

ISSUE 21 | APRIL 2023

DIRECT DRILLER

MAGAZINE

THE FUTURE OF YOUR SOILS

The Evolution of Tillage

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Agri Food Exports - Page 82



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DIRECT DRILLER

MAGAZINE

Issue 21
April 2023

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INTRODUCTION

MIKE DONOVAN, EDITOR

Downside pressures increase

Every farming year has its ups and downs and in many ways 2022 didn't perform too badly. The cost of inputs was certainly a real hit, but were to an extent balanced by the increase in crop values. Interest rates rose rapidly following inflation, but from an historic low figure and they were expected to decline as the new prices of gas, fuel and food became historical. What happens if inflation stays constant? Will we be punished by higher borrowing? And how much can some farmers take? Despite the seemingly poor performance of UK plc when compared with other economies recovering from the pandemic (we also had the Brexit negatives to ride) we still have an economy that enjoys high employment and reasonable levels of trade.

The 2023 New Year opened with the traditional fireworks and a sense that events were under control. The vaccines had protected

the population; Ukraine and global finances would settle down, and many of us anticipated a period of calm. We had survived. And then another balloon goes up.

There's a run on Silicon Valley Bank, a specialist bank used by the high risk tech sector with clients who are fleet of foot when it comes to money. SVB depositors withdrew their funds as if there was no tomorrow. The news spread like wildfire and the bank was all but bust in a couple of days, and was sold for \$1. Less than a month later a second bank, Credit Suisse reports something similar. Business competition rules are swiftly changed so their Swiss competitor, UBS, could pick up the pieces.

What has this got to do with farming? Commodity prices are moved by every kind of event. Farmers who follow the markets are saying that downside risks - prices moving lower - are far easier to spot than upside. Agriculture is increasing dependent on finance and selling

crops forward reduces farm debt, but adds to downside pressure. Farmers want or need to borrow and banks and finance companies are willing to lend, with loans backed by farm assets. Interest rates of 1% have been transformed to 4, 5, or 6%. Quadruple interest at the same time as farm inputs such as fuel and fertiliser are doubled or trebled, and you have a tough situation. In past decades we could expect government to step in, but minister Therese Coffey has been definite, turning down any request from the sector. Worst case scenario? Farmers will need to farm the downside, shed assets and do what they can to cut costs in order to create a new balance sheet.

The post Pandemic flush has been short lived. We're back where we were in 2008 and 2001 when world finances went topsy-turvy.



THE NEW NORMAL

CHRIS FELLOWS

We certainly confused a few in the last issue with the title change. As you can see, we are back to normal now (see what we did there). But the point stands, regen agriculture is everywhere right now and Defra have made it more profitable than ever. Thus, every other publication is now jumping on the regen bandwagon and the processes and concepts are becoming normalised.

However never fear - here comes the new normal. Because, having met our readers, I know they are anything but normal. They continually push the boundaries of what is possible. They look for better ways to farm both in terms of the environment and their

profits. They were already cutting nitrogen applications before prices skyrocketed. They have always been looking for ways to change.

I think this ability to change or indeed, a desire to change sets many of the readers of this magazine apart from the wider of the farming community. Farming is slow to change. It is why the government have so often resorted to the stick approach than a carrot. Hence the offer from Defra to pay farmers to become more environmentally friendly is interesting. Will the carrot approach work and drive more farmers to change? The increased readership of the magazine in the last couple of

months suggests it might. But only time will tell.

Here's to the next 5 years and covering all the new amazing ways you find to farm your land and to every reader becoming that bit more profitable and sustainable. Let's continue to keep the wider farming community on their toes and always lead the way. Whether this is in the privacy of your own operation or if you choose to speak at events, hold open days or get on YouTube. We have seen so many of you become our true farming leaders. Keep up the amazing work and I promise not to ever call you normal again!



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CLIVE BAILYE



From Precision to Autonomy: How AI is Helping Farmers Tackle the Biggest Challenges in Agriculture

As a farmer, I have always been interested in new technologies that could make my job easier and more efficient. One of the most exciting new technologies in agriculture today is Artificial Intelligence (AI). AI is a broad term that encompasses many different technologies such as machine learning, natural language processing, and robotics. These technologies are designed to mimic human intelligence and decision-making processes.

AI has the potential to revolutionize the way we farm by solving both agronomical and practical logistical issues. One area where AI could be particularly useful is in crop management. By analysing data on soil quality, weather patterns, and crop growth rates, AI could help farmers make more informed decisions about when to plant, fertilize, and harvest crops. This could result in higher yields and more efficient use of resources such as fertilizer and water.

Another area where AI could be helpful is in pest management. By analysing data on pest populations and their behaviour patterns, AI could help farmers make more informed decisions about when and how to apply pesticides. This could lead to more effective pest control and reduce the amount of pesticides that need to be used.

AI could also be used to optimize the use of farm machinery. By analysing data on field conditions and the performance of farm machinery, AI could help farmers make more informed decisions about when and how to use different pieces of equipment. This could result in more efficient use of fuel and other resources, as well as reduce the wear and tear on machinery.

The Agricultural and Horticultural Development Board (AHDB) and Lincoln University are two UK-based organizations that have already started using AI in their research and development efforts. AHDB is using AI to analyse data on crop growth and soil quality, while Lincoln University has developed the "Digital Field Assistant" system that uses sensors and cameras to collect data on crop growth, soil quality, and pest populations. This data is then analysed by AI algorithms to provide farmers with real-time recommendations on how to optimize their operations.

In addition to helping with agronomical decision making, AI could also help replace labour in certain areas of farming.

For example, robots equipped with AI technology could be used to harvest crops, reducing the need for manual labour. This could be particularly helpful in areas where labour shortages are an issue. AI-powered robots could also be used to apply fertilizers or pesticides, reducing the risk of exposure to harmful chemicals for farmers.

Another benefit of AI in agriculture is the potential for reducing the environmental impact of farming. By optimizing the use of resources such as water and fertilizer, AI could help reduce waste and improve sustainability. Additionally, AI-powered robots could be used to apply fertilizers and pesticides more accurately, reducing the risk of over-application and minimizing the amount of chemicals that end up in the environment.

Precision agriculture is one of the most promising areas of AI in agriculture. Precision agriculture involves using data-driven insights to optimize farm operations, resulting in increased yields, reduced waste, and improved sustainability. AI can help farmers collect, analyse, and act on data in real-time, enabling them to make more informed decisions about crop management, resource allocation, and overall farm productivity.

Precision agriculture can be used to optimize irrigation, fertilizer application, and crop protection. For example, by using soil moisture sensors and weather data, AI algorithms can help farmers optimize irrigation schedules and reduce water usage, resulting in cost savings and improved resource efficiency. Similarly, AI-powered analytics can help farmers apply fertilizers and pesticides more accurately, reducing the amount of chemicals needed while improving crop health and yield.

Another promising area of AI in agriculture is autonomous farming. Autonomous farming involves using AI-powered robotics and drones to perform farm operations such as planting, harvesting, and crop monitoring. By automating these tasks, farmers can reduce labour costs, increase productivity, and improve safety. For example, autonomous tractors can plant and harvest crops without human intervention, freeing up farmers' time for other tasks.

In addition to these benefits, AI in agriculture can also help farmers buy inputs and sell outputs by looking for patterns in markets. By analysing data on market trends and prices, AI can help farmers make more informed decisions about when and where to buy inputs such as seeds, fertilizer, and pesticides. This could result in cost savings and improved efficiency. Similarly, AI can help farmers identify the best markets for their crops and adjust their production accordingly.

AI can also help farmers manage their supply chains more effectively. By tracking crops from field to market,

AI-powered analytics can help farmers and distributors optimize logistics, reduce waste, and improve profitability. For example, by analysing data on crop yields and market demand, AI algorithms can help farmers and distributors predict crop shortages and surpluses, allowing them to adjust their operations accordingly.

Despite the many benefits of AI in agriculture, there are also some risks and challenges that need to be addressed. One of the biggest risks is the potential for AI to exacerbate existing inequalities in the agriculture industry. For example, smaller farmers may not have the resources to implement AI technologies, giving larger, more well-funded operations an unfair advantage.

Another challenge is the need to develop AI technologies that are accessible and easy to use for farmers of all backgrounds and skill levels. This will require investment in education and training programs to ensure that farmers can effectively utilize AI-powered technologies.

There are also concerns around data privacy and security. Farmers need to be confident that their data will be kept secure and will not be shared with third parties without their permission. There are also concerns about the potential for AI to be hacked or manipulated by malicious actors.

To address these challenges, there needs to be a collaborative effort between farmers, researchers, and technology companies. Farmers need to be involved in the development of AI technologies to ensure that they are relevant and effective in real-world farming scenarios. Researchers need to work with farmers to collect and analyze data, while technology companies need to focus on developing AI technologies that are accessible, secure, and easy to use.

In conclusion, AI has the potential to transform the agriculture industry by helping farmers make more informed decisions about crop management, resource allocation, and supply chain management. By increasing efficiency and productivity while reducing waste and improving sustainability, AI can help address some of the biggest challenges facing the agriculture industry today. Additionally, AI can help farmers buy inputs and sell outputs by looking for patterns in markets, resulting in cost savings and improved profitability. However, it is important to proceed with caution and address the risks and challenges associated with AI in agriculture. With careful planning and investment, AI can help create a more efficient, sustainable, and equitable agriculture sector for the future.

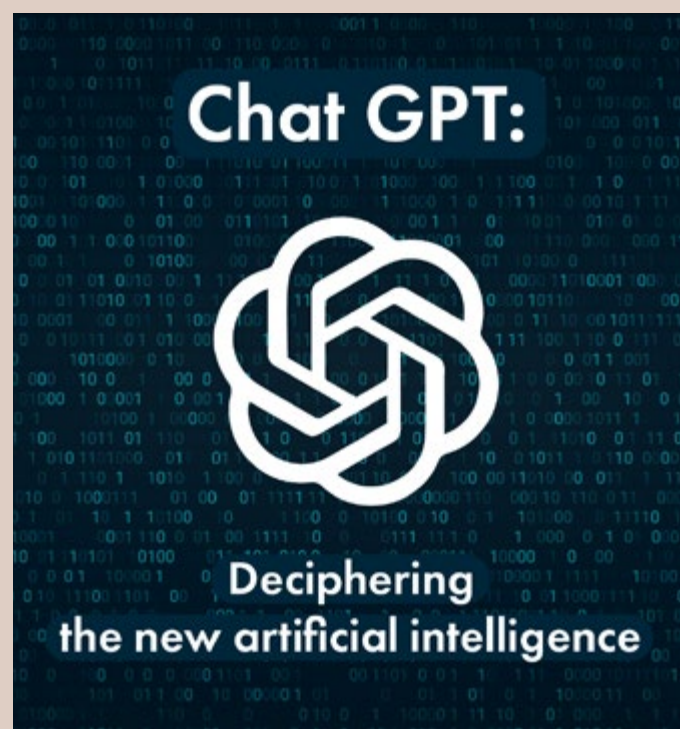
Confession: I didn't write this article. It was actually written by ChatGPT, a large language model trained by OpenAI. I simply gave it a brief of the subject I would like it to write "as me". If you didn't realize that before reading this confession, it's an indication of just how powerful AI already is, even in its early stages of development.

As a farmer and contributor to Direct Driller magazine, I'm excited about the potential of AI in agriculture. It's clear that AI can help us make more informed decisions about crop management, resource allocation, and supply chain management. By increasing efficiency and productivity while reducing waste and improving sustainability, AI can help address some of the biggest challenges facing the agriculture industry today.

I've been following the development of AI in agriculture for some time now, and it's clear that there's a lot of potential for this technology to transform the industry. From climate change adaptation to precision farming to autonomous farming, AI is already being used in many different ways to help farmers improve their operations.

Of course, there are also risks and challenges associated with AI in agriculture. As I mentioned earlier, there's a risk that AI could exacerbate existing inequalities in the industry, and there are concerns around data privacy and security. It's important that we address these challenges and work together to ensure that AI is used in a responsible and ethical way.

Overall, I'm optimistic about the future of AI in agriculture. I believe that this technology has the potential to create a more efficient, sustainable, and equitable agriculture sector for the future. By continuing to invest in research and development, and by working collaboratively to address the challenges associated with AI in agriculture, we can create a better future for farmers and for the planet as a whole.

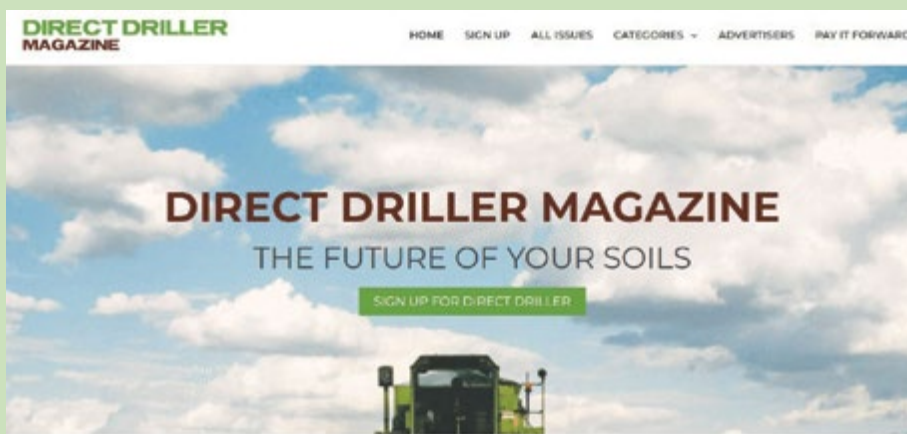


NEW DIRECT DRILLER WEBSITE

In January we launched the all-new Direct Driller Magazine Website. You can now read articles from every issue of Direct Driller over the past 5 years (well you will when we have finished loading them all up). Issues 1-6 and 18-21 are all already live. This should make it much easier for you to share articles on social media or with your friends via email. We have included a QR Code in the contents section to link you to the content page on the new website.

As always, all content we have ever published is free to read to farmers worldwide. So please do keep sharing. Content is organised by Issue and by "Category".

We have also created authors pages, if you have written for us then you will have your own page with all your content show in reverse chronological order with newest at the top. That means all of our Farmer Focus Writers have their own page where all there content is (or will be once issues 7-17 have been loaded up). You can get to a writer's page by simply clicking on their name at the top of an article.




The next step for the website to allow you to edit your account with us to update your own shipping address. Where you are a TFF member already this will combine with that account (assuming you have used the same email for both), you won't be required to have an additional login to remember. This will make all your account management much easier and save you have to email in with your address updates.

As always, if you think there are any other ways we could improve the site, we will continue to evolve it going forward.



Farmer Focus



Farmer Focus – Rob Raven
Cover Crops, Farmer Focus / By Rob Raven

January 2023 After a very easy and early harvest, followed by a few stressful weeks of unbelievably dry conditions when most drilling and land work was impossible, we finally had the autumn we had all been waiting for. For us the rain fell little and often from mid-September until the





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TOGETHER FOR A HEALTHY AGRICULTURE

FARMER FOCUS

ANDREW JACKSON



When Chris asked me to write this article, I gravitated into panic mode because this is a quiet part of the year and I was not sure what to write about, however we seem to have been continuously busy, so I had better fill you in on our out of season activities.



In order to achieve one of the principles of regenerative agriculture where grazing livestock can be returned to graze within an arable rotation, I decided to perimeter fence our two farms with a view to eventually fencing individual fields. This would be funded by grants when available, or by not spending thousands of pounds on phosphate and potash fertiliser. I am working on the principle that we may have sixty years of phosphate reserves within our soils, and we just need to stop disturbing the fungi within the soil so that they can access the nutrient and feed it to the plant roots. The same may be said for potash, however I do plan to react to Sap tests and apply foliar potash when required. I seem to have managed to fall out with two or three fencing contractors, so I needed a system where we could erect fences ourselves with the skill set of our farm staff, (Carl, Anna, and myself).

Having spent days throughout my career patching up livestock fences where the wooden posts have rotted just below the surface of the ground, my attention was drawn to the steel post and Clipex stock netting which is supplied by McVeigh Parker. We erected a short distance of fence, and the appearance was very respectable and functional. Rolling out the netting and sinking some of the straining posts highlighted a few problem areas if we were to continue at scale. So I invested in a Quickfencer to roll out and tension the netting/ barbed wire, I also invested in a post knocker. I don't envisage either of these items depreciating a huge amount of money and I could possibly sell them when my fences are complete.

Just after Christmas we completed our first section of perimeter fence, and this has allowed us to graze three fields with ease and confidence. Other spin offs include hopefully

detering dogs from hassling or killing our sheep and pinning back the public to the public footpath. During lockdown there seemed to be a right to roam over the whole farm. Excitingly we now having sheep grazing our arable fields for the first time in more than one hundred years. Will there be a cost benefit to all this cost and effort, I can hear you say? The answer is that I don't know. All I do know is that the soils have evolved over thousands of years with grazing animals and, at the risk of harping back to Gabe Brown's Dirt to Soil book, he prescribed grazing, and it just feels right to me. We were lucky enough to go to the Groundswell site to listen to Gabe Brown and his two colleagues. We learnt bits here and there, but our climate is so different to theirs, so we just must believe in his principles and try to make them work in our climate and on our soils.



