	1.90	2.36	15	New entry

*£ of output (yield x price) for every £1 of variable cost
Source: AHDB Analysis, The Agricultural Budgeting and Costing book, Industry contacts, Defra

decision making for harvest 23 cropping. These figures may also give an indication of what the UK planted area may look like too.

Harvest 22 – costs high but prices higher...

Using two scenarios, profitability between crops can be assessed for harvest 22. For many businesses, the story will rely on price paid for fertiliser and this impact on variable cost for harvest 22.

The first scenario takes an average season-to-date for UK produced AN 34%, Muriate of Potash and Triple Super Phosphate. The second scenario takes the top recorded prices this season for these three fertilisers, to compare profitability.

Perhaps to no surprise with strong global wheat values supporting UK feed wheat futures, milling wheat and

feed wheat are top performers in both scenarios. Though the difference in the price paid for fertiliser makes a large difference in gross margin.

For the milling wheat premium for harvest 22, this uses an average for the 2021/22 season to date. This season's average has been higher on the year due to the current tight supply and concerns around milling wheat availability. As such, milling wheat gross margins look attractive for harvest 22 especially in scenario 1.

Oilseed rape follows closely behind, considering high prices supported from inelastic demand for rapeseed and rapeseed oil. However, new-crop (Nov-22) prices are lagging previous May-21 highs, as supply is expected to improve globally next season. However, crush demand is set to be firm also, which could keep balances tight in the first half of the marketing year.

Gross margins for Harvest 2023



	Gross margin £/ha	yield	£ output per £ VC*	Rank	Change on harvest 22 scenario 1
Winter milling wheat	1202	7.95	2.18	1	Unchanged
Winter feed wheat	1193	7.95	2.30	2	Unchanged
Winter milling oats	1155	6.14	4.39	3	Up 3
Winter OSR	1108	3.31	2.24	4	Down 1
Spring malting barley	960	5.71	2.73	5	Unchanged
Winter feed barley	941	6.90	2.27	6	Down 2
Winter feed beans	859	4.20	3.18	7	Up 1
Spring milling oats	846	5.37	2.83	8	Up 4
Spring feed barley	837	5.71	2.51	9	Down 2
Spring feed beans	782	4.00	2.90	10	Up 1
Winter triticale	766	5.35	2.43	11	Down 1
Winter rye	751	5.90	2.20	12	Down 3
Spring feed oats	748	5.37	2.62	13	Unchanged
Winter linseed	525	2.20	1.91	14	Unchanged
Spring linseed	496	1.90	2.09	15	Unchanged

*£ of output (yield x price) for every £1 of variable cost

Source: AHDB Analysis, The Agricultural Budgeting and Costing book, Industry contacts, Defra

oats performed higher than winter rapeseed for harvest 23. We can explain this through reduced applications of fertiliser filtering into reduced variable costs.

Winter rapeseed margins look to remain favourable for harvest 23. Will the price incentive be enough for farmers to consider growing more? There are still the same issues surrounding cabbage stem flea beetle (CSFB) and impact on yield. But this year's crop conditions have not noted significant damage.

However, in regard to break crops, feed beans and winter triticale look to deliver a higher output per £1 spent on variable cost. The pulses market can be variable at times, but crops

Linseed, however, is understood now to be trading separately to oilseed rape. As a result, this crop may not have benefitted to the same extent from rapeseed's price highs.

Harvest 23 – prices lower than harvest 22, but costs to remain high?

Looking to harvest 23, costs look to remain high. Nov-23 UK feed wheat futures prices too look to be firm. Yesterday, the contract closed at £280.20/t. Though is this enough to offset high prices?

Using AHDB forecasts for potassium and phosphate costs, and using CF fertiliser's latest price for September delivery, margins look to be squeezed compared to harvest 22.

Even if there was a timely end to the war in Ukraine, destruction to Ukraine's export infrastructure will cause longer term challenges. This adds to the global tightness outlook for the medium term, still further supporting 2023 wheat prices. As such, milling wheat and feed wheat remain top performers.

However, the difference between the two looks narrower than harvest 22. For harvest 23, we have used a 5-year average premium to calculate the milling wheat price. This is despite the past two years seeing firmer premiums. Should the milling wheat

balance remain tight next season, we could see this premium increase, especially as harvest 23 approaches.

Looking to other crops, milling

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require lower inputs and benefit fields though nitrogen fixing. Something to consider in another high-cost year.

Conclusion

Perhaps unsurprisingly, when you purchased your fertiliser and how much you paid for it will be a big factor in your gross margin picture for harvest 22.

Looking forward to harvest 23, UK feed wheat prices look firm for Nov-23, but rising input costs will be a challenge. Purchasing your fertiliser will be something to think about, considering prices for AN are now available for September delivery. However, cash flow will remain a key concern to many, given the increase in input prices.

Also, a price output per £1 spent on variable cost will be something to consider, given the rising cost picture.

For help assessing how your farm performance currently, Farmbench is a useful tool available from the AHDB.

Notes on calculations

o OSR price does not include oil bonuses.

- Winter rye and winter triticale are priced as feed grains.

- Premiums and discounts

o For harvest 22, premiums and discounts calculated from season to date 2021/22 data, as this is the most representative for current trading.

o For harvest 23, premiums and discounts calculated as 5-year averages (2016/17 – 2021/22).

- Grain prices calculated using UK feed wheat futures, recent 4-week average.

- Rapeseed prices calculated using Paris rapeseed futures, recent 4-week average.

- Cereals seed costs are modelled on the historic relationship between the price of grain in the preceding season and the price of seed for the year of planting.

- With a weaker relationship between oilseed rape prices and cost of seed in the following season, historic seed values have been carried forward.

- Crop protection costs and sundries have been adjusted 17% in line with Defra's Agricultural input inflation.

- Yield calculated using Defra 5-year average (2017-2021) or ABC book where applicable.

Fertiliser costs.

o Harvest 22 scenario 1 – calculated using an average of the 2021/22 season-to-date (Jul- Mar) data.

- AN UK produced (34.5%) = £601.00/t.

- Muriate of Potash (MOP) = £512.00/t.