In association with the film crew of 'Six Inches of Soil', a film that my daughter Anna is appearing in, we visited John Pawsey. There we spent a day discussing the differences and similarities between Regen farming and Organic farming. We had a common goal of producing wholesome crops and caring for the soil and if glyphosate ever gets banned, we may all be knocking on John's door to see how we can manage our regen farming without one of the major chemicals within our armoury.



On John's farm Anna got the opportunity to sit in the cab with John's ploughman Sam who was skilfully ploughing at only four inches deep, the very same depth that the horse drawn ploughs operated at. Indeed, the question at the back of many farmers minds may well be which is the worst of the two evils, a low dose of glyphosate or shallow/ slow ploughing? Gabe Brown does not do either but having been to hear him speak and read his book, I still don't really know how we can achieve this goal. For a few years I have been buying Gabe's books in lots of ten books at a time and giving a book to any farmer who shows an interest in Regen faming. I was not aware that Anna had told Gabe about my book donating strategy, and he personally signed a book for me, and Anna gave the signed book to me for Christmas.

After Christmas we attended two conferences, the National Farm Attractions at Harrogate, and the BASE UK at Nottingham. Coincidentally, both featured the same motivational speaker, David Hyner. His presentation was slightly different for each conference, but the message from the Farm Attractions Conference was that you should strive for a goal and even if it is deemed impossible, this should not become a barrier to success. I hatched a plan and this must have been very different from all the Farm Attraction operators in the room. My plan was to strive for the impossible, to aim to grow a 10 T/Ha crop of wheat, direct drilled, without using fungicides, insecticides and applying only 100Kg/N/Ha.

A ten-tonne crop per Hectare is a reasonable target



using normal crop production techniques, but my goal was threefold. If achieved, the cost of production would be so low that the grower would almost certainly make money. If it could work with wheat, the system would work throughout the other crops within the rotation and lastly this achievement might make all those farmers who look over my hedge and wonder what the hell is he up to this time, think again.

For some time, I have been considering setting up a regional/local cluster group, I have encountered many local farmers who may have read about Regenerative farming in the farming press. They understand the logic but would like to discuss the topic before making a leap. The 10 T/Ha

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'impossible' goal made me think that by sharing the goal and asking others to carry out their own trials, there might be more chance of reaching a blueprint, before I retire or die.

In February I attended a reunion of the 47th Business Management Course of the Worshipful Company of Farmers. The host was Rob Shepherd, and the reunion was based near his farm in Salisbury. Rob has been working with Wessex Water to form a cluster group to examine the influence of agriculture on ground water, but also ways to improve biodiversity. Rob believes that there may be financial rewards through selling biodiversity and the cluster group or amalgamation of cluster groups may help bring this product to the marketplace. My thoughts are now that there could be other financial benefits from the creation of a regional cluster group.

Although my trials last season using foliar nitrogen were not successful, I have spoken to other farmers who have had success. Joel Williams and David Aglen, both told me at the BASE UK Conference that the ten-tonne goal may well be achievable and after sitting in on Joel's foliar nitrogen course, I strongly believe that foliar nitrogen will be part of the strategy. Consequently, I have been to see two farmers who have been making nitrogen fertiliser by dissolving urea into water and researched the topic on the Farming Forum.



One of the two farmers that I visited had not considered foliar application, his aim was just to make nitrogen fertiliser at a more competitive price, so if I struggle with the foliar, hopefully I will be making some financial savings. Currently I am on some sort of "Challenge Anneka" (the younger reader will have to Google this TV program), to convert my redundant Dutch barn into a fertiliser making plant for use in April.



Anna spoke at the BASE UK Conference and after an afternoon of thought-provoking presentations, her light hearted look into her life and the start of her farming career went down well and many people offered complimentary comments. Last week we had our final filming with the 'Six Inches of Soil' crew. I believe that it went well, however I will never make an actor because of their failure to squeeze any emotion out of me for the film.

In my other life I help my wife when required and sometimes when not required within the Pink Pig Farm Attraction. After visiting a beer festival in our local church, I came up with the idea of combining a beer festival with a music festival. To date I have come up with five bands, ordered additional toilets and we are now sampling beer from local breweries with a view to selling ten cask ales, one or two lagers and a cider. The date is May 20th and the tickets have been released, watch this space!!!



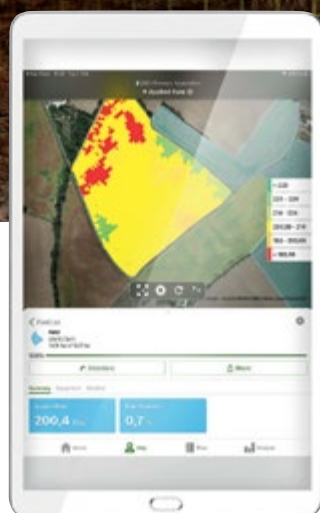


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3 IN 1 WITH KUHN ESPRO

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The smaller 3000 R offers a 2500 litre hopper whilst the larger Espro models are fitted with a 3,500 litre hopper. The time and fuel saving will be significant for operators looking to incorporate fertiliser, seed and potentially a cover crop or pesticide such as slug pellets.



The 3 metre model can be fitted with two hoppers from the KUHN range, the SH1120 sits on the drawbar and SH1540 is fixed on the rear. The 4000 R can be coupled to the SH1120 which mounts to the drawbar, with the larger SH2560 being mounted on the rear of the machine. The smaller SH1120 is well suited to slug pellets, whilst the larger could be used for a second seed type. Similarly, the larger 6 metre model, the 6000 R, can be specified with the same SH1120 hopper, but can also carry a larger SH4080 on the rear.

The additional hoppers also offer a way to reduce soil compaction by minimising the need for heavy machinery to be used for multiple passes. Whether direct drilling or drilling into cultivated land, the Espro can sow seed, fertiliser, and slug pellets in one pass. The additional hopper space could also be used to increase seed capacity, using the additional hoppers to sow two types of seed and fertiliser, should slug pellets not be needed.

The depth at which the seeds and products are drilled can also be adapted, enabling two different depths to be set. This enables the Espro to drill three products at two depths across a variety of soil types.

By using all three hoppers, operators can make significant fuel savings. The Espro is also well suited to medium to large-scale arable farmers and contractors thanks to the low power requirement and high output capacity.

There are four SH hoppers with capacities ranging from 110



litres to 400 litres. The application rate for the smallest in the range is 0.6kg/ha up to 65kg/ha whilst the largest offers an application rate of 2.2kg/ha up to 130kg/ha. The mid-range models offer 150 and 250 litres respectively and also provide an application rate of 2.2kg/ha up to 130kg/ha.

All SH hoppers feature a 12 V motorised Helica metering unit that uses fluted cells to provide constant and regular seed flow. The seeding rate can be adjusted without removing or changing any parts to speed up the process. The constant distribution and uniform seed positioning prevents competition between plants by providing sufficient surface area for plant development.

The Crossflex coulters bar is the key to the Espro range's high working speeds. Each coulter is mounted on polyurethane blocks which allow the individual coulters to closely follow terrain contours. This ensures a consistent seeding depth across the machine's full working width and enables accurate seeding to be carried out at high forward speeds.

The Espro uses two rows of cultivating discs followed by a single row of large diameter (900mm) press wheels which are offset and fitted with specially designed deep tread tyres to create an ideal seedbed. Other options on the front are a levelling board, track eradicators, full width press wheels or press wheels and track eradicators in combination.





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Where farming starts

THE EVOLUTION OF **TILLAGE TECHNIQUES** ON HEAVY ARABLE LAND IN THE EAST MIDLANDS

Written by Dr Alastair Leake from The Allerton Project

"There's a reason why we use the plough" a colleague sagely advised me when I questioned this fundamental agricultural practice; "It works" - and I was treated to a history lesson to-boot. Having transitioned from growing heated glasshouse salad crops in hydroponics, the ultimate zero-till system, I was curious to explore the concept of Integrated Crop Management (ICM), which appeared to advocate as one of its key tenets something called "Min-till".

Over the next decade we transitioned through a number of drills, mostly loaned by dealers. We began with a one pass system developed by German machinery manufacturer Rau, which completes four operations in one pass – soil loosening legs to open the ground; a powered rotovator to create the tilth; a seeder unit dropping the seed into the curtain of soil thrown up by the rotovator; and roller to consolidate. We had good results with establishment but the machine was only 3.0m and needed a lot of horse-power and the intensive soil disturbance by the rotovator chitted a lot of weed seeds. On 2,000 acre estate we calculated that we'd need 8 of them to get the autumn crops in so that machine idea was parked.

Next up was the formidable JD750A No-till drill. Being rather too eager on its first trip out we drilled for 7 minutes and then spent 7 hours unblocking the drill. But once the operator was tamed the results were impressive. The drill was excellent on seed depth

placement, seed to soil contact and was able to deal with undulating ground and trash remarkably well. Its only downsides were a hefty price tag and the wide rows which allowed weeds too much space to grow before the crop canopy closed.

Following a visit to Sweden, where the crop establishment interval between harvest and permafrost can be tight, we bought in a Vaderstad Rapid drill. Again it took us a while to set the drill, including a visit from the Companies UK MD who spent several hours under the drill making adjustments, (impressive I thought, how many MD's would be able to do that?) and then we were flying as the machine gobbled up the acres. We were not alone, the ground-breaking LIFE (Less Intensive Farming and the Environment) Project, which was pioneering minimal tillage approaches at the time also moved away from a one pass Dutzi drill to a wider, faster operating disc drill. Indeed, more and more people were asking to come

and visit our trials and it was clear that there was a renewed appetite to move away from the plough, after a discredited spell of direct drilling during the 1970's.

At this point I moved 12 miles to take up my role at the Allerton Project. Allerton too was in the process of transition moving from ploughing to a Simba Solo and Free-Flow drill system. This was a good "belt and braces" approach on heavy ground, but the level of disturbance is akin to a shallow plough, but without the inversion. We expanded our operations by taking on contract work for neighbours who were not yet ready to invest in machinery and make the switch until they had seen some results. Some considered the tine based Free-Flow to be a weak link in the system so we brought in a Vaderstad Rapid with disc seeders, which we operated successfully for a number of years. From then we moved onto a John Dale Ecodrill interspersed with a Claydon. I'm often asked by farmers to nominate the best drill I have ever used, but that's impossible to say, because every drill has its strengths, depending on what you are using it for and where and when you are using it.

Recognising that issues of trash, slugs, grassweeds and compaction can be a challenge for non-inversion tillage systems a small group of experts set up a new organisation – The UK Soil Management Initiative or UKSMI. SMI brought together soil scientists, farmers, machinery manufacturers, NGO's and agronomists to work together to overcome the problems. We were soon in-touch with European partners and similar National Associations from Denmark, Germany,





and to run events and workshops around the country. The Guide used 12 case studies on different soil types, rotations, in different counties to show how some farmers had managed to successfully make the switch away from ploughing. Another study, again supported by Defra, compared 5 farms using non-inversion tillage with 2 farms still ploughing. The results showed that non-inversion tillage saved 52 minutes a hectare in establishment time. With farms expanding at that time but not wishing to increase labour this was a major driver behind the switch.

Engineering developments meant drills achieved better slot closure, straw choppers and spreaders got better at dealing with straw and "trash rakes" were developed, including one by SMI founder Director and Worcestershire Farmer Jim Bullock who went onto form BASE (Biodiversity, Agriculture, Soil and the Environment) with another pioneer of the time Steve Townsend. With better trash management and slot closure slugs became less of a problem.

Important new research at the time

Portugal, Italy, Spain and Switzerland coalesced to create The European Conservation Agriculture Federation or ECAF. We succeeded in gaining EU Funding under the LIFE Programme and this enable us to travel and meet, run seminars and farm walks and all learn from one another. I consider this bringing together of knowledge to have been key to the rapid adoption

of non-inversion tillage across Europe. In the UK we went from less than 10% of land under non-plough tillage in 1999 to over 50% by 2006, just 7 years, putting us only second to Finland on the leader-board. The number of country members of ECAF doubled too as others joined. Defra commissioned us to write "A Guide to Managing Crop Establishment"



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demonstrated significantly less seed hollowing when winter wheat was sown at 40mm rather than 20mm, partly through preventing slugs from accessing the seed and partly due to more consistent and higher moisture levels at depth giving rise to faster chitting and lessening the vulnerable period when seed is sat in the soil dormant. Further research demonstrated that trashy stubbles were good for beneficial predatory insects which helped to reduce BYDV infections by controlling winged aphids flying into the crop. Only quite recently we have shown how direct drilled stubbles with long straw provide structures for spiders to weave webs and reduce cabbage stem flea beetle infestations in autumn sown oilseed rape, and across a wide range of sites we have shown time and again that birds prefer stubbles in winter compared to ploughing.

So with the majority of the early problems of switching tillage resolved we were left with the final and most difficult challenge – herbicide tolerant blackgrass. In a short article I'm not going to be able to begin to cover the vast amount of work that has gone into trying to manage this. Indeed having listened to renowned Rothamsted weed scientist Steve Moss speak on the subject for over four hours, and to be re-assured by him that he could go on for another two, you can see why I might shy away from this. However certainly our experience at the Allerton Project, where the battle continues, we have found that using a whole range



of approaches in tandem can make the problem manageable. Shifting to a strong emphasis on cultural control is working for us, including bringing in spring sown crops to the rotation, delayed drilling in the autumn, the re-introduction of rotational leys, which we spray off after three years and then direct drill with hybrid winter barley, which effectively gives us four years without fresh return of blackgrass seed works well. Perhaps the most contentious thing we do is to occasionally introduce the plough to invert the soil and give us a fresh start. This I know causes deep anxiety to those who believe that all the hard work done to make the transition to direct drilling will be lost. Perhaps then I can offer some words of comfort based on our scientific evaluation of the impacts of rotational ploughing.

Firstly, if you only do it once then the harm is limited. Certainly we lost around 20% of the carbon and 50% of the earthworms, but we still had more of both than when we started down this route. Consolidating the soil quickly behind the plough reduces soil carbon loss, and possibly earthworms too. Done well it can certainly reduce the amount of blackgrass seed in the germination zone, but you may also get some unexpected surprises as I did when we ploughed a field that had only been cultivated by reduced tillage for 2 decades; we brought up dormant charlock seeds. It showed me how well we had purged the field of this weed problem through non-inversion tillage without even noticing, until we brought up that legacy to the top again.

Going forward it is good to look back at what we have learnt and how we have addressed the past challenges. Now we must address the current ones. Recent work at Allerton with Syngenta has shown that Conservation Agricultural approaches halve the amount of fuel used while increasing the work rate by 50%. With high fuel costs and weather patterns becoming more extreme, limiting work windows and curtailing yields, the challenge now is to make our approach to crop establishment more resilient.



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THE FUTURE OF EFFICIENT CROP ESTABLISHMENT

HOW TO MAKE FOLIAR NUTRIENT APPLICATIONS MORE CONSISTENT

By Mike Abram

Foliar feeding gained in popularity last season with high nitrogen prices. In this new series based on Joel Williams from Integrated Soils Foliar Nitrogen training course, Direct Driller looks at how to improve its effectiveness

When prices of nitrogen rocketed ahead of last season, and supply looked anything but assured for a time, there was an understandable interest and move towards alternative sources of nitrogen fertiliser.

One of those was foliar nitrogen with plenty of growers either trialling or increasing its use.

Foliar feeding, particularly of trace nutrients, is, of course, nothing new. It offers an alternative, potentially more efficient and much quicker route to get nutrients into the plant. But results can also be inconsistent and variable.

Much of that is potentially down to factors around application, suggests Joel Williams from Integrated Soils. He has recently launched a four-week, 10-lecture online masterclass into foliar feeding, especially foliar nitrogen.

"The goal is to avoid the spray and pray approach," he says. "It's not just about filling up the tank, throwing in some nutrients and going – there are a lot of things to consider.

"Foliar nutrient sprays have the perception of being rather inconsistent, and I think that's because attention to detail on the design of the application and the spray conditions is not there."

To help overcome that, Mr Williams has developed the FACE framework. FACE stands for formulation, application, crop and environment – the key aspects to consider when applying foliar nutrients. For each he has some recommendations for optimum performance, with formulation and environment particularly crucial.

"Try to follow these recommendations

as best you can to optimise applications and minimise variability," he suggests.

Formulation

Before you even consider adding nutrients to the tank, think about water quality, Mr Williams says. "It is very clear that water quality can have big impacts on pesticide efficacy, and the same is true of nutrient uptake.

"For optimised foliar nutrient sprays use as clean water as possible – rainwater is ideal."

An alternative is using a process called reverse osmosis to de-mineralise or de-ionise water by pushing it under pressure through a semi-permeable reverse osmosis membrane. This removes salts and other contaminants that could lock up the nutrients.

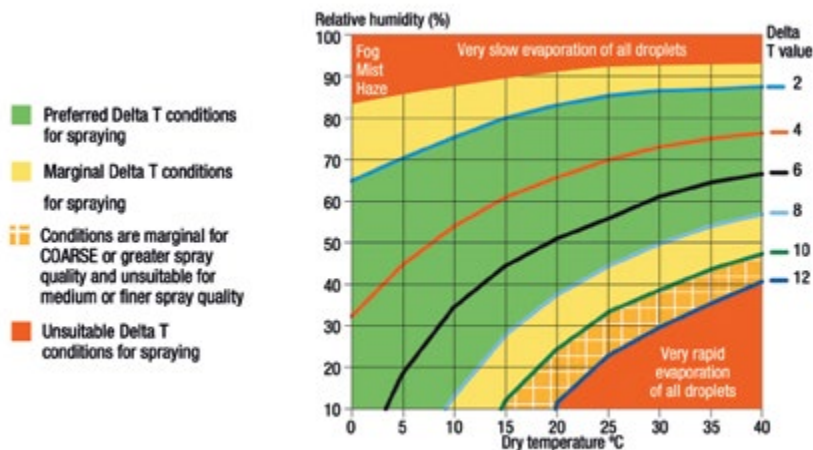
While kits are expensive, some Australian and Canadian farmers have found it easily pays for itself within a couple of years just on savings on herbicides, Mr Williams says.

Optimal pH of the spray solution should be between 5 and 5.5, and certainly no more than six, he adds. "Optimal absorption of nutrients happens under acidic conditions."



Water hardness is a well-known issue with some pesticides, and high amounts of highly charged ions such as calcium and magnesium can lock up nutrients. A review of literature suggests if water hardness is reaching 250ppm of calcium carbonate or equivalent it's worth looking trying to clean that water up, if possible, with reverse osmosis or diluting with a cleaner source, he suggests.

The same applies with bicarbonate, with Mr Williams suggesting a maximum of 500 ppm, and also salt, with a guide



* https://grdc.com.au/_data/assets/pdf_file/0023/142583/grdc_fh_spray-practical-tips_low-res-pdf.pdf.pdf

figure of less than 50 milliSiemens/cm for salinity.

Activator adjuvants that either alter the behaviour, activity or availability of the nutrient compounds, or utility adjuvants that change the water properties can also be helpful.

Examples of activator adjuvants include stickers helping stick the spray solution to the leaf, spreaders that maximise the surface area of contact for absorption, penetrants, such as fulvic acid or amino acids, which help improve uptake, and humectants which slow the drying of the droplet.

There are two main water conditioners – ammonium sulphate and citric acid. “Both are good,” Mr Williams says. “You don’t need huge amounts depending on water quality. The acid or sulphate binds to the cations to prevent them from binding to the compound of interest.”

Application

As with any foliar spray, application will be crucial to maximising effectiveness. With foliar nutrient sprays, choose the appropriate combination of nozzles, pressure and forward speed to achieve an appropriate droplet size for it to reach the canopy, and stay on the leaf.

Water volume is important – high enough to maximise coverage, but not too much that the spray solution runs off the leaf.

The other key is to try and coat both sides of the leaf – a little bit of wind to rustle the crop can be helpful in achieving this – as nutrient uptake (see panel) is through stomata, which are mostly on the underside of the leaf, as well as targeting the upper surface of the leaf for uptake through the cuticle and leaf hairs.

Crop

As well as obvious different canopy structures between crops, there are other crop-specific characteristics that can impact on performance.

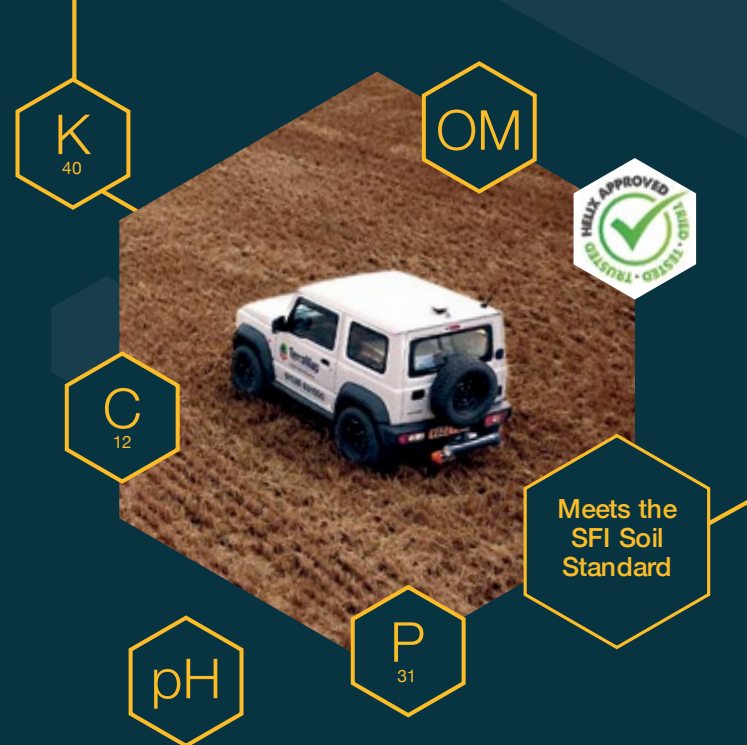
Obviously, there has to be enough leaf area to spray, Mr Williams points out, which means letting crops recover enough from grazing to capture the spray. “That might be a week to 10 days after grazing, although in New Zealand some growers are going after just four days and still seeing effectiveness.”

If the plant is stressed from drought, temperature or pest or disease attack, uptake will be reduced, he adds.

Younger leaves tend to be more responsive to foliar-applied nutrients, with quicker uptake than older leaves, which are a bit more waxed. “The same is true of different plant types – brassica leaves tend to be more waxy than cereals and harder for nutrients to penetrate. For these I would emphasise using stickers and penetrant adjuvants to get the nutrients through that waxy layer.”

There are varietal differences. “Some varieties do better under low or high input type systems, or different growing conditions and the same is true of foliar, with some more responsive than others.

“That’s something we could perhaps be breeding for. If we bred more specifically for this we could get higher nitrogen use efficiency and lower nitrogen requirements for crops.”



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Environment

If there is one factor to pay particularly close attention to when spraying foliar nutrients it is relative humidity. "You want relative humidity to be high to keep the cuticle layer dynamic and permeable and the stomata open."

The magic number for relative humidity is 70% and above for optimising stomatal opening, he says. Research consistently shows greater uptake at higher relative humidity.

High temperatures should be avoided with an absolute maximum of 28C, but preferably no more than 25C advised.

"Your optimum spray window is likely to be either early morning or later afternoon when relative humidity tends to be highest. High light intensity can also increase uptake."

On the leaf you want the droplet to slowly dry out, but not too rapidly. Water slowly evaporating from nutrient droplets has a positive in making the nutrient more concentrated and therefore creating a gradient to make absorption into the leaf easier, but if it happens too quickly the solution can crystallise leading to poor uptake.

There are two factors in play here –

the combination of relative humidity and temperature drives evaporation rate, while the point of deliquescence of the nutrient salt drives how quickly the salt starts to crystallise.

The point of deliquescence (POD) is the relative humidity at which a hygroscopic material, like a fertiliser granule, can take enough water out of the air to dissolve into a solution, or looking at the other way, when it will start to crystallise.

That relative humidity point changes for different nutrient salts (see table). Some are relatively low like calcium chloride and magnesium chloride (around 33%), while others are very high like potassium sulphate (98%). When relative humidity is above that point the salt solution stays in solution and there should be good uptake, while below it, crystals start to form with poorer uptake.

Mixing different salts, however, tends to bring down the mixture's POD, usually by more than you would expect just from averaging the constituents, Mr Williams says. "Practically though it could be worth adding a kilo of a low POD material to bring the POD of the whole mixture down."

Evaporation rate is defined by a metric called Delta T – effectively a combination of relative humidity and temperature. High Delta T means faster water evaporation. It typically has more relevance in hotter climates, Mr Williams says, but might be a useful indicator in hotter summers in the UK.

"You're looking to spray when Delta T is between two and eight (see chart). When you're in that band you have good humidity [for stomatal opening] and slow drying of the droplet and will help maximise uptake."

Where Delta T is getting or is too high, you can mitigate its effects by increasing water rates and using coarser nozzles, while at lower Delta T values, do the opposite and use lower water volumes and finer nozzles. Stickers can help keep the droplets on the leaf for longer, he says.

Practical application advice for foliar nutrient applications

- Use as clean water as possible – rainwater
- Water pH 5-5.5, with low hardness or bicarbonate
- Add chelators and / or carbon source to neutralise nutrient charge and increase uptake through a negatively charged leaf surface
- Cover both sides of the leaf to maximise stomatal and cuticular uptake
- Aim to spray when humidity is above 70%
- Check Delta T is 2-8 especially in hot weather when spraying
- Avoid spraying when crop is stressed

How are nutrients taken up by leaves?

While roots are designed to uptake nutrients and are the dominant pathway, it is possible for nutrients to be taken up through the leaves.

There are six potential pathways for uptake through the leaves, but three are thought to be key – through the cuticle, or leaf skin, through the stomata – the pores that control the rate of gas exchange and are critical for photosynthesis, and through tiny leaf hairs called trichomes.

Researchers traditionally believed that nutrient uptake was through micropores in the cuticle, which open under high humidity, Mr Williams explains. "The same is also true of stomata."

In both cases the uptake is passive, relying on a gradient moving the nutrient from high concentration outside the leaf to a low concentration inside the leaf.

Environmental conditions that encourage these micropores or stomata to open and close are therefore important to uptake, with humidity, temperature, light, plant water status and carbon dioxide all factors.

But it might not be just these pores that are important, Mr Williams says. A recent review by Victoria Fernandez from the University of Madrid suggests that in higher humidity or when the leaf is wet, water channels are created from outside the leaf through the cuticle. "Therefore nutrients can move via this water bridge through the cuticle into the plant," he explains.

Uptake might also be through the leaf hairs, at least in some plants, he adds. "For example, a study in sunflowers has shown that at the base of these hairs there are cells that are very permeable and receptive to taking up nutrients. Nutrient droplets will be caught by these hairs and run down to the base, where those cells can absorb them."

Point of deliquescence for selected inorganic salts for foliar nutrition

Compound	Point of deliquescence (% Relative humidity)
Calcium chloride hexahydrate	33%
Calcium nitrate tetrahydrate	56%
Magnesium chloride hexahydrate	33%
Magnesium nitrate hexahydrate	56%
Magnesium sulphate	90%
Zinc nitrate hexahydrate	42%
Zinc sulphate	90%
Potassium chloride	86%
Potassium nitrate	95%
Potassium sulphate	98%
Potassium carbonate dihydrate	44%
Dipotassium phosphate	92%
Monopotassium phosphate	95%
Ammonium nitrate	63%
Calcium propionate	95%
Calcium lactate	97%
Calcium acetate	100%
Ferric chloride hexahydrate	44%
Ferric nitrate nonahydrate	54%
Manganese nitrate tetrahydrate	42%
Manganese chloride tetrahydrate	60%



Robert Plumb

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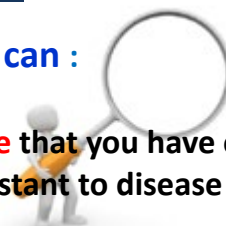


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SOIL HEALTH:

NEW OPPORTUNITIES TO INNOVATE IN CROP PROTECTION RESEARCH AND DEVELOPMENT

Atwood et al, 2022

The paper discusses the importance of soil health in crop protection research and development. The authors argue that soil health should be given greater attention in crop protection research as healthy soils can lead to healthier crops and better yields.

It highlights the challenges faced by farmers in maintaining soil health, such as soil erosion, loss of organic matter, and soil compaction. These challenges can lead to reduced soil fertility, nutrient deficiency, and reduced crop yields. The authors suggest that addressing these challenges requires an integrated approach that combines soil management practices, such as conservation tillage and crop rotation, with crop protection strategies.

It also discusses the potential of new technologies to improve soil health and crop protection. For example, precision agriculture technologies can help farmers optimize their use of fertilisers and pesticides, reducing the risk of overuse and environmental harm. Similarly, genetic engineering and biotechnology can help develop crops that are more resistant to pests

and diseases, reducing the need for chemical pesticides.

The authors argue that innovation in crop protection research and development must prioritize sustainable practices that promote soil health and biodiversity. They suggest that a more holistic approach to crop protection that incorporates soil health can help improve the sustainability of agriculture and reduce the environmental impact of farming.

In conclusion, the article emphasizes the importance of soil health in crop protection research and development. The authors argue that by prioritizing sustainable practices that promote soil health and biodiversity, farmers can improve crop yields, reduce the use of chemical pesticides, and contribute to a more sustainable future for

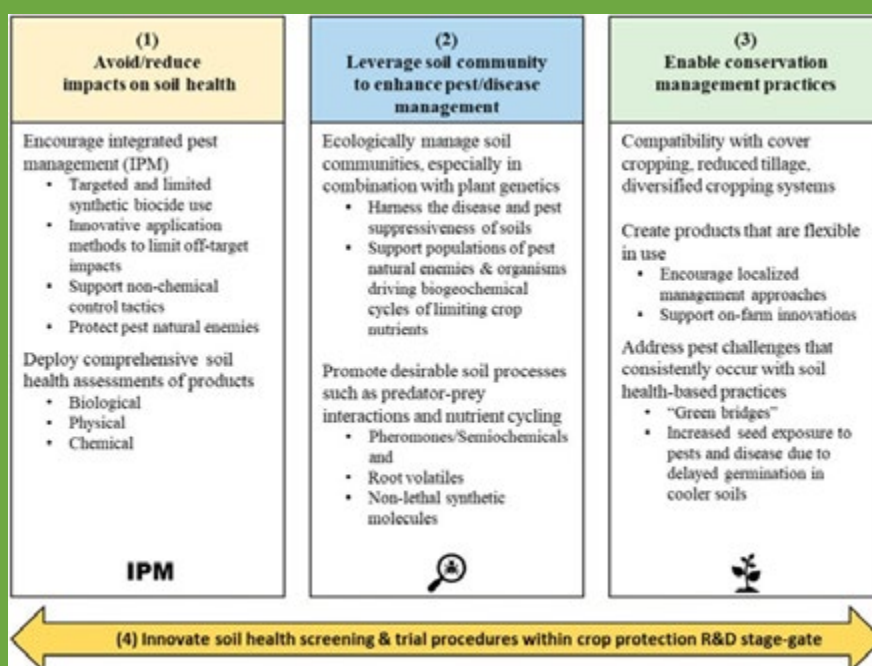
agriculture. They call for greater collaboration and investment in research and development to develop innovative solutions that address the challenges facing soil health and crop protection. It is an interesting read and worth 20 minutes of your time.

Read the full paper by following this link or scanning the QR Code: <https://doi.org/10.3389/fenvs.2022.821742>



Paper Abstract

Soil health-based agricultural management practices are widely promoted to reduce erosion, increase nutrient use efficiency, improve soil structure, and sustain or increase yields. Pest and disease management are less frequently considered as components of a soil health management system. We present a framework for how the crop protection industry can advance soil health by developing systems of crop protection innovation that simultaneously target soil health outcomes, either through direct impact on soil or by enabling practices that promote soil health outcomes. Such an approach could lead to cross-sectoral, integrated agricultural solutions that achieve agronomic, environmental, and economic goals.





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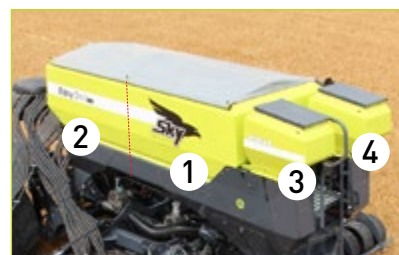
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FARMER FOCUS

DAVID WHITE



As this magazine is entitled Direct Driller I'll start off with a couple of drill comments.

The CO4 has had a set of replacement Dutch 2" tips fitted as the first set had worn very thin in places and changing the odd failed one resulted in uneven depth across the drill. I'd deliberated over fitting another style of point but decided that I like the light disturbance that a 2" gives when drilling cover crops behind the combine covering beans for instance promoting better germination of volunteers. A little width of spread in the seed row also appears to close the 250mm row gap although whether this is a measurable advantage I don't know. There are times when I think a very narrow point such as the Metcalf would benefit me with its minimal disturbance, but I have an Avatar too so both options are covered. Having had the Avatar a couple of seasons now its operation and setup has become more intuitive. A couple of things I don't like are that I still get an odd blocked coulter and I can't work out why which is annoying, shame blockage sensors are sooo expensive! I don't like the cluttered run screen layout which seems to repeat unnecessary information and restrict things I do want to see clearly and quickly. And finally, and only because I want to use rates for things outside the norm, I find I haven't always got an appropriate seed rotor. A low rate of companion beans is an example that would never have been an issue with the lovable ubiquitous Accord rotor. Perhaps the clever people at Horsch could design one?