- Triple Super Phosphate (TSP) = £556.00/t.

o Harvest 22 scenario 2 – highest price recorded this season-to-date.

- AN UK produced (34.5%) = £839.00/t.

- Muriate of Potash (MOP) = £664.00/t.

- Triple Super Phosphate (TSP) = £746.00/t.

o Harvest 23 – calculated using AHDB forecasts used also in the fertiliser application strategies analysis.

- The UK produced AN price uses CF fertiliser's latest price for September delivery at £705.00/t.

- Muriate of Potash (MOP) = £665.00/t.

- Triple Super Phosphate (TSP) = £745.00/t.

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TIM PARTON



Yet another challenging Spring! Don't you just love farming! It's what I love most even though I moan (according to my wife) but if it was easy, everybody would want to do it! Every year is a new challenge, bringing new decisions, sometimes things go wrong sometimes they work spectacularly well.

Canola was drilled the first week of September in a field crawling with Flea beetle (even I was concerned). As usual I started the plant off with placed balanced nutrition and much to my delight the flea beetle disappeared, since no food was available because the plant was synthesising correctly, putting the right sugars out as exudates and not having a build-up of mono saccharides (within the plant), which is pure food for the beetles. All Canola was drilled with white clover, Burseem clover and Crimson clover. First time for me growing Crimson clover which is quite dominant and has certainly taken over in any poor patches! Problem or opportunity? I always try to look for the positives in life, so a new riddle has been ordered for my Grain cleaner, which hopefully will enable me to clean out the clover and re-grow! Ever the opportunist.



I have 14 different trials on the go this Spring which as you all know generates work within itself. If I have a new idea, I need to get on with it or I'd have to wait a whole year before trying it out. Nick Woodyatt and I have been kept busy as ever keeping the farm moving forward. Wheat has been grown with 50kg of soil applied N and then monitored through sap testing at Novacrop. I gather a lot of people have had trouble getting samples across, maybe I have been lucky, but all samples so far have gone through fine. I am using the amide N from Aiva fertilisers which I apply with whatever nutrient the plant requires to keep it balanced. At the time of writing once again no fungicides have been used, with the wax on the wheat leaves simply glowing and standing proud with its full armour on ready to withstand attack! I am growing some Spring barley with just amino



acids this time being an Organic form from Mike Harrington and more Carbon positive. "What do points make?..... Money!" (in the form of more Carbon to sell). Results will be revealed in my next article along with the other trials. Most foliar applications are now done at night since there are obviously no UVs (scorch or biological terminator) at this time. Additionally, the plant does 80% of its growing while most of the general population are asleep, which is the perfect time to add a foliar in my opinion with test results backing this up.





Spring Beans were drilled on the green and using the crimper roller that Trevor Tappin built for me. It worked very well as ever, with each roller being independent and able to follow the contours of the land, along with being able to set the pressure to suit the crop on the roll using air, I was able to achieve the perfect crimp! Cover crops were a little uneven here due to the very dry start they had last year, which meant I also needed a low dose of glyphosate to finish the crop off. Beans were drilled with a compost tea, from a 1:1 F/B compost made on farm in my new extractor/ brewer, which has worked fantastically well! I have been a little better off for rain this Spring, than I was last year (desert) and the whole farm looks very well at the time of



#GFC22 on the 25th May, along with Trinity AgTech and our sponsors - Edaphos, Oakbank Game and Conservation, Severn Trent Water, Soil First Farming, Kings Crops, Indigro. A good day was had by all. Carbon and biodiversity are going to play a big part of our incomings going forward and will become the norm for future generations of farmers.

Trinity AgTech launched their grassland module for permanent grassland and Severn Trent Water launched some of their new catchment area schemes, which were welcomed by those in the catchment areas.

Hope to see you at Groundswell and I wish you all a successful harvest.



writing (which has probably put the kiss of death on it!) But it really is nice to see the whole farm functioning well and work coming together. For anybody just starting off on the journey, firstly, well done for starting and secondly, always remember where you are heading and what you want to achieve; as it doesn't always go as planned and can be challenging, but isn't that the roller coaster of life? You must have the dips to appreciate the highs and one would get bored if it was continuing highs!

I have also been kept busy this Spring with my colleagues at The Green Farm Collective, holding our first conference



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DRILL MANUFACTURERS IN FOCUS...



SOLAR-POWERED SEED-N-WEED ROBOT WITH SIMPLICITY ON ITS SIDE

A fully autonomous, solar-powered robot capable of precision drilling and weeding has joined the OPICO line up and will be on display at Groundswell this June.

Offering pesticide-free weed control with zero fuel and minimal labour bills, the FarmDroid is the brainchild of two Danish farmers and takes a really simple approach to how it works.

The FarmDroid uses ultra-accurate GPS to record exactly where it places each seed. Then on each subsequent weeding pass it has no need to identify what's a weed and what's not – it simply knows where the crop plants should be and works around them, hoes shares running between each row and blades slicing off anything between each crop plant, in the row.

This approach means that unlike other similar machines, it doesn't need to employ banks of high-definition cameras

and complex computers to identify and target weeds. It also means the machine can start the weeding process before the crop has emerged because camera recognition is not required.

Its simplicity is just one of a number of features that set the machine apart from anything else on the market.

Being solar-powered, FarmDroid owners don't have any fuel bills for the machine. Not only does this have a clear impact on the bottom line with today's increasingly volatile energy markets, it's also environmentally friendly. In a future where food retailers are progressively looking to be perceived as 'green' with carbon audits becoming more and more common, the FarmDroid can help provide one step towards energy self-sufficiency (and herbicide-free crop production).

With in-row and inter-row action it eliminates weeds both

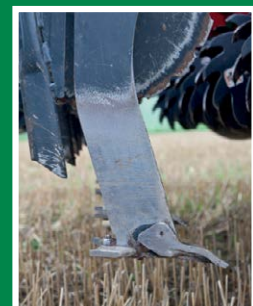


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between the rows and between the crop plants. Capable of working right to up within 5mm of each seedling between the rows and 20mm in the row, the FarmDroid's shares mean it does the complete job so there is no need for hand-rogueing problem weeds like fat-hen (saving c.£250/ha).