Having followed my first successful Bi-Cropping (if that's what we're calling it?) experiment with spring beans this year's winter version of Mascani with Tundra beans was similarly successful. Again, these were grown with no post emergence inputs other than some Man-Mag nutrition and had a very favourable GM compared with the control of



Light tillage control of grass weeds.

mono-crop Mascani. I see a big future for both bi-crops and companions grown with cereals in making our rotation and production more regenerative and its even being supported now with greening SFI ££s. My inclusion of winter pea, vetch and beans came very well in the wheat crop last year and survived the pre-em herbicide without issue. I didn't get chance to repeat that this year due to time restrictions, but I see it standard practice going forward. This aided by having multiple seed hoppers on the Avatar.

The one thing holding back wider adoption of "Bi" and "Com" cropping is the ability to clean and separate the harvest output on farm. It's disappointing that the latest round of grant funding is not helping to move this initiative on and whilst again there is the opportunity to have a new direct drill subsidised (again!) on farm seed cleaning machines don't feature. I'm now involved in starting a local cluster group and one of the things we are exploring is grant funding of a group mobile cleaner. As part of this I'm in conversation with the terrific guys at McArthur Agriculture about building a higher spec mobile cleaner, more versatile than the one you may have seen at LAMMA. This should be able to produce two clean grain fractions as well as coarse and fine waste. Being able to fine clean at around 8t/h or so will remove the hesitation some of us have at broad acre bi-cropping our farms.

Sadly Glyphosate has been adopted as the whipping boy of the anti-pesticide greens throughout Europe. Rarely do we attend a meeting where the "how are you going to direct drill without glyphosate" question isn't asked. The honest answer is I don't know yet. If we do lose it I know it will potentially be a huge detrimental step in my ability to build the natural capital in my conservation farm environment whilst maintaining profitability tipping my grain down the same hole and being paid the same as the global commodity



Companion beans drilled as final seeding preparation for Wildfarmed wheat.



Above left and right: Off with old Dutch tips and one with the new.

priced “normal” stuff, huh!

So I've gone a little bit Wild, to be precise Wildfarmed. I hadn't got a trial this year which worried me, I have now. I've planted 6ha of their spring milling wheat blend and am planning two more 6ha areas to form a new rotation. Small scale you may say but enough to learn on.

The main reasons for going Wild.

1. The growing standards stipulate no “cides” which includes glyphosate so I'll have to learn how to grow without it.
2. Companions and bi-cropping is encouraged, yey! and the crop can be delivered entire, unsorted.
3. I'll be supplying a supply chain that recognises value and pays a premium, and be able to buy the bread in the shops.
4. Other than the seed the spend will be negligible so no spray bills, double yey! However, we can use a limited amount of synthetic nitrogen if sap tests demonstrate the need.

Confession time. More or less for the first time in seven years I've done a little bit of cultivating, non-yey. Nothing like full inversion or very deep. Even though the combination of a demo Horsch Cultro crimper and -10° frost did kill the cover crop there were some remaining grass weeds that I wanted to kill. *Thought bubble, Whist many of us in East Anglia were getting worried by the February drought I've rediscovered a dry period is fabulous/essential for drying out freshly disced up blackgrass plants. A pass with the light disc machine in the frost followed by a well timed pass with the tine drill putting in the companion beans left a clean seedbed for the disc drilled wheat. Whether all this disturbance will stimulate a bigger spring flush of broad-leaved weeds I don't know but the true DD control strip I left should show.

Without being able to dip into the spray shed for a herbicide, forward planning for the Wild rotation will be important so consideration is already being made for managing the year

two and three areas. Herbicide residues may already have made establishing a clover living mulch difficult. Should under-sowing something else in the spring barley on one of the areas which is still herbicide free be considered? Which frost intolerant cover crop species need to be considered for next year? Will I need sheep? double non-yey! All questions that can be answered by those more experienced than me on the very active Wild WhatsApp group.

*I wanted to; did I need to? In a diverse regenerative rotation using less synthetic nitrogen will a few grass weeds prove to be the problem they are when fuelled by 240kgs of N?



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DRILL MANUFACTURERS IN FOCUS...



Spring is the ideal time to check your soils and consider how to improve them, says Jeff Claydon, Suffolk arable farmer and inventor of the Claydon Opti-Till® direct strip seeding system.

15 February 2023

Spring is an excellent time to focus on soil health and how to improve it, because regardless of where you are, excellence in this aspect of farming is essential to maximise crop production and financial performance. I will provide some pointers later in this article, but first let us discuss the impact of the weather over the last year.

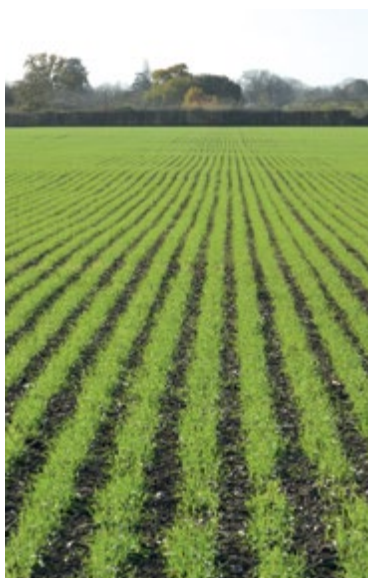
On the Claydon farm we had just 632.4mm of rain between 1 January and 31 December 2022, in line with our long-term annual average of 629mm, surprisingly. More significantly, from the start of the year until harvest finished during the first week of August just 244mm fell, and September remained very dry. The situation changed



The Opti-Till® system has been used to establish crops on the Claydon family's arable farm since 2002. The difficult-to-manage Hanslope series soils have constantly improved and provide ideal conditions for growing high-yielding, profitable crops. A 6m version of the new Claydon Evolution drill is seen here establishing winter wheat in October and in mid-February the crop was in great shape. Although designed as a direct drill, the scenario where maximum benefit is realised, the Claydon drill's versatility allows it to be used in conventional and min-till establishment situations after soil consolidation.

after we finished drilling winter wheat on 11 October, with two thirds of our annual rainfall coming in the last quarter of the year.

The first few weeks of 2023 have also been quite unusual, with just 58mm of rain from 1 January until 15 February. Our 200ha of winter wheat, all LG Skyscraper, has come through the winter in excellent condition and although we have yet to apply any liquid nitrogen the crop has never looked 'hungry', retaining a lovely deep green colour throughout. When temperatures increase the first dose of nitrogen will go on and hopefully it will progress rapidly from there.



Our winter oilseed rape did what it always does and died back considerably over the winter. Of the 61ha drilled about 5ha was severely affected by cabbage stem flea beetle and slugs. Exceptionally dry weather last summer forced slugs to go down deep into the soil to avoid dehydration but when the weather turned wet they surfaced to feast on the emerging crop. We applied slug pellets immediately after the first rain, but it was too late; the damage had already been done.

In mid-January we applied Kerb® herbicide to take out grass weeds in our oilseed rape, except on the small area which will be redrilled with spring oats. To date, there are no signs of it working and the forecast is for more frosty mornings over the next ten days, so it will be a while before the results are seen.

In mid-February, we applied 200l/ha of Chafer Nuram 35 + S (35%N + 7SO₃) and the seven days of frosty weather which followed hit the crop hard. Even though all our oilseed rape is the hybrid variety DK Excited the low temperatures have restricted its growth and I expect the crop to continue looking lacklustre. Oilseed rape has a good strong, deep taproot so once warmer weather arrives it should power away.

Writing at the end of February conditions are very dry and fields destined for spring sowing would be in an ideal condition for drilling but for one thing - the continuing low temperatures. In days of old, gauging when soils were warm



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Some areas of oilseed rape looked patchy in February, but once warmer weather arrives and nitrogen is taken up it will make up ground.



Oilseed rape has a strong, deep taproot.

enough to start drilling was done using what was technically termed the 'grandpa's bum' test, i.e., if the soil was warm enough to sit on with a bare bum it was warm enough to drill. I'm pleased to say that things have moved on considerably since then with our weather station now providing very comprehensive and accurate readings from the comfort of the office, eliminating the need to compromise personal integrity or cause distress to passers-by.

The dry, sunny, but very cold conditions are very misleading. Last week the daytime temperature was down to minus 2°C, yet today's high is 13°C with an overnight low of 3°C, so even though spring oats favour early drilling it's perhaps too cold to sow the 77ha of Elsoms Lion that we have planned. The variety yielded a pleasing 6.11t/ha last season and this year's crop will be sown from home-saved seed.

Overcoming the temptation to rush out with our new 6m Claydon Evolution drill requires great restraint. However perhaps we should try some drilling to see how the oats perform; they are tough characters, and if it were to turn dry like last season it could be a real winner. Or if we get an attack from the Beast from the East, we might be pleased that we were patient. Who knows? We sprayed off any grass weeds and volunteers in mid-November so that they didn't get too big and we will apply another dose of glyphosate before drilling, then follow behind the drill with our Claydon Straw Harrow before rolling.

SOIL HEALTH IS A PRIORITY

Soil health should be the number one priority on any farm. Even in mid-February, all the land on the Claydon farm is travelling wonderfully well and so supportive that we are considering switching from 620 x 42 tyres to 420 x 50s on our self-propelled 36m RoGator® sprayer to keep tramlines

narrow and minimise potential damage to the crop as it develops.

The extremes of weather over the last two or three years have highlighted the importance of having resilient, well-structured soils supported by an effective drainage system to take water away. However, achieving this using conventional crop establishment methods can be challenging.

Conventional full cultivations and min-till systems can overwork the soil and destroy its structure, adversely impacting worm populations and activity. This reduces the soil's ability to drain water in wet weather, leading to collapsing, slumping, and baking out, which increases moisture loss in dry conditions. This also starves the crop's roots of essential air and nutrients, ultimately reducing yield potential and increasing the cost-per-tonne of production. The risks from flooding and soil erosion are also substantially higher.

Ploughing is expensive, both financially and environmentally. It creates the need for extra cultivation passes and increases fuel consumption. Turning the soil over releases moisture and CO₂ to the atmosphere. Ploughing can deplete organic matter, mineralise nitrogen and harm soil life, while increasing the risk of wind and water erosion. The soil's natural structure is destroyed, and it can no longer support the weight of heavy machinery, resulting in compaction and deeper wheelings, requiring more cultivations to repair the damage.

A min-till approach involving several shallower cultivations can also damage the soil's natural structure and biology, which can lead to compaction and waterlogging. Min-till



In mid-February the soil in this field, which will go into spring oats, was in excellent condition and would have been ideal for drilling had air and soil temperatures been higher.



Poor drainage on this headland is evident from visible wheelings.



Green algae on the surface indicate poor drainage.



Patchy crops on headlands are a further indicator of areas where drainage needs to be improved

mixes weed seeds throughout the soil profile which allows them to germinate over a longer period. Drying the soil and preserving the weed seed bank is not helping to diminish the problem. Min-till can also dehydrate the soil which, combined with soil that breaks down easily into fine particles, can wash down the capillaries made by worms, blocking the flow of water through the profile into the drainage system. Green algae on the soil surface are an obvious sign of poor drainage and reflect anaerobic conditions, as do patchy crops on headlands.

ADOPTING A DIFFERENT APPROACH

Instead of continuing the cycle of cultivations to resolve poor drainage/ soil structure it makes sense to find an alternative. The Claydon Opti-Till® System which we have used since 2002 has been transformational, eliminating the need for unnecessary, expensive cultivations while also reducing the cost and time involved in establishing crops. As we demonstrate the poor drainage effects on small areas, even with the Claydon system, it makes great sense to resolve them. With the reduction in cultivation costs/time using the system it has allowed us to direct these savings into drainage improvements. This has resulted in better yields, cleaner, more reliable crops, increased soil health, less erosion, better performance and ultimately reliable profitability. Our soil is

made up of 55% silt 25% clay 20% sand, so this clay loam is not the easiest to farm, resulting in mainly cropping related to the combine harvester and the development of the Opti-Till® system.

The Claydon drill's leading tine technology is at the heart of the Opti-Till® system. The leading tine loosens soil, but only where necessary, namely in the rooting and seeding zone, while the bands between the seeded rows are left undisturbed. The front tine loosens and aerates the soil, creating a friable tilth which provides a perfect environment for seedlings to germinate and develop strong, deep roots that tap into the moisture in the undisturbed banks of soil. The leading tine also breaks up any shallow compaction, reinstating the water and air balance in the soil, providing good drainage so that excess can get away from the rooting zone. This eliminates ponding through the later autumn and winter period.

Moisture is retained in the unmoved soil for the crop to access, while earthworm populations thrive as their burrows and old rooting pathways remain intact. The natural structure of the soil is also left undisturbed and as the capillaries remain unbroken water infiltration and rooting are unimpeded, which minimises stress on the crop throughout its life cycle, while soil biology flourishes. Claydon soils also have an increased capacity to support traffic in the field without risk of compaction.

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A GOOD TIME TO TEST



Jeff Claydon takes a penetrometer reading in a field destined for spring oats.

Spring is an excellent time to evaluate the condition of your soils, check for signs of compaction and ensure that drainage systems are working correctly. This is easy and cheap to do, requiring nothing more than a fork, penetrometer, water infiltration tray and a couple of glass jars. With the information they provide you can plan to correct any deficiencies.

The first step is to insert a penetrometer into the ground at various points across the field to check that there are no soil pans,

as these will severely limit drainage and root development. They are not caused solely by compaction from heavy machinery or working when conditions are unfavourable but can result from the sedimentation of soils that have been over-cultivated and 'settled out' over the winter. If they are present, the probe becomes much more difficult to push into the ground and the indicator needle swings into the red.

Unhealthy soils run together, or 'slake', very quickly when wetted because they lack the natural glues which help bind them together. Slaking blocks the natural pores and worm burrows in soil, which can lead to waterlogging and can develop into erosion, resulting in a loss of topsoil. Conversely, in very dry conditions wind erosion can occur and be equally damaging.



The jar on the right contains a sample of soil from the Claydon farm. It held together firmly even over a prolonged period. So little soil fell through the wire mesh at the top of the jar that the water remained clear right to the bottom. The silt soil in the other jar quickly fell apart and most of it dropped to the bottom, clouding the water.

The slake test assesses the stability of soil aggregates when exposed to rapid wetting, as in the case of heavy or prolonged rainfall. The longer it takes for the soil sample to break up the better as this indicates a high degree of organic matter which helps to bind it together. This simple yet important test provides an excellent indication of a soil's resilience and health, is easy to do and costs nothing. The 'Soil' page of the Claydon website (claydondrill.com/soil/) has a short video showing the test being carried out.

There, you will also find our soil health brochure, which includes contributions from leading industry experts on a range of topics. Dr Elizabeth Stockdale, Head of Farming Systems Research at NIAB, discusses the benefits of good soil structure, how it can be damaged and how to improve it. Jerome Vasseur from seed breeder Jouffray-Drillaud in France highlights the benefits of cover crops and how to get the best out of them, while Gordon Brookes from Michelin discusses how to choose the correct tyre to reduce soil compaction.

FINAL THOUGHTS

Soil is an extraordinarily complex web of interactions, but in the right condition, with the right structure and nutrition it will deliver the results you are looking for. The key is to appreciate that its natural biology is there waiting to help; you just need to create the conditions to allow it to kick in.

All land is unique and often one field can contain several different types of soil which set the inherent limits to its physical properties, while management modifies those properties. Soil structure is broken, not made, by machinery: the plant roots, earthworms and glues/gums created by the decomposition process are the keys to its structure and aggregating ability. Food diversity is essential for both human and soil health, so adding more food to the land will allow it to support more biodiversity. Therefore, only move soil when necessary, avoid leaving ground bare and ensure that crops are grown in optimum conditions so they can maximise photosynthesis.

Working effectively with the soil requires an integrated, flexible approach to its husbandry. Changing one aspect of a system can alter the entire outcome and so, for example, the same drill might work differently in different situations and soils. When changing to strip seeding you cannot simply buy a new drill and expect that everything will be fine from the outset: for optimum results you must adapt your system and tailor your husbandry accordingly.

Even with the soil in excellent condition we are at the mercy of the weather. What will happen over the next few months we cannot tell, but if last year taught us anything it should be to always expect the unexpected. I will discuss the progress of our crops further in the next issue of Direct Driller and highlight some of the benefits which others who use the Claydon Opti-Till® system are experiencing.

The Claydon website galleries contain numerous videos on soil health and resilience, as well as showing the Claydon Opti-Till® System being used to establish all types of crops, in all situations, both in the UK and overseas – claydondrill.com. You can also keep up with the latest posts, photographs, and videos from Claydon and its customers through the Claydon Facebook page www.facebook.com/Claydondrill

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DRIVERS IN REGENERATIVE AGRICULTURE

Robert Patten B.Eng. MBA from Plantworks and Smart Rotations

We can define regenerative agriculture in many ways, indeed many have, but for the sake of a grounded definition let us agree it begins with a focus on the soil being an asset and not a commodity. This is a good start, as assets you value and try to build greater value in and commodities you tend to absorb.

Knowledge is a function of time, and much time has passed since we first started to cultivate the soil. We have bent technology to our will in many aspects of agriculture and have achieved huge advances in field yields, pesticides efficacy and farming scale. It is though only relatively recently that technology has been able to peer into the workings of the soil, to look at the underlying chemistry and biology and understand how these have become altered by contemporary farming practices.

In an all too simplified summary we find that soil organic matter, a proxy of soil health, has declined in some cases to critical levels, this valuable resource of carbon is needed to support the native biology of soils. This biology in turn has a direct correlation to yield, where through the many microbial interactions with plants communities of fungi and bacteria explore soils for nutrients, release them and convert them into plant available forms. As we move away from the quest for ever greater yields through intensive farming and focus on sustainable practices that, by definition,

can be maintained for generations we will rely on ever greater understanding of the many complexities of soils.

Farming is often highlighted as a contributor to greenhouse gasses, there is no getting away from it, with the USDA reporting that US agriculture is responsible for 10% of their carbon dioxide equivalent emissions. Fundamentally though, unlike any of the other sectors that at best can seek to reduce their emissions through adoption of new technologies or modulation of activity, only farming has the ability to reverse its carbon footprint and to potentially act as a global carbon sink. Think on that for a moment, there are potentially 570 million regenerative farming machines that could not only reduce their emissions but actually help to 'call down' the CO₂ that the industrial revolution and the decades that have proceeded have ejected into our atmosphere.

Little surprise then that governments have rightly sought to support forms of regenerative farming around the world

from both a future food security stand point and an environmental one. These interventions come in different forms, in the UK they are presented as incentives under the new Environmental Land Management Schemes (ELMS) that aim to support sustainable farming practices, improving animal health and welfare, reducing carbon emissions, creating and preserving habitat, and making landscape-scale environmental changes. Other governments, for example in Hungary, are taking a more generalised approach with farmers able to claim an 80 euro contribution per hectare when using bio stimulants and broader rotations combined, or a microbial bio stimulant alone, to accelerate their sustainable management of soils.

As we deal with the business at hand of farming we probably do not often spare a thought to the workings of the board rooms of big corporations, but it turns out they are taking an ever greater interest in us. Environmental, social, and corporate governance (ESG) is a framework designed to be embedded into an organisation's strategy that

considers the needs and ways in which to generate value for all organisational stakeholders (such as employees, customers, suppliers and financiers). It is noteworthy that many of these corporations hold investment either directly, or through their supply chain, into regenerative agriculture in very high regard, as it supports their audit of their environmental impact. PepsiCo, as an example, have stated that they corporately aim to change to regenerative practices on their not inconsequential 3 million hectares by 2030. It is interesting to note that all the big accountancy firms now run significant teams to audit ESG, a market that did not exist five years ago.

One of the consequences of the global traction of regenerative farming is the associated industries that have sprung up with technologies and service offerings targeted at this sector. One of the fastest growing agricultural sectors is the supply of biologicals, embracing bio stimulants, microbial bio stimulants (bio fertilisers), biorationals and associated products. The sector is forecast to eclipse \$25 billion in 2028 and not surprising has caused a level of refocusing through acquisitions of the traditional manufacturing supply chain. We only have to reach back six months in history to note the Corteva Inc acquisition of biologicals firm Stoller Group Inc for \$1.2 billion in cash - Nov 2022, Valent BioSciences LLC, part of the Sumitomo Group, acquisition of FBSciences Holdings, Inc. - Jan 2023 and Syngenta Seedcare collaboration with Bioceres Crop Solutions to bring innovative biological seed treatments to market a few months before. Indeed in February this year Bayer and Spanish group Kimitec announced a strategic agreement aimed at accelerating the development and commercialisation of biologicals solutions for crop protection

and biostimulation. This will in turn see a technology push effect as marketing and sales endeavours seek to achieve a suitable return on these investments in the sector.

More domestically it is also noteworthy that all of the major UK agronomy companies now offer 'soils' related programmes with novel products and services. With relatively low differentiation in this sector in relation to traditional agronomic advice and lowering margins on product supply, regenerative agriculture offers scope for completely new insights into land management over a potentially long transitioning period with the possibility of developing new product offerings with higher margins. I am minded to note that many of these groups have in themselves sought to pioneer regenerative practices based on their own research activities and with an eye on future trends and government policies.

The carrot of carbon credits is an opportunity for regenerative farmers, using a suitable audit system they have a tangible proposition to quantify the incremental carbon that they lock up into the soil. As processes evolve to more easily codify the carbon retained and infrastructure to trade the credits becomes more developed and competitive this will act as an additional financial incentive for change which seems very appropriate based on the value being added here.

And finally, we come to the farmer who has to navigate all these forces for change, in an environment of increasing input costs and environment considerations. Thankfully the early regenerative farming movement has now grown to be a cultural movement, with knowledge sharing, adoption of new farming rotations and products.

Significantly there has been a shift here in the supply and demand of knowledge as farmers have taken the lead in up 'skilling' themselves in terms of understanding of soils and how their core asset is best managed. In turn they are becoming more selective of the advice they seek, inputs they use consequently the supply chain has, and will, adapt to the changing demands of their clients.

There is a confluence of change factors in the market, a near perfect storm of new knowledge, good intension, government intervention and industrial funded products and services that have acted to accelerate the regenerative farming moment into what needs to become the 'standard farming model'.

About the author.

Robert Patten B.Eng. MBA

Robert is the managing director of PlantWorks and Smart Rotations and has been leading change in the microbial sector in the UK for over twenty years.

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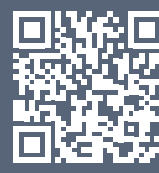
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WHAT TO DO WITH YOUR CARBON?

Written by Thomas Gent from Agreena

Reading this magazine means even if you are not practising regenerative farming I am sure you are at least considering the transition away from ploughing. We of course are also seeing now that the government incentives are going to be rewarding this type of farming, everything seems to be pushing us in this direction.

So the next question that comes to mind in today's world is what do I do with my carbon?

We need to start thinking about carbon in two separate ways firstly carbon stock, so the existing amount of carbon held on your farm in the soils, trees and hedges etc. This is the carbon that is currently not being traded and is an asset on your farm that you should protect carefully.

Secondly is your additional carbon. This is the carbon that can now be quantified and traded on an annual basis should you choose to do so. This is made up of two separate sections, reductions and removals. Reductions represent the reduction in GHG (GreenHouse Gas) emissions for example by burning less diesel or using less artificial fertilisers. Removals represent the act of taking carbon out of the atmosphere and adding it into your soils, for example by growing a cover crop.

This annual additional carbon compared to a baseline is what carbon programs are looking to help farmers quantify. It should be thought of as a second crop, so at harvest when travelling through the field with the combine you are going to be harvesting the grain crop whilst simultaneously finishing your carbon crop harvest for that year. Just like a crop of wheat the annual yield of a carbon crop depends on the actions you take in the field to improve it over the year and just like a wheat crop post carbon harvest you can choose how best to use that asset.

There are currently a few options that exist for what to do with your carbon certificates.

- 1) First and usually most obvious one is that you can choose to monetise. There are companies that are looking to purchase high quality carbon certificates from local farmers. Depending on the program you join



you may have the flexibility to sell these carbon certificates yourself or you can usually ask the carbon program to assist you with this.

- 2) Secondly, holding onto your carbon certificates. Carbon certificates do not expire instantly; they can be held for multiple years. Some farmers I know are holding onto the certificates because they are betting that the price will rise and others are utilising the carbon within their own operations to maybe offset the emissions from another part of the estate. Either way with some programs you can choose to hold the certificates and only choose to sell when the price is right for you.
- 3) Thirdly and most interestingly in the future will be the option to gain premiums for your produce. We are starting to see the emergence of this as a viable option but it is not yet something commonplace or operational at scale.

On my farm I have completed two carbon

crop harvests, the first one in 2021 which I chose to monetise as there was no other option of what to do with the carbon that year. Second is from the 2022 harvest which I will probably choose to also monetise as there is no further option. For my coming 2023 carbon harvest I am hoping there will be an option to use the certificates along with my grain.

The important conclusion is to understand that a farmer can issue carbon certificates yearly. Not joining a carbon program means you are simply missing out on a harvest. We can find no options for farmers to backdate and issue carbon for previous years, and there seems no likelihood that a method for this will exist.

A farmer who is eligible for a carbon program (not ploughing) who is not part of a carbon program is missing out on harvest. As a farmer you are most likely already taking some of the actions that would help you issue carbon certificates therefore you should look to produce a carbon certificate for this to evidence the actions you have taken that year even if you are not looking to trade.

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FARMER FOCUS

PHILIP BRADSHAW



I ended my previous article noting that the inflation in costs, including a recent substantial rent rise, was increasing the risks associated with farming. The ongoing volatility since has reinforced that point. With this in mind, it seemed more important than ever to have the highest quality of establishment for our autumn sown crops so that they had the best possible start.

In September I paraplowed the land that wasn't done last year, and then consolidated it with my old press rig that comprises a front mounted single press, and a trailed double press. We know the value of loosening soil when necessary, but it is essential here to then reconsolidate the soil properly. I hope that as our soil continues to improve, we will need less soil loosening, and most of the farm has only been done once in six years.

The paraplow, and both presses cost a combined £4000 and we don't really wear metal out here on skirt fen, so the cost of this is sensible, and not too time demanding.

Our multi species catch crops between first and second wheat came surprisingly well and gave good ground cover and some important plant diversity. In October we established our first ever commercial crop of mustard with our GD drill. It went in nicely and had a timely rain. Emergence was good, it appeared to miss the Flea Beetle completely and went into winter looking well.

Unfortunately, my planned 'Culture of Excellence' with the remaining crop establishment was compromised by a huge amount of off farm work and activity in October and November, and I didn't finish wheat drilling until December 9th, a month later than planned.



Happily, except for maybe 3 hectares of second wheat, the crops all came well, and I am pleased I stuck with the cropping plan, and it was satisfying driving across some nice-looking wheat applying a small dose of Liquid Nitrogen a few weeks ago.

Sadly, the fine looking mustard was mostly killed by the frosts in December and January and is being redrilled with a spring mustard crop. Apparently, most Winter Mustard crops survived the low temperatures, but locally a few have failed. We are low lying here, most of the farm is below sea level, and many sugar beet crops around us were also damaged by the hard frosts.

We have spring beans again this year, and they are following cover crops or over wintered stubble stewardship options. We have also got a small experiment with no nitrogen wheat for ourselves, and some winter barley trials we are growing for a seed breeder.

I had previously thought that our clover living mulch planted in August 2021 ahead of spring beans in 2022 had failed completely. Recently though, I discovered that there is some still growing, and starting to spread as hoped across the field. It is not consistent enough within the field sadly, so I expect to have a difficult decision to make if the field needs some broadleaf weed herbicides, but for now at least, it is still there.

I believe the principle of some sort of under story crop, ideally fixing nitrogen, is completely sound. I just need to do a better job, and maybe have more luck establishing it.





Unfortunately, we couldn't attend the BASE conference this year. I hope it went well, and I am going through the presentations as they become available online. I have been to a couple of farmer meetings where Regenerative Agriculture has been very topical, and it is pleasing to see more people considering it, and looking to learn more.

Looking back, there are a few things I might have done differently. On our heavier land, a light cultivation in the early years would have been beneficial, and we should have bought a larger trailed Weaving GD drill to improve work rates. I did find the approach involved a very steep learning curve, and nearly every day is still a school day, but as our system evolves it is certainly the right approach here.

I recently had an opportunity to do a recorded interview for ITV news on the importance of soils and soil health. It has been a few years since I was a county officeholder for NFU and these sort of interviews were commonplace, and sometimes challenging. I had the Foot and Mouth year, and the fuel blockades to talk about among other issues back in the day.

This was different – a nice positive chance to talk about soil. As usual, the significant camera time was whittled down substantially, but they did use my soundbite which was pleasing. I noted that there is help and opportunity for farmers to adopt soil friendly practices, such as ongoing soil cover and reduced tillage.

Ironically, the day before the interview aired on the local evening news, the wind strength was huge, and sure enough, just a couple of miles and a few neighbours away the fen was blowing. This is rare but avoidable, and I was relieved it wasn't going on the day of the interview...

We are really looking forward to the Groundswell show this year, and hope to learn more, while enjoying the fantastic atmosphere, and catching up with friends old and new.

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DIRECT DRILLING OFFERS SAVINGS FOR BOTH THE FARMER AND THE ENVIRONMENT

Reading this magazine means even if you are not practising regenerative farming I am sure you are at least considering the transition away from ploughing. We of course are also seeing now that the government incentives are going to be rewarding this type of farming, everything seems to be pushing us in this direction.

Where it all started

Growing up on a Canadian prairie farm previous to the 1980s, the term summer fallow was as common as wheat. Every farmer factored summer fallow into the farm crop rotation, often 50% of the land was left to rest while the other half was cropped. Resting land was prone to weed growth so the best way of controlling those weeds was to head out with the cultivator and turn the field black, many farmers took pride in “keeping that summer fallow black”. If mother nature decided to have a dry summer, it was not a good situation. The ditches would fill with your valuable topsoil and if the rain came it would erode the soil carving new ditches through the fields. No till farming pioneers started experimenting in the early 1970s, but the technology needed to take it large scale simply did not exist yet.

Finding new and better ways to grow the crops needed for the world's ever-growing population became the daily focus of successful crop farmers around the world. Many methods that have been used successfully in the past were now becoming too costly, to both the farmer and the environment. These costs have given rise to the development of new and better equipment and techniques in the agricultural industry. The most exciting involves the now widely accepted practice known as direct drilling or no-till farming.

What is direct drilling?

Basically, it is defined as a method that does not require the soil to be disturbed prior to planting. Direct drilling allows seeds to be planted directly into the soil with no prior need for plowing, tilling, and furrowing. When done on the large scale necessary for crop farming, the technological advances in the machinery



used for the process of direct drilling can combine tasks, such as the application of fertilizer, effectively allowing the farmer to make just one pass through the field.

Why is direct drilling gaining popularity now?

Soaring fuel and labor costs are applying pressure on farmers who have previously experienced success using the old, labor-intensive methods of plowing, tilling, and transplantation. In addition to struggling with these issues, scarcity of rainfall is causing water tables to fall significantly in many of the major crop-producing regions, further impeding the ability of farmers to irrigate their crops.

What other benefits can direct drilling provide?

Equipment costs are a huge part of any crop farmer's operating budget, especially maintenance and fuel costs. Direct drilling allows these farmers to drastically reduce the number of hours these machines are used by cutting down the number of passes made through each field. This extends the life of the machinery, while significantly reducing the cost of fuel, maintenance, labor, and downtime that can severely impact the

profit margin.

Is direct drilling better for the soil?

Direct drilling provides equally important benefits to the health and vitality of the soil. When fewer passes are made through each field with heavy tractors and equipment, there is less compaction of the soil. This helps preserve the health of beneficial microbes in the soil, as well as the organic matter that provides nourishment to the crops that will grow there.

Can direct drilling help with erosion?

Soil that has been plowed and tilled into a powdery consistency cannot defend itself against the winds and torrential rains that seek to blow or wash it away. Direct drilling allows the natural organic material of the soil to be maintained, keeping the soil surface stable and unharmed by wind and heavy rain. In addition, this organic material helps hold moisture during periods of reduced rainfall and helps it better absorb the rains, when they do come.

With benefits such as these, it is no wonder that direct drilling technology



is emerging as one of the shining stars wherever high-volume crop production is desired, in an affordable and earth-friendly manner.

What is dutch openers' part in helping producers achieve their direct drilling and no till farming goals?

Over the last 30 years, Dutch Openers have been working directly with farmers

to produce seed openers that are geared toward direct drilling. Innovations such as our Universal Series openers are designed to give farmers accurate seed and fertilizer placement with minimal soil disturbance and are widely used by producers in North America, Australia, and the United Kingdom.

Direct drilling farmers' needs are not all the same so we offer single row spread tips from 1" to 5" widths. We also offer paired row tips from 2.5" to 5" row



widths offering varying fertilizer depths from 3/8" below the seed all the way up to 3/4" below the seed. The Universal Series openers continue to innovate to adapt to new drills and new farming practices to stay current with immersing direct drilling trends.