Weighing just under 1,000kg, FarmDroid has the lightest footprint possible - good for soil health and the bottom line - headlands aren't run down with the result that yields are maintained across the entire cropped area.

In fact, organic growers across northern Europe - and in the UK - have seen some fairly dramatic results where they're using the FarmDroid. They're reporting increases in sugar beet yields of 40-60% over tractor-hoed crops and are putting this down to the combination of precise seed placement and intra-row weed control making for uniform crop development.

Combined with the savings in herbicides, fuel, labour and machinery costs (depreciation, maintenance, tyres, capital tie-up, etc...) - the financial argument for FarmDroid is a strong one, especially as the purchase price and ongoing running costs are a fraction of those associated with the traditional machinery used to do the job. The current six-row FarmDroid FD20 retails at £59,500 with an additional £4,243 required for an RTK base station. Grant funding is likely to be available to assist with the purchase of this innovative seeding and weeding machine.

"We believe robotics will form the backbone of the next major step in technological development for agriculture," explains OPICO managing director James Woolway.

"FarmDroid has come up with a unique solution that is suited to large and small-scale farming systems. OPICO's distribution network, parts and technical teams are more than capable of backing the product up so it's a great fit.

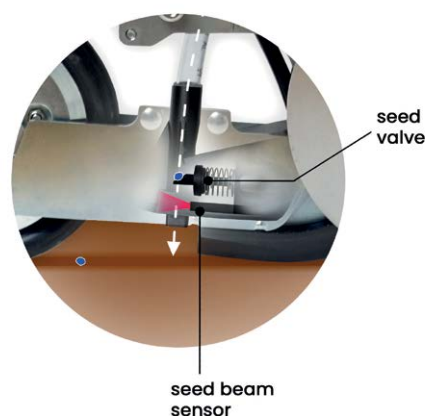
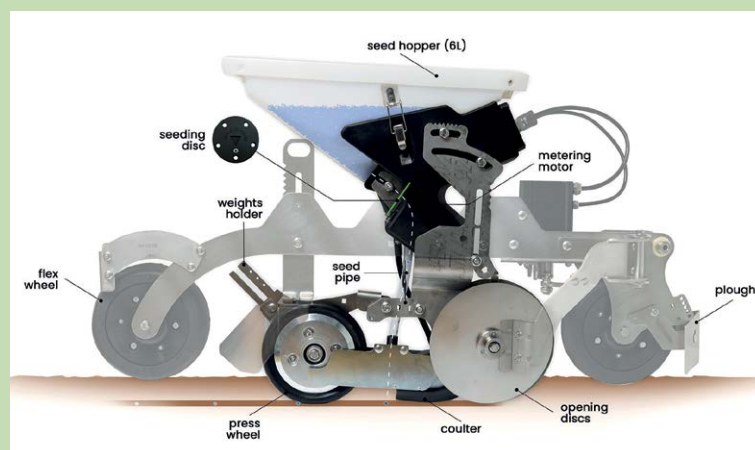
"While it's early days, we're coming to the UK market

with a product that is tried and tested. The timing couldn't be better with rising energy costs, labour issues and environmental factors at the forefront of UK farmers' minds. FarmDroid ticks so many boxes in all these respects."

A bit of background...



The FarmDroid concept was the brainchild of Jens and Kristian Warming - two farming brothers from central Denmark. They built the first prototypes with the help of some robotics specialists in their farm workshop and launched the machine to the world at Agritechnica 2019. Now located in a state-of-the-art manufacturing complex, the business has over 250 machines out working across northern Europe.



The seeding unit comprises a six-litre hopper, metering unit and double-disc couler, designed to plant to up to 1cm depth into a fine tilth.

The unit drops the seed into the couler shoe and a gate opens to drop it into the soil at precisely the right moment so that the correct spacing for the desired plant population is achieved.

This is pre-determined so that the FarmDroid knows where every seed is placed.

Should a blockage occur, a light seed sensor beam in the unit temporarily stops the FarmDroid and sends an alert via the FarmDroid app to the customer's mobile phone.

DEMAND FOR 100% PASTURE-FED BEEF SOARS AS CONSUMERS LOOK FOR **HIGH QUALITY BEEF**

Pasture for Life continues to attract new farmer members as interest from consumers looking for high nature-value, nutrient-dense meat and dairy grows every day. Here two farmers explain how being Pasture for Life certified has contributed to their success. Sara Gregson reports

Nicola Chapman, Carr Farm, Suffolk

Twenty Belted Galloway cows with their calves, all with their distinct, thick white band around the centre of their bodies, graze peacefully on the marshes at the bottom of Nicola and David Chapman's 40-hectare farm, at Burgh St Peter on the Suffolk/Norfolk border.



Nicola with the only red belted cow in the herd

The Chapmans arrived at Carr Farm in 2011, from a smallholding in Diss. Originally, the land had an agricultural tenant, but has now been taken back in hand. Half comprises drained marshes of the River Waveney and the rest is higher land of light sandy, gravel soils.

"David and I were both working full time to start – David with the NHS in Norwich and me as a surveyor," Nicola explains. "I gave up completely two years ago and David is now down to working three days a week, so we are gradually finding more time to do the things we want to on the farm."

The Chapmans carry out low impact



David and Nicola with the cows on the marshes

farming, encouraging all elements of nature and wildlife to flourish alongside the production of prime beef. The pedigree Waveney Herd graze extensively at home and on a further 49 hectares across several parcels of land, mainly belonging to the Suffolk Wildlife Trust, but also some reserves in private hands.

"I always knew I wanted to have cattle," says Nicola. "After we bought the farm, we reverted the arable fields into grass and then had to decide which breed of cattle we wanted.

"With no barn then for winter accommodation, we were looking for hardy, native cattle that were not too big but that produced fine meat to eat. Belted Galloways fitted the bill perfectly.

The Chapmans sourced their first five pedigree heifers with help from the Belted Galloway Pedigree Cattle Society in 2014. Now there are 80 animals in total, including the cows and calves, yearlings, breeding youngstock and finishing animals.

"The steers mature very slowly, eating nothing but the grasses and plants that grow out on the marshes. Nothing leaves here under 30 months of age and it is this that gives the meat its incredible texture and flavour," says Nicola.