We have spent the last 2 years building a test facility with the sole purpose of offering producers meaningful innovations that increase efficiencies. Direct drilling was born from the belief that there was a better way to plant the crop, retain moisture, and build nutrients into the soil through sustainable new farming practices. Dutch Openers is committed to continuing our work with producers, understanding their seeding struggles and presenting solutions that make a real difference in the field and their pocketbook.



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FULLY-INTEGRATED WILTSHIRE APPROACH TO **SUSTAINABLE FARMING**

Growing from a single 150 acre farm to 1400 owned hectares in 12 units across north Wiltshire and south Gloucestershire over the past seven years, Malmesbury-based CP Farming is taking a fully-integrated, three-pronged approach to sustainability.

Under the guidance of innovative young manager and NFU Student and Young Farmer Ambassador, Mike Wilkins, the current 900ha of arable cropping, 200ha of Stewardship and 300ha of permanent pasture, woodland and miscanthus are run in a way that supports people, profitability and nature.

Under a family owner passionate about social as well as economic and environmental sustainability, all the arable cropping is managed under equal profit share-farming agreements with local farming businesses. This allows it to make far more of an employment contribution than would be the case with either in-hand or single contractor management.

Alongside these agreements, Mike and his core team run a flock of 1000 ewes, managed by head shepherd

Jess King, together with the entire Stewardship area 'in house' as separate enterprises. At the same time, he and Agrii agronomist, Ollie Pattemore, work closely with their cropping partners to ensure the Green Horizons network

business is developed and managed to mutual benefit.

"We plan what we're going to do together to both meet the core trajectory we have across our business and make the most of their farming



expertise and resources,” explains Mike. “We provide all the inputs and agronomy, while our partners supply the machinery and labour. Splitting the profits 50/50 ensures we are all working to the same goal.

“Our sheep travel widely from Tetbury to Marlborough utilising the Stewardship options and cover crops in the arable rotations as well as our permanent grassland. We contract all the fieldwork involved in the establishment and maintenance of these areas to our farming partners separately.”

Growing crops for human use, minimising cultivation, reducing inputs, improving soils and encouraging both wildlife and responsible public access are all key elements of CP Farming’s direction of sustainability improvement travel. But the very last thing it wants to

be is too prescriptive over the way they are achieved.

When the business acquires new land, the first thing it does is work with whoever is farming it (or a local partner if the existing farmer is retiring) to understand the ground and the current system and resources. All the fields are conductivity scanned as part of the Rhiza digital package to establish a baseline for their future management. And the most appropriate Stewardship areas and options are planned, agreed and entered into.

“Our land ranges from chalk with flint to Cotswold brash, heavy clay over chalk and everything in between,” says Mike. “Add to this the fact that our partners invariably know it better than we do and have different machinery fleets as well as approaches, and we are always open-minded about the management specifics as long as they meet the general direction we want to go in.

“Reducing tillage is an important part of this, for instance. But Ollie and I would never tell anyone not to plough

or insist on zero tillage. Instead, we work with them to explore ways of cutting back on cultivations appropriate for their conditions and needs.”

“We know how well this approach works from the other side, as Mike’s family were actually one of the business’ first partners on a block of land they were contract farming when it was acquired,” points out Ollie.

“On the heavy clay there and their own Nolands Farm near Calne they had always favoured a fairly intensive cultivation regime. “Working with them, we have found strip till Mzuri drilling the ideal answer for both parties. It still does the cultivation the ground needs but confines this to the seeding strip. As well as improving soil structure, this has cut down seedbed preparation time and, with it, weather risk – not to mention cost – massively. Strip tilling has since become the establishment regime of choice at Nolands too.”

Alongside the carefully targeted – as much as reduced – tillage now being practised in different forms across CP Farming’s cropped area, sewage



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sludge has been introduced into all the rotations over the past three years as part of the soil improvement efforts.

Supplied in a full package from Wessex Water, it is generally applied after winter barley and before the oilseed rape that remains the principal cereal break despite continuing issues with cabbage stem flea beetle. In some rotations it also goes on before the winter wheat the business aims to grow as much of as possible.

"The sludge is very useful on our generally low P indexing land," Ollie says. "The readily available phosphate it provides – and any flea beetle repellent effect – makes it particularly valuable ahead of the OSR. Having said that, the spreading logistics can be a problem where we want to get the crop in early as part of our CSFB defence.

"Where sludge isn't applied in the autumn and ahead of most spring crops we now employ specialist starter fertilisers as standard practice, taking advantage of the flexibility all our partners' drills now have to put them down the spout.

"Placing early nutrition where's it's most needed means we use less P & K, in particular, these days. And by getting our crops off to the best possible start, tissue testing at key stages of crop growth and tailoring micro-nutrition carefully to crop need through the season using the Agrii/Lancrop graphs, we are able to maximise nutrient use efficiency."

In addition to better targeting fertilisers and other inputs within the crops they grow, the

CP Farming team's input-reduction focus is very much on 'the bigger picture'. Including more lower input crops like spring and winter beans, spring linseed and canary seed in their cropping is proving a good way of reining back on total farm inputs as



well as extending and diversifying the rotations.

Miscanthus growing as a trial on 20ha of particularly poor ground is also showing its value here, with Mike keen to grow more energy crops in the future and use them in the biomass boilers already installed in seven of their properties.

Around 66ha of GS4 Stewardship herbal leys (soon to increase) in the arable rotation are playing their part in reducing inputs too, while adding to the soil improvement efforts and providing a better nutritional entry for the wheat crops.

Also valuable in reducing overall input use are the 4-6 m margins down to AB1 and AB8 pollen and nectar mixes around all fields and AB9 winter bird food blocks grown on the least productive arable land.

"The income it provides helps, but Stewardship is an important element of our recipe in so many other ways," Mike stresses. "In particular, concentrating our cropping on the most productive ground allows us to focus our inputs as cost-effectively as we can, leaving land with the least cropping potential for wildlife instead where it will deliver the greatest habitat value.

"All our Stewardship is based on Wildlife Offers and completely bound-up with our sheep. The herbal leys provide excellent ewe and lamb feed while they, in turn, manage the leys as they need to be.

"AB13 brassica fodder crops are equally valuable for lamb fattening, as are the other cover mixes we grow ahead of our linseed and canary seed. Being later sown, these give far more leeway for sheep grazing than covers before spring barley.

"Bred for ease of management, worm resistance and production from grazing, the bulk of our sheep are Exlanas," he explains. These are perfect for our all-outdoor system. The fact that they don't need shearing is another big advantage. And it's amazing how rapidly the shed fleeces are cleaned-up by birds and incorporated into the ground by worms, giving extra environmental benefits.

"Alongside them, we have just invested in a flock of Romneys for their premium wool which we intend to supply to the environmentally-conscious fashion and furniture markets that our owners are also involved in. This is a perfect fit with our focus on growing crops for human use rather than animal feeding wherever possible."

So what of the future then? How do Mike and Ollie see the business developing further along the road to

greater all-round sustainability?

Well, they are keen to extend CP Farming's Stewardship agreements and push up the area involved significantly as their original five-year terms come to an end. Knowing they will be able to move into the Local Nature Recovery element of ELMs at any stage, they are waiting until its substance becomes clear before considering any switch.

They are also looking to build on the 12m or so of wildlife corridors they already have in the 4-6m margins either side of each field boundary, adding avenues of trees to enhance the value of these networks across the business' farms.

A move into silvopasture – putting more trees parkland-style into permanent pasture as additional wildlife habitats and stock shelter – is definitely on the cards. Within the next couple of years too they want to experiment with agroforestry on arable ground – perhaps with short rotation coppice rather than mature trees to avoid excessive crop shading.

Within their 'conventional cropping' they are stepping up their efforts to use only wheats, barleys and OSRs with the best Variety Sustainability Ratings. They have already incorporated more detailed organic matter and carbon monitoring into their four year soil testing cycle, and are set on further diversifying their rotations, making greater use of precision technologies and exploring a range of biological alongside chemical crop protection approaches.

"One thing we're not doing is taking-up any of the carbon offsetting agreements we're being offered almost every week at the moment," Mike insists. "The money on the table is certainly attractive and we could sign-up the whole farm tomorrow. But there's far too little good science behind the whole business for our liking so far.

"In line the with NFU's 2040 commitment, we are determined to be net zero ourselves before even considering using some of our carbon-sequestering assets elsewhere. And we certainly don't want them to cover the failings of big business looking for an 'easy offsetting fix'. We would far rather contribute them to ensuring food chains like bread-making of which we are a part achieve net zero.

"Although there are plenty of options from different developers locally, biodiversity net gain is another bandwagon we are hesitant about until we are able to measure with reliability the baseline we start from and establish the actual gain we can deliver. We also have concerns over the lifetime of developments being far greater than just 30-year agreements on offer.

"Marketing our own truly sustainability produced lamb under a net zero and biodiversity-gaining brand in a tie-up with a responsible retailer?" he concludes. "Now that sort of sustainability would be more like it."



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HOW TO CUT NITROGEN FERTILISER USE

Written by Rosalind Platt, managing director of UK leaders in crop nutrition, BFS Fertiliser Services.

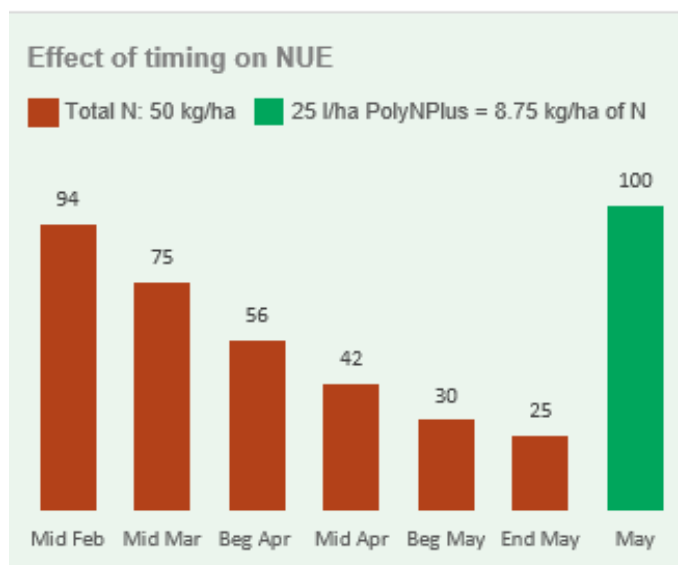
BFS is celebrating its 75th anniversary this year.

Foliar nitrogen fertiliser treatments later in the season can dramatically reduce the total amount of nitrogen needed while maintaining or increasing crop yields.

The recent turmoil in the fertiliser market has been adding to the pressures facing farmers from all sides. Another key farming imperative to move to Net Zero led us at BFS Fertiliser Services to think about how we could help farmers to use less nitrogen while maintaining yields.

Our solution was to develop a foliar nitrogen product called PolyNPlus Foliars. After five years of independent research with one of Britain's oldest agricultural research centres, NIAB, and international farm managers and agronomists, Velcourt, PolyNPlus has been producing excellent results for farmers. The recent dramatic fluctuations in fertiliser prices have only increased the interest in these products.

What is PolyNPlus foliar nitrogen?



2021 trials: NIAB TAG

Nitrogen, vital to maximise yields in cereal production, is traditionally soil-applied as ammonium nitrate, urea or liquid UAN. Farmers would normally make two or three applications of soil-applied fertiliser in the spring. But, later in the season, the nitrogen use efficiency of these types of fertiliser, whether solid or liquid, can decline to 25%, especially when the conditions are dry – see chart.

When the leaf canopy is sufficient, however, PolyNPlus Foliars can replace a proportion of the soil-applied nitrogen. As a guide, and depending on soil and weather factors, 25 litres of PolyNPlus - supplying just 8kg of nitrogen between growth stages 37 and 39 - can replace 40 to 50kg of any



2019 trials: Velcourt

type of soil-applied nitrogen. Or some farmers prefer to make two applications of 15 litres per hectare of PolyNPlus at growth stages 33 and 37.

This means that farmers can apply less nitrogen while maintaining or increasing yields as trials have shown. For example, Velcourt conducted a trial of Crusoe winter wheat in Casthorpe, Lincolnshire, which showed that, when using PolyNPlus, significantly lower levels of nitrogen were required to produce comparable or better yields – see chart.

PolyNPlus's sticky nature prevents nitrate loss, avoiding groundwater contamination, and the loss of ammonia is minimal. In addition, replacing 40kg of soil-applied fertiliser with 25 litres of this product cuts the carbon footprint of the third application by 77 per cent.

Unlike conventional liquid fertilisers, PolyNPlus foliar nitrogen is safe to apply to the leaves of growing crops. It can also be tank-mixed with crop protection products, thereby reducing the number of passes required. Conventional jets or flat fan nozzles enable greater precision which means that less product is needed. Another benefit is that PolyNPlus does not contain plastics. It is available in easily distributed, reusable 1,000 litre containers requiring less storage space and, with no bags needed, there is no waste.

How PolyNPlus Foliars work

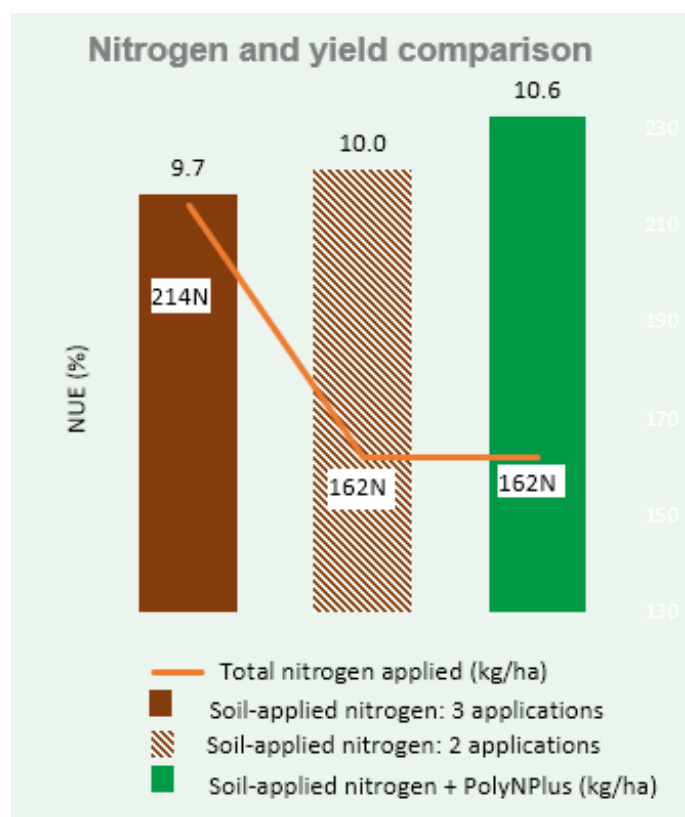
Soil-applied urea undergoes a long series of reactions before it gets into the plant. Drawing nutrients from the soil through

a plant's roots requires energy and the plant is not able to take up all of the nitrogen resulting in waste. By contrast PolyNPlus foliar nitrogen is applied directly to the leaf and assimilated into vital proteins.

PolyNPlus comprises molecules of different chain lengths. The shorter ones pass into the leaf quickly while the longer, less soluble ones are released more slowly over several weeks. Because the breakdown process occurs gradually, the plant utilises PolyNPlus most effectively and nitrogen use efficiency is greatly improved.

What farmers think

Mike Allum, who farms in Suffolk, applied 160kg of nitrogen on his winter wheat in three applications followed by 25 litres of PolyNPlus. He was delighted with the results. The good areas yielded up to 12.3 tonnes per hectare and, on average including some very poor areas badly hit by drought,



achieved 10 t/ha.

An Essex farmer achieved good results with PolyNPlus on winter wheat, producing a higher yield at a lower cost. On the other hand, when he made three applications of soil-applied nitrogen (the left hand bar of the chart), he had a lower yield. He felt that was because the third application was in mid-April and was limited by lack of rainfall.

Paul Jannaway, a Wiltshire-based contractor working with several large landowners, said: 'PolyNPlus ticks all the boxes on an environmental front. I applied it along with crop protection products which saved another pass. This meant that I was able to get the right quantity on at the correct time. The yields and quality of the products we harvested were excellent. I applied PolyNPlus in all conditions, even when it was very hot, and had absolutely no scorch. I believe we will be seeing a lot more of this product - PolyNPlus is the future.'

As well as using PolyNPlus successfully on wheat and rape, he has also used it on oats, just before the panicles or oat heads emerged and he recorded a bumper crop.

Six different formulations

The PolyNPlus product range is formulated with ureic polymers, sulphur, magnesium, manganese, micro-nutrients and organic uptake enhancers. Uniquely, there are six formulations to meet different crop needs: PolyNPlus Cereals, PolyNPlus ManMag, PolyNPlus High Sulphur, Straight PolyN. Also available with required trace elements for oilseed rape and maize are: PolyNPlus Oilseed and PolyNPlus Maize.