The cows overwinter on the free-draining sandy land behind the farm house and are supplemented with large hay bales made from the marshes the previous summer. In April the grazing agreements start and the yearlings go to the furthest sites, including Carlton and Oulton Marshes.

The cows mainly calve from early April for two months and calve easily and without assistance. A few of the older mothers are now more than ten years old.

Pasture for Life

"We joined Pasture for Life straight away and became certified," explains Nicola. "This means we can use the Pasture for Life logo on our beef packs which is the only 100% grass-fed guarantee.

"A third of our customers buy our

meat for health reasons because they cannot eat meat from animals that have been fed grain or soya. Another third are local customers who buy because they love to see the Belties grazing on the marshes – there is a real connection.

“Direct selling is hard work and I spend a lot of time being a retailer and promoting our beef on social media. We have built up a loyal list of customers who we email when a beast is ready.

“But there are signs of more interest coming now from butchers and restaurants, as the benefits of farming in a more regenerative way become more widely recognised.”

Anna Blumfield, Deersbrook Farm, Essex

Anna Blumfield and her husband Phil started a grass-fed only herd of Sussex cattle alongside her parents intensive cattle rearing and fattening unit, near Braintree in Essex in 2015. She always knew she wanted to sell her meat direct to the public and setting up the new herd was the way she saw to do this.



A Belted Galloway cow and her calf on the home farm marsh

“After lots of research we knew we wanted to go down the 100% Pasture for Life way of farming and we knew the Sussex breed would absolutely thrive on this type of system,” Anna explains.

A total of 190 head of cattle – including 115 suckler cows, now graze 41 hectares of grassland at the home

farm, as well as a further 278 rented hectares on grazing agreements, including Natural England heritage sites and some around some MOD airbases.

“Throughout their lifetime our cattle graze different biodiverse pastures filled with clovers and herbs,” says Anna. “They also browse the hedgerows and

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Made it Myself Workshop Projects in Issue #121

Buckrake: A transport frame carries what the forage harvest team needs.

Slurry: A hydraulic powered tower slurry stirrer based on a telehandler arm

Logs: stored in modified potato boxes - stackable, easy unload modification

Salt gritter: uses Viccon spreader with ground wheel drive trailer towed by panel van

Seed drill: Drawbar extension makes tight turns easy

Grazing: Grant aid under Sustainable Farming Incentive. Chain Harrows vs Aerators vs Sward Lifters.

LAMMA report: Mechanical weeders. Novel ventilated roof ridge. Hydrogen-diesel engine adds 17% efficiency

FarmWalk: shows a 500 acre arable farm transformed to regenerative

Financial Focus: the investment puzzle, and the financial importance of pensions

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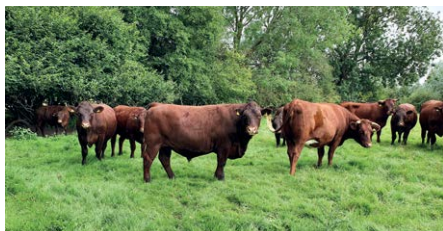
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trees which means they can access all the nutrients they need."

The cattle spend spring, summer and autumn grazing and come into straw-bedded barns in November and fed just hay, silage and minerals. Muck from the winter barns is composted and applied back to the home fields.



Anna's red Sussex cattle

Most of Anna's grass-fed cattle finish at 26 to 29 months of age at 300 to 350kg deadweight and grade at an average conformation score of R4L. Anna started selling her meat at farmers' markets and from a small shop on the farmyard at home. In 2018 she opened a new butchery and shop, giving her more control over how individual carcasses were broken down and presented.

"We've built a really solid customer base, and are now selling a full carcass every week," says Anna. "Customers range from locals who pick up their regular staples, to those who come from further away, many aware of the nutritional advantages of 100% grass-fed beef and buy all kinds of cuts to fill their freezers."



Anna is a key member of the Great British Beef Week campaign team

Anna was one of the first beef farmers to become Pasture for Life certified in the country.

"Being Pasture for Life certified is



Anna's butchers shop on the farm

fundamental to our business because it encompasses everything we believe in – the ethos of regenerative farming, working with the ruminant's natural digestive system, and farming to benefit the environment, wildlife and water systems as well," says Anna. "It really is all encompassing to what we believe farming should be.

"I've been lucky enough to attend lots of Pasture for Life tasting events supplying cuts of our beef and talking about how we look after the animals to consumers. I have also taken every opportunity to promote the principles

of 100% grass-fed beef production on national and local radio and national TV, including Saturday Kitchen and Newsnight.

"Pasture for Life has really supported us over the years, and this, with the certification has given our customers trust in the product they are buying from us. It's been a fantastic journey so far and long may it continue!"



Pasture for Life launches new visual identity

The Pasture-Fed Livestock Association has announced it is to be known as 'Pasture for Life' from now on and has launched a new logo and visual identity.

The past two years has seen growing numbers of consumers looking for livestock products that come with high environmental, ethical and health credentials. This has prompted the organisation to refresh the way it communicates to drive greater awareness of high nature-value farming.

The move, which coincides with Pasture for Life's 11th birthday, marks a significant moment for the organisation, which has grown from a few farmers back in 2011, to a diverse group of farmers, butchers, dairies, artisan food producers, chefs, nutritionists, academics, students, storytellers and many more. Membership now stands at more than 800.

"We have refreshed our visual identity and our core messages to better reflect the benefits of 100% pasture-fed farming," says Pasture for Life Executive Director Jimmy Woodrow.

"We hope this will help our farmers communicate the benefits of the way they farm and help shoppers find and understand the health, welfare and environmental advantages of buying Pasture for Life certified food and fibre."

In addition to the new visual identity, Pasture for Life also launched a short film to mark its first ten years, which can be viewed on the Pasture for Life YouTube channel.



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TOGETHER FOR A HEALTHY AGRICULTURE

WORLD CONGRESS OF SOIL SCIENCE 2022

31ST JULY TO 5TH AUGUST 2022

The World Congress of Soil Science 2022 (WCSS 22) is a leading international soil science conference, held every four years in different countries and attended by over 3,000 soil scientists from around the globe. The next Congress is being organised by the British Society of Soil Science on behalf of the International Union of Soil Sciences.

The Congress theme, 'Soil Science – crossing boundaries, changing society' will focus on the link between soil and society, with sessions covering soil systems, soil processes, soil management and how we interact with and use soils around the world. There will be opportunities for specialist workshops and discussion sessions across a wide range of soil disciplines. The core programme is supported by tours and a cultural and arts programme for delegates and the wider public to explore our diverse environment and culture.

Where & when is it?

The Congress will take place at the award winning and world-class Scottish Event Campus, a riverside venue minutes from central Glasgow in Scotland, UK. The Congress will take place between 31 July and 5 August 2022, flanked by an exciting menu of soil science activities such as the soil tours, soil judging programme and outreach activities under the banner of Our Living Soil.

Who should attend?

The congress is open to anyone who has an interest in the sustainable use of soils, particularly research scientists, regulators and NGOs. There will be a specific policymakers' programme on Tuesday 2 August 2022 to discuss how scientific research can inform environmental policy.

Speakers

The exciting programme includes the full list of plenary, divisional and interdivisional sessions and the agreed keynote and oral presenters for all sessions.

Plenary speakers at the event will include Dr Ranveer Chandra, CTO Agri-Food, Microsoft, USA; Prof. Suzi Huff Theodoro, Professor of Soil Geology, Pesquisadora Universidade de Brasília; Prof Ismahane Elouafi, Chief Scientist, UN FAO and Dr Debra Roberts, Co-Chair of Working Group II of the IPCC, Durban, South Africa.

If you haven't already booked, don't miss out on the opportunity to attend the major soil science conference of the last four years. To book your full congress ticket or one-day delegate pass, please visit www.22wcsc.org.

Why should i attend?

At a time of global concern for our planet and its growing population, managing our soils sustainably has never been as important. 90% of our food comes from soil, as does all of our timber and other fibre. Soil, and the ecosystems it supports, have a huge role in mitigating against climate change, is a vast reservoir of biodiversity, plays a significant role in flood management and contains key evidence of past civilisations. Our understanding of the importance of these functions is developing rapidly and the Congress provides the ideal setting to discover the international state of the art in these critical global issues and an opportunity to connect across all who work with and rely on soils.

View the
programme
of speakers
here:



#GROUNDED SOIL RESTORATION



Our supporters Lizzie Daly and Riverford Organics recognise the need for effective action and that the protection and restoration of soils must be a global priority. At a policy level, the British Society of Soil Science (BSSS) supports



the Global Soil Partnership, led by the UN and we will be leading the call for collective change at COP 26 and the World Congress of Soil Science 2022.

It is estimated that there are 1,500 gigatonnes of carbon in the world's soil; three times more than in all vegetation and forests. Deforestation, global warming and poor farming practices can lead to the release of soil carbon into the atmosphere, and in turn speed up the climate warming process.

Our Science Note: Soil Carbon, sets out why soil carbon is so important and outlines our recommendations for governments.

Healthy soil supports biodiversity: biodiverse soils can host millions of organisms in each teaspoon. Sustaining life in soil is essential to ensure soil health, which supports our ability to grow food and farm effectively. When managed well, soil can store significant amounts of rainfall, preventing flooding and stop soil washing away, which can affect the health and safety of communities.





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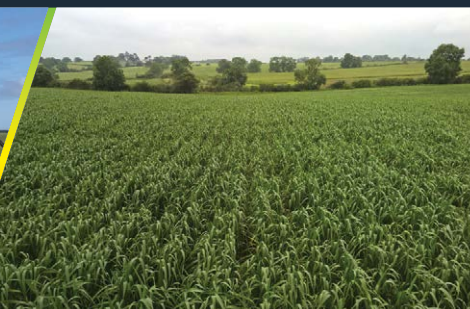
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DRILL MANUFACTURERS IN FOCUS...



Kverneland

STRIPPING BACK ESTABLISHMENT COSTS



Looking to reduce the cost of producing grain maize, Andy Longman of Snagg Farm near Shepton Mallet, Somerset, has opted for a Kultistrip to develop strip tillage practices for the high value forage crop.

It followed a demonstration in 2021, where a six-row Kultistrip was put to work, preparing ground ahead of a contractor's eight-row maize drill.

"It was very much trial and error, but we liked what we saw," explains Andy, pictured left. "So we bought the Kultistrip and a six-row Optima V from C&O Tractors, to precisely match-up with the cultivated strips. This season's crop has gone in extremely well, saving time, fuel and establishment cost."

He says that of last year's crop, those fields that were strip-tilled yielded 0.7t/acre more than the conventionally grown crop.

"We weigh every load that comes off the combine," he says. "I'm sure the yield difference came from the Kultistrip keeping moisture in the seedbed, compared to higher moisture loss from traditional seedbed preparation."

He says that weed incidence was reduced and has eliminated the need for a pre-emergence spray, enabling any weeds to be knocked out with a post-emergence application.

"We'll still need to plough periodically, but rotationally rather than as an essential part of maize establishment," says Andy.

"This way, we can make the most of soil biology and micro-organisms."

He says that taking control of the strip-tillage and drilling processes has created better timeliness, and the opportunity to experiment with pre-drilling cultivations. With the Kultistrip, the surface is stripped clean ahead of soil being loosened across a narrow 150mm strip, courtesy of front cutting discs, a loosening tine and side discs, before being crumbled and firmed by Farmflex rubber press wheels.

"We've done a lot more preparation for this year's crop by switching to two passes," he says. "The first was at 6in to set the ground up, then a deeper pass followed a few weeks later at 9in, ahead of drilling."

"If we can get a front tank sorted, we'll put fertiliser into the strips instead of broadcasting on top of the seedbed, to increase plant uptake," he adds. "We're looking for 1,000 tonnes of grain off 180 acres, using three varieties."

Operator Chris Keen (pictured right) is impressed with the process.

"The Kultistrip is an impressive piece of kit, and then the Optima V just raises the bar another notch," he says. "Seed placement accuracy – both depth and down-the-row-spacing – is amazing. And with RTK guidance, we can match up the six rows perfectly."