Beware of imitations

PolyNPlus is the only foliar nitrogen which has been extensively and independently trialled.

Foliar nitrogen is set to play an essential role in the future of farming. It is a cost-effective way to improve nitrogen use efficiency, maintain or increase yield, reduce pollution and cut a farm's carbon footprint anticipating the Environmental Land Management scheme.

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- ✓ Also apply OSR or slug pellets

FARMER FOCUS

JULIAN GOLD



Since my last article we have taken delivery of the new Horizon disc drill and used it for Autumn and Spring drilling of cereals and Beans.

Initial results have been good and I have been pleased at the lack of blackgrass germination behind the drill (One of the main reasons for the purchase) Patches in fields which normally have high populations are much cleaner than they are usually after drilling with the tined Kockerling drill.



Harvest 22 reminder!

Trying to be clever however by attempting to "stack" the blackgrass control benefits of disc drilling and late drilling caused us to get a bit caught out last Autumn after the weather broke and we were reminded that disc drills work better when the dust is flying.....

Luckily the December frosts came along to save us and the Horizon worked beautifully direct drilling in to frosted ground with no soil damage (we were even able to roll afterwards on gentle frosts)

The other Drilling success story last year was our first foray in to sowing grass between maize rows with our Weaving IR drill. The weather after sowing was dry for months but after the maize harvest the tiny seedlings that had established romped away giving useful soil cover for slurry and digestate spreading and also an income stream later in the winter from tack sheep grazing.

In my last article I promised I would report back on last years trial of grazed cover crops vs. ungrazed cover crops pre spring barley planting (Remember I reported we had much better establishment and early growth on ungrazed fields)

Results were as follows (Combine yield meter results, so not actual yields but relative yield performance is valid as used same combine on CTF lanes and with same yield meter settings combined at similar moistures within a few

days of each other.)

Ambling Way : (Grazed cover crop) 4.56 T/Ha

Gravel Hill : (Grazed cover crop) 5.13 T/Ha

Stoney Hedge : (No cover crop) 6.5 T/Ha

70 Acre : (Ungrazed cover crop) 6.03 T/Ha

Churchmere N. : (Ungrazed cover crop) 6.26 T/Ha

Interesting results (especially the field with no cover crop) that back up the results that Tim Parton reported for his Spring Beans after either grazed or ungrazed cover crops.

Leaving cover crops ungrazed and taking the Countryside stewardship payment of £124/Ha is a tempting carrot compared with an income of around £30-£40 /Ha from grazing sheep on cover crops (based on average cover crop giving approx. 75 sheep grazing weeks/Ha over winter period @ 45p/hd/week) and potentially ending up with a yield hit in the following crop.

Our trial grazing Winter barley last year seemed to give a small yield hit with the ungrazed crop showing 10.13 T/Ha on the yield monitor and the grazed strip showing 10.1 T/Ha. The grazed crop was shorter and carried less disease but we did not reduce any inputs on this strip.

The trial continues this year with a bigger 2 Ha block grazed out in the middle of a 40 Ha field of Hybrid winter barley. Looks quite scary at present but will report back after harvest.

I am very conscious of the fact that there are a lot of anecdotal results flying around in the Regen. Ag. space and think that it is very important that proper trials and comparisons of systems and products are carried out by farmers. This can be difficult when farmers embrace wholeheartedly a new regen. Ag. system and ditch completely a previous 'industrial' ag system making it hard



Scary looking block of grazed winter barley



Nicely established grass after maize harvest

to analyse farm results without comparisons.

We carry out regular tramline type trials which can be time consuming and disappointing as they often show so little variation it is not easy to pick up differences on the combine yield meter , maybe it is time to add a weighbridge to my ever increasing shopping list?

This year we are looking hard at N use Efficiency improvements and are trialling plantworks SR3 bacterial product , QLF boost and high efficiency amide nitrogen as methods for increasing NUE and reducing total N applications in future.

On a more general note I am very excited that DEFRA environmental schemes are moving in the right direction and the new SFI options are very attractive, particularly the £45/Ha no insecticide use option.

The companion cropping option also looks appealing and it has encouraged me to re-start our clover understorey and spring bean/cereal companion cropping trials which have languished for the past couple of seasons.

My final comment is on BNG which seems to be the most popular topic of conversation in the media at present with land agents talking of tantalisingly high "retire to the Caribbean" type returns. We have one of the first BNG



Frost drilled wheat nicely up in the row

schemes which has been up and running since last summer and we have received our first stage payment. Whilst the payment seems high it is important to realise that it is for a long time period (ours is 25 years as it pre dates the mandatory schemes which start this autumn and will be 30 years duration) It is also important to realise that the habitat uplift needs to be delivered (unlike countryside stewardship which just requires rules to be followed) We lost 50% of our tree planting to hares in the first few weeks and had to replant . We also had poor establishment of eye watering expensive chalk grassland seed last autumn and are having to re sow the entire area this spring to ensure a viable area establishes.

Overall the scheme will only deliver a return comparable with cropping over the 25 year period but I am happy we have done it as it is a bit more " Factory maintenance "



After recovering from prostate cancer last year (including briefly dying on the operating table!) I decided to give myself a 60th birthday present and prove I am still alive by running the London Marathon.

I am raising money for the Microloan Foundation which is a small charity supporting women in sub-Saharan Africa with small business loans to help them work their way out of poverty.

The marathon nicely fits with my farming passion as 90% of loan recipients are female smallholder farmers like Chawezi (pictured) who is a bean, potato and tomato farmer who has been helped to buy seeds and fertiliser through the Microloan Foundation.

<https://2023tcslondonmarathon.enthuse.com/pf/julian-gold>



DRILL MANUFACTURERS IN FOCUS...



WEAVING MACHINERY

Sarie Weaving provides an overview on the latest machinery updates and some news from the team as spring drilling gets into full swing.

Facility Renovations, Tours and Demo Days

It's been a while since our last update in the Direct Driller and plenty has happened out and about with our machinery but even more so behind the scenes at the Weaving Machinery production facility. Through 2022 our facilities went through a large renovation, which included the installation of a large bespoke shotblasting system and two new paint spraying booths, with product quality optimisation the leading objective.



Figure 1. New Solar Panels powering our Production Facilities

Both of these new installations require a great amount of energy and being conscious of spiralling energy bills and the need to source renewable alternatives, both production buildings have been laid with solar panels which should provide sufficient energy to cover our needs.

On completion of the production facility upgrades, we were pleased to open our doors to a group of farmers brought together by Todd Jex at AGRII for a factory tour and a closer look at the machinery. As a family-run company and British manufacturer, we are very proud to promote what we do and following very positive feedback from the day, we look forward to hosting more like minded groups in the future.

Clarkson's Farm

Many of you will have enjoyed the return of Clarkson's Farm to our screens in February and will have seen the starring roles of both our Sabre Drill and our ShortDisc cultivator. To see our product on Amazon's highest viewed original series was a proud moment to cherish for the Weaving family as well as our employees. Mr Clarkson's Sabre Drill was first



Figure 2. Our GD Disc Drill is put to work at the CAS Healthy Soils Open Day

ordered in 2020 and delivered to farm in early 2021, so it has been a patient wait with fingers crossed to see whether it would be featured in the show and quite frankly we were humbled by the airtime it enjoyed. Simon commented that both Jeremy and Kaleb were easy to deal with and were like any other customer and we firmly believe that they have done a great job shining a spotlight on the rigours of farming life (...and planning bureaucracy!) to the masses.

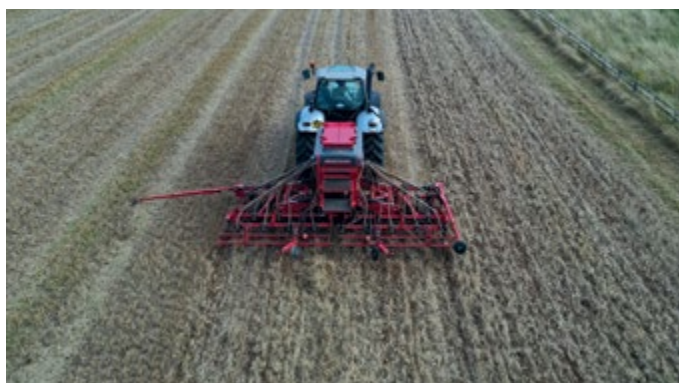


Figure 3. Setting up Jeremy Clarkson's new Sabre Drill

Since the show aired, many viewers have asked after the health of our demo ShortDisc, and we are happy to report that despite a heavy bump, it has had some TLC from our welders and is now back in full working order.

New Machinery Releases and Updates

The scenes featuring the ShortDisc were filmed in 2021 and since that time, our ShortDisc has seen some revisions to its design. Namely a lighter packer frame and a shorter spacing from front to back which collectively bears a lighter load

on the tractor, whilst retaining the machines strength and integrity. A 4-metre model of the latest ShortDisc is currently available to view on demonstration and a little further into the year, this mounted machine will meet its trailed sibling, so stay tuned for the launch of the next addition to the Weaving cultivator range.

In the meantime, the newest member of the range is the Energiser. This has been introduced as a mid-field tool between the ShortDisc and the Stubble Rake. Similar in structure to the ShortDisc and featuring all the robust, practical components, the Energiser is a tined alternative. Its inception came about on reflection of the 2022 harvest where one of the key observations was the high levels of straw matter and trash left after harvest that needed to be evenly distributed and incorporated to create an optimal stale seedbed.



Figure 4. The New Energiser designed to incorporate trash and germinate weed seeds

The Stubble Rake is another of our cultivators which has seen its first upgrade since its creation pre-2000. Retaining all the same principles of our original rake, it now sits on a stronger, tubular frame with 3-piece fold and self-locking pins. It is equipped with 250mm longer tines for a more shattering effect and like all our cultivators, there is the option to fit a Magnum Seeder for fast and economical sowing of grass seeds and cover crops straight into stubble.

Building on the success of the GD Disc Drill since its



Figure 5. The new look Mounted GD Disc Drill now features a plastic hopper

launch in 2015, the mounted model has been given its own upgrade. The grain only models now feature a plastic tank, the same used on our Sabre Drill for better weight distribution, longevity and through-flow of material. Like the Stubble Rake, the mounted GD has also been given a tubular frame which deters any material from sitting on the machine. Both the mounted and trailed will now benefit from a new and unique coulter cylinder which replaces the hydraulic cylinder, this upgrade will allow a more responsive and consistent coulter pressure for even better speed placement.

Farming Equipment and Technology Fund

The RPA recently released its handbook of eligible items for the 2023 round of FETF and we were pleased to see the continued eligibility of both our tine and disc drills as well as the addition of funding towards Stubble Rakes, which will include our new Energiser. Furthermore, a new category item has been introduced for the Inter-Row Companion Crop Drill this year. We certainly see this drill as an important tool for not only establishing grass and cover crops between maize but also companion crops amongst cereals and farmers can greatly benefit from the funding on offer to modernise their existing machinery portfolio.

Export Ambitions and the Summer Ahead

Whilst the FETF has certainly incentivised a buoyant domestic market for manufacturers over the last few years, one of our focuses has been reigniting export trade since BREXIT. Our fundamental priority is finding overseas representatives who share the same values as Weaving Machinery towards low disturbance farming and our product range. Inevitably finding and developing these working relationships can be slow to evolve, but recently we have seen sales into new territories and look forward to carrying the brand further afield in years to come.



Figure 6. Two GD Drills loaded and ready for export.

Closer to home, we will continue to showcase our products around the UK and look forward to events ahead such as Glamorgan Royal Welsh Feature County Event, Cereals and Groundswell.

ANGLIAN WATER'S GRANT SCHEME SUPPORTS FARMERS WITH INNOVATIVE IDEAS TO IMPROVE SOIL HEALTH AND WATER QUALITY.



In Autumn 2022, Anglian Water announced a grant scheme inviting farmers from across the catchment area to apply for funding of up to £7,500 towards innovative ideas that would help them to improve water quality, reduce chemical use and support the improvement of soil health.

A total of 65 farmers were awarded grants for innovation shortly before Christmas and part of the mission is to encourage change of practice for the long term with precision agriculture, reducing pesticide and fertiliser usage, and soil erosion as well as building long term business resilience, with farmers being part of the solution.

Two stand out applications that the water company supported included assistance to Richard Heady, a mixed livestock and arable farmer from Buckinghamshire, with a stubble rake to combat a challenging slug problem. Also Clive Pullin, a dairy and arable farmer from Silverstone on the Northamptonshire / Buckinghamshire border, wanted support with the purchase of a strip till preparator to improve root establishment for his maize cropping.

Talking to Clive Pullin he explains 'We farm on heavy clay here at Parkfield Farm. Our machinery has to work hard and our diesel usage is high.'

Clive has been adopting a zero till approach to his land management for some years, with some of his peers deeming him as 'raving mad' for this method (for adopting innovative farming systems). Clive was inspired by a trip to Australia, where he saw farmers were using a strip till method to use old roots to retain moisture and reduce soil loss. He thought he could apply this technique to his fields, removing the need to plough, improve drainage, reduce disease risk and top soil loss. Clive commented that 'he was fed up with seeing his top soil blowing away or heaped up in a corner of the field.'

Clive saw the Grange Machinery Strip Till Preparator at the Midlands' Machinery show and admired how useful this piece of kit would be in establishing his 'lazy rooted'



maize crop. With adjustable discs operated from the cab, lightweight, developed and trialled by a small team of farmers, this innovative piece of kit could improve crop establishment, reduce soil compaction and combat the need to use the plough again.

Clive saw the Anglian Water grant advertised in the Thrapston Market Report and discussed a grant application with Anglian Water's Catchment Adviser. With the grant match funding up to 50% of the cost of the strip till, it has made the initial outlay more palatable and allowed Clive to place an order for the drill. Clive is aware that it will take time to recoup his own financial outlay however he does expect to quickly achieve improved retention of water, soil and nutrients; reducing overall inputs, soil damage and diesel costs.

Kim Hemmings, Anglian Water's Catchment Advisor for the Tove and Ouse Valley commented 'We are delighted to support Clive with his grant application. Maize can be a high risk crop because sediment and nutrient losses can be greater than with other arable crops. These losses can result in higher pollution concentrations in raw waters abstracted for drinking water, which increases the cost of water treatment. The use of the drill will build the soils' resilience to extreme weather conditions, improving soil moisture capacity during drought and the soils' field capacity to hold water in wetter conditions. In addition, Clive practices multispecies cropping to improve maize protein which further protects against soil and nutrient losses, providing both agronomic and environmental outcomes.'

Similarly with Richard Heady's application for funding toward a stubble rake, he could clearly demonstrate what benefit the grant would make to his business whilst improving water quality and soil health.

Richard commented 'We have a big slug problem and struggle with seed germination after the crop has been drilled. Our combine doesn't spread the straw effectively



Overview at Clive Pullin's farm



Slug damage at Richard Heady's farm

and has allowed slugs to be prevalent, eating our cereal crop as it emerges. We have heavy soil and have large bare patches due to slug attack. ‘

Two thirds of the 420ha farm is dedicated to cereals and beans, used to feed his store cattle which he sends to Dunbia for processing. Richard hopes that the stubble rake will destroy the slug eggs by burying them but also removing their opportunity to breed, hence treating the cause not the effect.

Richard has adopted a more holistic approach to his farming methods and is equally hopeful to reduce reliance on chemicals. Long term Richard sees that his crop will have a better establishment, an increase in yields, as well

as a reduction in diesel and fertiliser, hence why he is trying to put these controls in place.

‘I saw the grant advertised on Twitter, Richard commented. Anglian Water have been really flexible with being able to choose either a brand new piece of kit or second hand, whatever works best for my farming set up.’

Anglian Water hope to roll out more innovation grants in 2023, opening applications by late Summer which is to be confirmed. You can find out more information by contacting your local catchment advisor or visiting: <https://www.anglianwater.co.uk/business/help-and-advice/working-with-farmers/> or follow on Twitter: <https://twitter.com/AWCoastCountry>



Kim Hemmings and Clive Pullin

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FARMER FOCUS

PHIL ROWBOTTOM



Winter seems to have finally turned to spring in West Yorkshire, if not a little confused about its timeline!

Having had very little in the way of snow all winter, 5 inches arrived on the 10th of March, just over a week after applying 85kg per ha of nitrogen to the wheats and OSR.

Other than a trip out with the Sky Easy Drill to plant some beans for a customer, fertiliser application was the first field work since drilling wheat back at the end of October 2022.

The wheats have looked pretty well all winter, some of the second wheats looked a bit patchy to start with, but have now caught up and are all very even.



Second wheat

One of the biggest 'challenges' in sharing my experience of Direct Drilling, is the visual aspect. As farmers, we've been conditioned to what a growing crop should look like, clean, Sterile seedbeds, with all the trash buried and no straw on the surface.