Chris says the range of adjustment on both the Kultistrip and Optima V provide enough scope for the soil types and field conditions encountered.

"Sowing depth is as good as guaranteed, no matter what the conditions," he says. "And without overlaps from electric drive and section control, we're using less seed. Seed counts are typically 40,000 per acre, and we're looking to cut back to around 37,000."

Chris adds that the Optima V's hydraulically telescoping frame affords easy road transport, and total control of row widths from 40-85cm, handy when precision planting other seed types.

"We bought beet discs too, which brings additional versatility from investing in the drill," he adds.

Andy Longman is pleased with the changes made to maize establishment at Snagg Farm.

"We've just sown 65 acres of maize with one operator and tractor, in just three days and that includes the time spent making two passes with the Kultistrip," he says. "Our Fendt 724 is burning just five litres/acre with the Kultistrip, and 2-3 litres/acre when drilling, which means our diesel use is close to 25% of what we'd normally use for seedbed production."

He says the key to its success lies in effective cultivation of the area to be occupied by the rows of maize.



"Why should we continue to move all the soil when maize is grown in 75cm row spacings?" he asks. "This is where strip tillage makes so much more sense. The untouched ground helps to carry the weight of machinery, which limits compaction. And not moving so much soil helps to discourage weed germination."

"With an increase in the cost of diesel this year, and a higher grain price, the Kultistrip should pay for itself in little over 200 acres," he adds.

Come and see this combination in action at Groundswell, on 22 and 23 June, at Lannock Manor Farm, Hertfordshire.



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DRILL MANUFACTURERS IN FOCUS...



Agriweld's low disturbance cultivation range provides numerous options to reduce tillage methods in line with modern, minimum tillage systems. Tillage reduction provides many benefits, including enhancing soil aggregation and promoting biological activity, leading to greater available soil moisture and improved soil tilth. Reducing tillage can also be economically advantageous for farmers, by minimizing passes and saving on crop establishment costs. As Agriweld design and manufacture their full product range in house, there is the opportunity to work to individual requirements.

The ASSIST & ASL – Rear mounted, low disturbance toolbars

The Assist low disturbance, rear mounted toolbar has been designed as part of the company's low disturbance range as an option to reduce tillage processes by enabling a one-pass system. Primarily designed to work with a trailed drill/cultivator, the leading straight, serrated disc cuts through the trash creating a path for the following leg. The discs and legs lift out of work independently to the drawbar, so not to affect the drawbar height of the drill.

The Assist LD legs lift and shatter the soil across the full width of the machine, alleviating compaction in the seed bed whilst still retaining precious moisture and allowing for nutrient ingress up to 300mm deep. This toolbar is complete with rear hydraulic coupling unit complete with four double acting hydraulic services, ¾ free flow return and 7 pin plug socket.

The 6m model provides the unique ability to interchange disc and leg centres, either having 12 legs at 500mm centres or 8 legs at 750mm centres for drilling maize, of which the change is easily performed with Agriweld's own, innovative 'hook-on' leg socket design. The 6m machines 'Tight Turn' feature enables easy turning on the headland by partially folding the wings, allowing for a trailed implement to pass under the machine; operating on the same hydraulic function allows the wings to fold, in sequence, after the legs have lifted out of work.

The ASL rear mounted, low disturbance toolbar performs a similar role to the Assist, however, the features provided between the two models differ to facilitate alternatives intended to cover the majority of cultivating requirements.

The 3 and 4m ASL are designed to run in conjunction with a mounted combination drill and include auto-reset legs with fixed leg centers at 500mm as standard. Available in 3m rigid, 4m rigid, 4m folding and 6m folding models, the 3m and 4m models include a PTO cut through feature for the PTO shaft to run through the frame. The 6m model includes a pair of stability wheels. All ASL models are complete with rear CAT 3 linkage for mounted/combination drills as standard.

New ASL features for 2022 include front leading discs and rear packer roller option available at the time of order or as an aftermarket feature thanks to a modified standard frame design.

The popular 'Tight Turn' feature is also included on the 4m and 6m folding ASL; by partially folding the wings, performing operational manoeuvres on the headland is easily achievable and prevents fouling.

The ASL offers an optional drawbar clevis, front leading discs and rear packer roller, enhancing the versatility of the toolbar and provides further cultivating options.

Both rear toolbars provide growers with the ability to build a system that works for them to subsequently reduce their crop establishment costs.

The MIN-DIS – Low Disturbance Subsoiler

The Min-Dis Low Disturbance Subsoiler is designed to lift and alleviate compaction and promote soil structure, while causing minimum disturbance to the top layer of soil.

Complete with Agriweld's innovative Snap-Bar shear leg protection system and unique Agri-Packer roller as standard, the Agri-Packer's replaceable shoulders with a shallow profile assist in achieving consolidation across the whole width across the machine. The company's Easy Clean Scraper Bar system allows for quick and easy displacement of soil on scrapers and eliminates the risk of transfer of blackgrass and other volunteers to other fields. Auto-reset leg protection is also available, along with an optional flat roller with drive teeth for grassland.

The 460mm serrated straight cutting disc cuts through the top layer of the soil and trash, allowing the following low disturbance leg to pass through the soil without great disruption. Leaving the cover of trash on the field provides additional protection against water and wind erosion of the soil. The disc bar is fully height adjustable, independently from the legs.

The following LD leg combined with a standard issue low disturbance point drives through the opening left by the disc at a maximum depth of 300mm. The angled wings on the point lift the soil before it sits back down causing a shattering effect across the full width of the machine, alleviating compaction, aerating the soil and aiding water/nutrient infiltration. This is all done with minimal disturbance to the top surface of the soil.

The Min-Dis is available in 3m, 4m and 6m models.

Further details on Agriweld's low disturbance cultivation machines and their full product range can be found on their website, via email on sales@agriweld.co.uk or by calling them on 01377 259140.

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DRILL MANUFACTURERS IN FOCUS...



NEW MZURI IPASS LOW DISTURBANCE DRILL SHOWCASED AT CEREALS 2022 WITH NEW LOWER LINK SENSING DRAWBAR

British manufacturer's Mzuri have recently launched their new low disturbance, iPass direct drill at LAMMA earlier this year which continued its public tour at Cereals in June.



Staying true to the Mzuri concept, the iPass has been designed to achieve optimum establishment at a fraction of the cost of conventional establishment, into a range of soil and residue types.

Parallel linkage coulters for accurate seeding

Low disturbance legs and clever individual parallel linkage suspended coulters allow for excellent contour following and seed depth control thanks to the drill's independent depth wheels. Accurate seed placement is maintained across the width of the drill and excellent soil to seed contact is achieved via the V-shaped press wheel - vital for quick, even germination.

The manufacturer is an advocate of band placement fertiliser below the seed for giving crops the best start, particularly



The iPass has been designed to compliment the existing Mzuri range, offering customers a lower disturbance model whilst still being founded on Mzuri's key principles for good establishment



Pivoting individual coulter assemblies feature a parallel linkage and v-shaped press wheels to follow the ground contours and maintain coulter angle and depth for accurate seed placement.

useful for spring drilling where dry weather can reduce the effectiveness of broadcasted nutrition.

Large capacity, pressurised tank system

The impressive machine boasts a large capacity, 5000 litre pressurised tank to accurately meter and convey high application seed rates at higher forward speeds. Four variable speed electric metering units offer high output, efficient delivery and the flexibility to shut off half of the drills width as required.

Aimed at growers of a wide range of crops including cereals, oilseeds and beans the iPass is a versatile drill for those looking to minimise soil movement whilst not compromising on a quality seedbed.

New Lower Link Sensing Drawbar

The model displayed at the Cereals event featured the new semi-mounted drawbar option which has been designed to allow accurate seed depth control across the whole of the machine whilst also ensuring efficient use of the tractor and its horsepower. Automatically adjusting to ensure correct working depth, the system is useful for challenging terrain and conditions while always ensuring maximum efficiency of the tractor.

The iPass range is available in widths of 4.0m, 4.8m, 6.0m, 8.0m and with two different row spacing options, excluding the 4.8m version which is only available with row spacings of 266mm. The 4.0m, 6.0m and 8.0m machines can be ordered with row spacings of either 250mm or 333mm depending on the operator's preference.

A major draw of the new iPass is its relatively low horsepower requirement with the smallest model in the range, the iPass 412 starting at a recommendation of 170hp+, with the manufacturer recommending a forward speed of 6-18km/hr.

Visit **farmxport** for more.



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BASE-UK is a nationwide, knowledge exchange organisation led by farmers for farmers and individuals passionate about the regenerative agricultural system increasing the sustainability and health of our soil, crops, livestock and therefore our industry.

It has been a great spring so far with members hosting Farm Walks and we have just attended Cereals and Groundswell so it feels like life is getting back to normal following the past 2 years.

Coming up, we have a members visit to Agrovista's Lamport Project in Northamptonshire and a variety of member farm walks before harvest happens. We are planning more online webinars in the autumn and winter.

The committee are busy working on a fantastic line up of speakers for our AGM Conference next year when we will be celebrating 10 years of our organisation successfully getting members together.

**Save the dates - 7th and 8th February 2023.
Our theme is "Growing Confidence"!**

**We are delighted that Frederic Thomas,
founder of BASE France and mentor of our
group will be joining us for this event!**

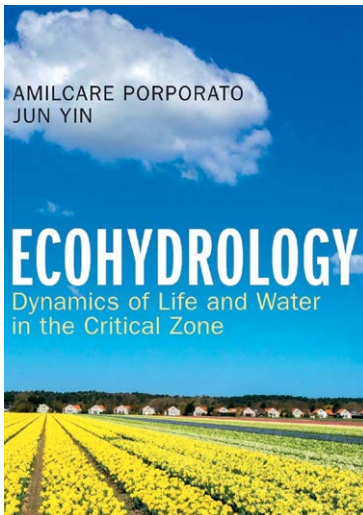
If you would like to know more about how to join BASE-UK,
please visit our website: www.base-uk.co.uk
or email Rebecca@base-uk.co.uk



WHAT DO YOU READ?

If you are like us, then you don't know where to start when it comes to other reading apart from farming magazines. However, there is so much information out there that can help us understand our businesses, farm better and understand the position of non-farmers. We have listed a few more books you might find interesting, challenge the way you currently think and help you farm better.

Ecohydrology: Dynamics of Life and Water in the Critical Zone



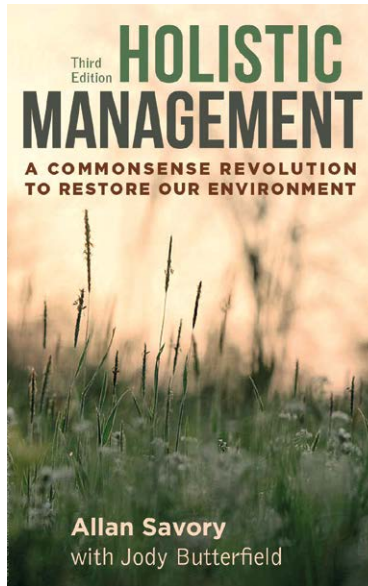
Ecohydrology is a fast-growing branch of science at the interface of ecology and geophysics, studying the interaction between soil, water, vegetation, microbiome, atmosphere, climate, and human society. This textbook gathers the fundamentals of hydrology, ecology, environmental engineering, agronomy, and atmospheric science to provide a rigorous yet accessible description

of the tools necessary for the mathematical modelling of water, energy, carbon, and nutrient transport within the soil-plant-atmosphere continuum. By focusing on the dynamics at multiple time scales, from the diurnal scale in the soil-plant-atmospheric system, to long-term stochastic dynamics of water availability responsible for ecological patterns and environmental fluctuations, it explains the impact of hydroclimatic variability on vegetation and soil microbial systems through biogeochemical cycles and ecosystems under different socioeconomic pressures. It is aimed at advanced students, researchers and professionals in hydrology, ecology, Earth science, environmental engineering, environmental science, agronomy, and atmospheric science.

Holistic Management: A Commonsense Revolution to Restore Our Environment

Fossil fuels and livestock grazing are often targeted as major culprits behind climate change and desertification. But Allan Savory, cofounder of the Savory Institute, begs to differ. The bigger problem, he warns, is our mismanagement of resources. Livestock grazing is not the problem; it's how we graze livestock. If we don't change the way we approach land management, irreparable harm from climate change could continue long after we replace fossil fuels with environmentally benign energy sources.

Holistic management is a systems-thinking approach



for managing resources, developed by Savory decades ago after observing the devastation of desertification in his native Southern Rhodesia (now Zimbabwe). Properly managed livestock are key to restoring the world's grassland soils, the major sink for atmospheric carbon, and minimizing the most damaging impacts on humans and the natural world.

This audiobook updates Savory's paradigm-changing vision for reversing desertification, stemming the loss of biodiversity, eliminating fundamental causes of human impoverishment throughout the world, and climate change. Reorganized chapters make it easier for listeners to understand the framework for holistic management and the four key insights that underlie it.

This long-anticipated new edition is written for new generations of ranchers, farmers, ecological and social entrepreneurs, and development professionals working to address global environmental and social degradation. It offers new hope that a sustainable future for humankind and the world we depend on is within reach.

Ninth Revolution, The: Transforming Food Systems For Good

We are at a critical point in human history and that of the planet. In this book, a world leader in agricultural research, Professor Sayed Azam-Ali, proposes a radical transformation of our agrifood system. He argues that agriculture must be understood as part of global biodiversity and that food systems have cultural, nutritional, and social values beyond market price alone. He describes the perilous risks of relying on just four staple crops for most of our food and the consequences of our current agrifood model on human and planetary health. In plain language for the wider public, students, researchers, and policy makers, Azam-Ali envisions the agrifood system

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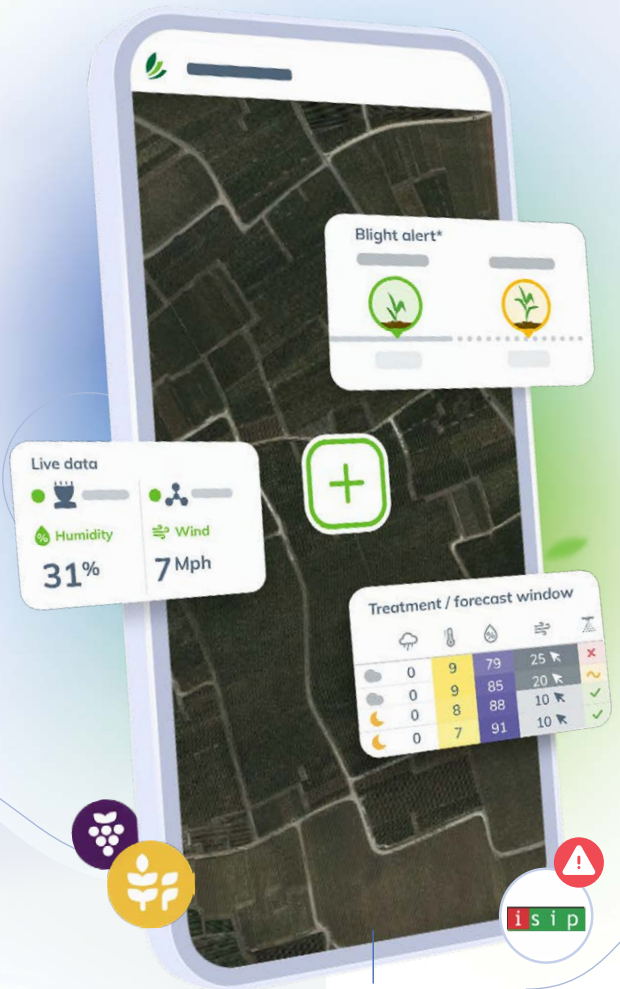
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monitoring



Disease and pest
prevention



Irrigation
management



Connect your crops to your station

Consult forecasts to organise your treatments

Program your interventions according to the weather
conditions of your fields

Connect your favourite DST*

THE NINTH REVOLUTION

Transforming Food Systems for Good



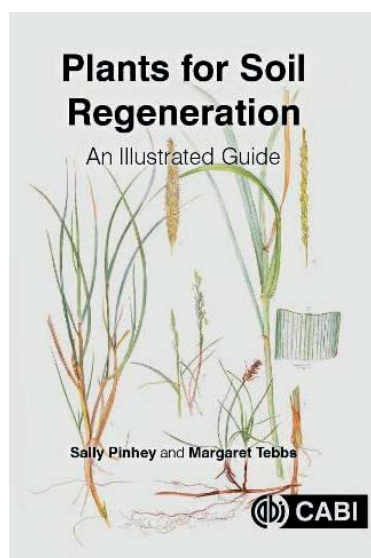
Sayed Nader Azam-Ali

World Scientific

as a global public good in which its practitioners include a new and different generation of farmers, its production systems link novel and traditional technologies, and its activities encompass landscapes, urban spaces, and controlled environments. The book concludes with a call to action in which diversification of species, systems,

knowledge, cultures, and products all contribute to The Ninth Revolution that will transform food systems for good.

Plants for Soil Regeneration: An Illustrated Guide



Plants for Soil Regeneration

An Illustrated Guide

Sally Pinhey and Margaret Tebbs

CABI

This book is a comprehensive, beautifully illustrated colour guide to the plants which farmers, growers and gardeners can use to improve soil structure and restore fertility without the use and expense of agrichemicals. Information based on the latest research is given on how to use soil conditioning plants to avoid soil degradation, restore

soil quality and help clean polluted land. There are 11 chapters: 1 to 6 cover soil health, nitrogen fixation, green manures and herbal leys, bacteria and other microorganisms, phytoremediators and soil mycorrhiza (plant-fungal symbiosis). Chapter 7 has plant illustrations, with climate range and soil types, along with their soil conditioning properties and each plant is presented with a comprehensive description opposite a detailed illustration, in full colour. Chapters 8 to 10 examine soil stabilisers, weeds and invasive plants, and hedges and trees and the final chapter, contains 5 case studies with the most recent data, followed by an appendix and glossary. The book allows the reader to identify the plants they need quickly and find the information necessary to begin implementation of soil regeneration.

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