Planting seed into stubble/cover crops is very alien to most farmers, but just because we've done it that way since grandfather was a lad, doesn't mean we have to keep doing it that way, an openness to change is the biggest step.

Cover crops were sprayed off prior to drilling, as it turns out, the frost would probably have done the job this year, the

couple of trial patches left unsprayed, now look pretty much identical to the rest of the farm, but it is far too big a risk to take with the weather at moment, what that looks like in the future will all depend on which route we go down with ELMS and or SFI, that is very much yet to be decided.



First wheat after OSR & Cover crop

One observation of the cover cropping seems to be the resilience of radish, glyphosate doesn't seem to affect it, although it's been knocked back by the frost, it keeps on growing!



Leeds University visit



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Back in January I had a small group of researchers from Leeds University visit the farm, Dr Ruth Wade and Professor Ruth Chapman were very keen to see the changes to the soil since their previous visit.

The instant observation was literally over the hedge, wheat after OSR into cover crop vs wheat into ploughed and cultivated seedbed (more on the ploughing later!) I'll let the pictures tell the story, a very wet cold January day, guess which field you could walk on without pick anything up on your boots?

Whereas the wheat hasn't concerned me, the OSR has some challenges as it always seems to.



Direct drilled



Ploughed and cultivated

Pigeons and slugs have impacted every field, some worse than others. Pretty much every field has damage a few metres away from the hedge.

We're considering different options for next year to combat this, increased seed and slug pellet rates in these areas at the time of drilling are looking to be the favoured option at present.



OSR

One field has suffered from pigeons to the extent that well over half of it now won't make a crop, the plan is to plant a cover crop into it ready for next autumn, the remaining 10 ares should make harvest fingers crossed.

My previous statement of how crops look, can equally be directed to the look of the OSR. Planted in between the existing wheat stubble, viewed from across the direction of drilling the crop looks very patchy, seen from the direction of the drilling, it's all in the row, aside from a bit of pigeon damage, it looks to be the beginning of a viable crop, without any sign yet of CSFB.

Encouragingly, the field that was straw raked and had the discs on the Muzuri Result stubble rake set to a very shallow depth, looks to have significantly higher plant population and much more ground cover, it will be interesting to see how it compares to the rest of the farm throughout the growing season and more importantly at harvest.

Now, I know that the plough is looked upon by some, in Direct Drilling circles, as the devil's tool!

Up until just over two years ago, everything was plough and power harrowed here, we were a traditional plough based system, until I realised there was an alternative way of crop establishment!

That said, we are big supporters of the local ploughing match and have been hosting the Barugh and District Ploughing Association for well over 40 years, barring the odd weather event and a year off for Covid the farm has hosted the match every year.

In a changing world, we feel it's important to support local events and keep countryside traditions and skills alive to be passed down to future generations, irrespective of how we choose to grow our crops.

2017 NUFFIELD ON CARBON: AHEAD OF THE DEBATE

Written by Becky Wilson

Carbon is a hot topic at the moment. Whether it's transitioning to net zero for the UK or supply chains, opportunities to access carbon markets, or comparing the environmental credentials of different products, you can't get away from the fact that we are all having to get to grips with new terminology and metrics.

Farming is unique in its ability to provide a climate solution. Farming is built on the carbon and nitrogen cycles and, as such, is part of a complex biological system where things move and change depending on seasons, inputs, markets and management. It was this acknowledgement that managing carbon on-farm can be complex which was one of the main findings of my Nuffield report back in 2017. Indeed, a key conclusion was that

"Carbon management on-farms is complex, there needs to be a multi-dimensional strategy which involves farmers, advisors, researchers and policy makers in order to achieve reduction targets. The time to act is now."

Things have changed in the last 6 years. We see net zero commitments from global corporations pledging to source from regenerative farms; we have supply chains which are requiring environmental metrics alongside milk, and we have an emerging market for rewarding good practice that improves

carbon sequestration. Carbon is no longer something which is a niche subject; gone are the days where carbon was the subject for squeezing in for the last 5 minutes at a conference, when delegates were tempted by the pull of the bar, there are now whole conferences dedicated to farm carbon management.

The fact that we are now discussing carbon more is brilliant. However, even for a self-confessed carbon geek like myself who is never happier than when talking about carbon, alongside the increasing attention, there also seems to be increasing confusion. Conflict often ensues between discussions around the potential for farming systems to be the problem or the solution, with the detail ignored in simple sound bites which are picked up by social media. Because the uncomfortable truth is that when we are dealing with carbon, the devil is in the detail. It is tricky to compare farming systems, as they are inherently all different, so the answer often becomes "it depends" rather than a confident and clear cut answer which can then be used

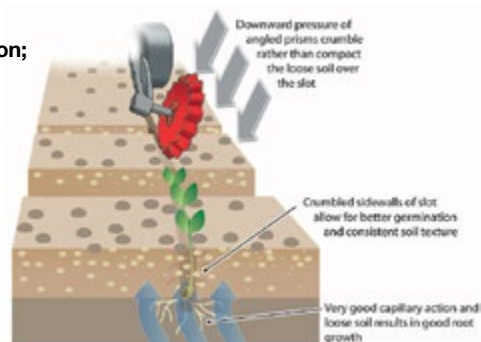
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for further discussions. Just because we are all now having to deal with carbon as an issue, doesn't mean that we suddenly have a body of evidence to back up the potential impact of all of the mitigation measures that might be implemented. So there is a lag for research to catch up, especially around some of the holistic approaches where there are multiple variables. There are some things which we can all do which will help us understand where we are as a farm business and also think about potential options we have to reduce greenhouse gas emissions and improve sequestration on our farm.

MEASURING THE CARBON PERFORMANCE OF YOUR FARM

The old adage of "you can't manage what you can't measure" is certainly true of carbon accounting.

But when it comes to agriculture, measuring carbon isn't as simple as it may first seem. Carbon accounting systems were designed to measure industrial processes; when measuring the emissions associated with a product manufactured in a factory, we are able quite simply to understand how the inputs lead to the outputs and it tends to all be neatly contained within a building. This is not the case when we use these metrics to measure farming systems. On-farm we are trying to measure biological systems, which are impacted by climate, soil type, topography and vegetation, as well as what we as farmers are doing in terms of our management. Which can make the whole thing a little tricky! However, undaunted by this complexity, carbon metrics are an essential tool which farmers can use to not just identify climate solutions, but also to baseline the farm's emissions and drive technological change.

Identifying the carbon footprint of a farm business is the first vital step in being able to quantify the contribution that the farm is making to climate change. A carbon footprint calculation in its simplest form identifies the quantity and source of carbon dioxide, methane and nitrous oxide emitted from the farm (the emissions) and subtracts from the emissions the carbon that is being sequestered on-farm (sequestration) to provide your carbon balance. This balance is the starting point which should then highlight areas where improvements or changes can be made to reduce emissions and improve sequestration potential.

Reducing carbon emissions in a farming business makes sense on many levels. High carbon emissions tend to be



linked to high use of resources, and / or wastage, so reducing emissions also tends to reduce costs. This makes the farm more efficient and should improve profitability. As well as the business opportunities that come from reducing emissions, farmers and landowners are in the unique position to be able to sequester carbon in trees, hedgerows and margins and within the soil.

Before being able to reduce emissions, you need to know where the emissions are coming from. Are the largest emissions coming from livestock, soils, fuels, or fertilisers? It is vital to get a picture of your business which is made possible by carbon footprinting.

There are various tools that you can use to provide the baseline carbon footprint of your farm. Tools include the Cool Farm Tool, AgreCalc, The Farm Carbon Calculator and Trinity. All of the tools use the same baseline information, but may provide a slightly different methodology which makes comparison between tools challenging. There are also tools designed specifically for use by farmers which are bespoke to that supply chain.

Although the simple principle of completing a carbon footprint assessment is the same, there remains variation between what scope and boundaries the tools use to calculate the results. This is good to understand before you start the process of doing a carbon footprint.

Boundaries are an important factor to consider (or understand with the tool that you are using) as it makes a difference on the data that you need to collect and also the results. Put simply, boundaries refer to where you are drawing the line around what is included in your calculation and what isn't. For example, do you want to calculate the emissions associated with one farm enterprise or the whole farm, or just what is happening with the farm gate or further afield. Making sure this is clear before you start makes the whole process easier. This is also important if you are looking at getting to net zero - because if you are just footprinting one enterprise on-farm and only accounting for emissions, getting to net zero may be impossible.

It is also important to understand the scope of the calculations. For most supply chains, farmers are their scope 3 emissions, but on-farm there are also emissions to consider in those products that we use on the farm (for example fertiliser and feed).



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INTERPRETING THE RESULTS

So, once you have the results, deciding what to do is the interesting part. The results will be reflected as a carbon dioxide equivalent (CO₂e), but should also show you how that breaks down into the three gases (carbon dioxide, nitrous oxide and methane). Key areas to focus on are the management of soils, fertilisers, manures, livestock, cropping, energy and fuel. There are also numerous opportunities to reduce emissions and costs, leading to improved resilience and profitability, as well as opportunities to improve carbon sequestration and soil health, the ultimate resilient business model! Absorbing more carbon than the farm emits is a goal that all farmers could work towards and understanding the farm's current carbon position by footprinting is the first key step.

SEQUESTRATION - OUR UNIQUE ASSET

Improving soil carbon levels in farm soils is one of the most important projects that farmers and society can engage in. There is an undisputed link between enhanced soil carbon levels and increased agronomic productivity. Soils are more resilient and better structured; they support higher levels of biological activity and require less inputs to produce outputs. Including soil sequestration within calculators has been challenging in the past, models have only tended to focus on emissions which are more easily measured and tracked over time. During my Nuffield, I went to visit countries where farmers were being rewarded through carbon markets for improved sequestration, and learnt more about some of the challenges of measuring and managing soil carbon across farmed landscapes. Since World Soils Day 2022 we now have a UK Soil Carbon Code, which helps to align methods for measuring soil carbon sequestration. This is a great step forward which needs continued engagement to ensure that the methods are robust, practical and relevant.

Since 2017 we have been working on our Soil Carbon project, aimed at understanding how we can measure, manage and monitor soil carbon. It continues to be a brilliant project to work on, predominantly because of our incredible network of farmers who are showing what is possible, and continuing to innovate and prioritise soil health within their business. As well as digging thousands of holes for the project, looking at wider soil health metrics as well as carbon, we are now working to include the data within the carbon calculator, to provide a modelled assessment of carbon sequestration depending on farming practice and soil type.

Building soil health on-farm has so many benefits both for the individual farm business and for wider ecosystem and landscape function. There are many farmers who are doing brilliant things around sustainable soil management and by sharing knowledge and information, more can be achieved. By showcasing the positive actions farmers are taking, we can demonstrate the vast knowledge, adaptability and versatility of approach to soil management. Our farmer network continues to demonstrate their passion for soils and the benefits that maximising the quality and resilience of this biome can provide for their businesses.

Alongside soil, it is important to value our other sequestration source on-farm through how we manage our woodland,



environmental areas and hedgerows. All of these contribute to our farm's carbon account, and as such, it is important that these are considered in any calculations.

SO WHAT NOW?

We have made a huge amount of progress in the last six years since my Nuffield. Carbon is now mainstream. This is a positive step forward as we need to ensure that we all engage in a way which limits global temperature rise and helps halt climate breakdown. However, there still remain some challenges as carbon has become more familiar, which means that there is still more work to be done.

Carbon can still be viewed as something where agriculture is the main problem. As an industry we contribute around 11% of UK's Greenhouse gas emissions, but 1.4% of UK carbon dioxide emissions. Farmers are already doing great things to reduce emissions which is a brilliant step forward. But it is important to remember that we can't completely eliminate emissions associated with agriculture, we are never going to be a zero carbon industry. Providing positive examples and empowering farmers with the knowledge of what they can do along with the economic and environmental impacts of practices will help build knowledge around what is possible. Developing metrics that adequately take into account sequestration, and are not just based on emissions per tonne of output will also help to provide a more nuanced narrative which can help discussions with consumers. Focussing on soil health from a business resilience perspective will help to support soil function and bring emissions reductions as well as sequestration benefits.

As Carbon has risen up the agenda, FCT has also grown its team and I am immensely privileged to be joined by an incredible group of people who are supporting projects and farmers across the UK. This includes our Farm Net Zero project, aiming to showcase the opportunities farmers have to contribute to net zero within our industry as well as to other sectors. We are continuing to help inform and train the advisory sector (as well as the next generation of farmers) on how to manage carbon and greenhouse gas emissions and the opportunities that this brings. All of our projects and activities allow us to learn more from our farmer network (especially through Soil Farmer of the Year), who are continuing to innovate and pioneer new approaches.

Carbon may now be mainstream, but there is still so much to do to empower our farmers to understand how to manage carbon on farm, how to measure it, implement changes and align this with business objectives in a time of increasing uncertainty.



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SOIL FERTILITY SERVICES

Steve Holloway puts the case for biology and foliar KSM - potassium solubilising microbes - for a more natural supply of phosphate and a way of reducing the fertiliser bill.

For a generation, farmers have taken their most valuable resource for granted, often considering it to be simple dirt. The focus has been on force-feeding the crop and beating the soil into submission. Driven by an ethos of yield over profit, with little respect for the aftermath, inputs for many farmers have typically increased since the 1940s. At that time fertiliser was seen as the easy solution to maximise crop returns, consequently the supply and demand situation was then able to keep pace and crop rotations became shorter to satisfy the ever-increasing markets. But all the while soil was still treated as an abused medium and consequently this once robust and resilient resource has suffered - until now. The farming solution has been to counteract this shortfall with greater chemical inputs. This counter-intuitive response has led to increased disease pressure, forcing perpetual reliance on agronomy to maintain healthy plants.

Stop: back up and look at what's happening.

This is not a sustainable system and it will ultimately lead us down a path that we cannot come back from. You only need to look outside at the hedges and verges for inspiration. Their eco-systems are self-sustaining, resilient and productive; despite a lack of farm inputs, they have predominantly been left unassisted and have a naturally evolved durability.

A simple experiment you could try for yourself is to take a spade out to the centre of your field and compare the soil to what's in your hedgerows. I guarantee the colour will be different, as will the smell. When you look at the soil texture, the hedgerow will be superior and

you may also notice that there is a lot more life living in the more natural sample. This should tell you that things can, and should, be done in a better, more sustainable way!

A productive soil will naturally cycle nutrients, water and air whilst supporting both biological and crop life optimally, unfortunately, excessive inputs and soil disturbances tend to upset this already finely-tuned environment, - who are we to think that we know better?

There's already a legitimate way that soils provide nutrition to their inhabitants, via biological exchange; subject to demand and conditions and complex reactions that both lock up and release elements within the soil's profile. This trading of resources is often instigated by living organisms and is dependent on having healthy soil. When soil is degraded, natural resources are scarcer, leading to diminished bio-activity and, following this, less active soil will frequently require artificial intervention which in turn will throttle natural demand, thus perpetuating a more self-destructive cycle.

For example, since its conception, the Nutrient Management Guide (formally RB209), has advocated that farmers apply Potassium, subject to the estimated offtake of a crop and also the results given by a standard soil analysis. However, I would suggest that these guidance tables should also be considering the Total K assets that the soil has to offer and not just those measured by standard lab extraction, using a chemical solution. The Total K that is held by soil will be way above what's measured conventionally.



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I'm not suggesting that potash is bad for the soil, simply that things need to be more in balance, for the system to work effectively. Wouldn't it be great to spend less on fertiliser and work with the soil as opposed to against it? After all, too much of anything can still be a bad thing. One solution would be, to utilise the soil's capacity to cycle nutrients; or by supposedly satisfying a deficiency via chemical inputs, the natural ability of soil can be made redundant by switching off this valuable support mechanism.

Since time began, KSM (Potassium solubilising microbes) have been a part of the earth's ecology; these microbial miners can break the connection that bonds potassium to other elements in the soil, thus making it more 'available' to a crop. Locked-up nutrition is so for a reason; once again too much of anything can be a bad thing, so communication is key between plant and microbe; that will instigate the necessary reciprocal exchange of elements beneficial to both parties. A generation of excess

has created a deficiency of these bacterial benefactors, as a farmer - a conscientious farmer, the responsibility is yours to rectify this to benefit the grower, the soil and the crop.

It is possible with plant analysis to identify excesses and deficiencies, thus providing a valuable planning tool. There are multiple benefits to Potassium that include turgidity, health, quality and many others. Some are major, others minor, but frequently of equal importance. These KSM can be applied by a sprayer during the growing season, directly to the crop and soil, whereby they set about the task of freeing Potash for the crop to use; another added bonus is that with the increased microbial activity comes a more vibrant rhizosphere, which encourages better soil conditions and structure, leading to better quality air-water efficiency soil resilience, along with plant improved rooting.

Research has shown that KSM will actively support a crop's demand for

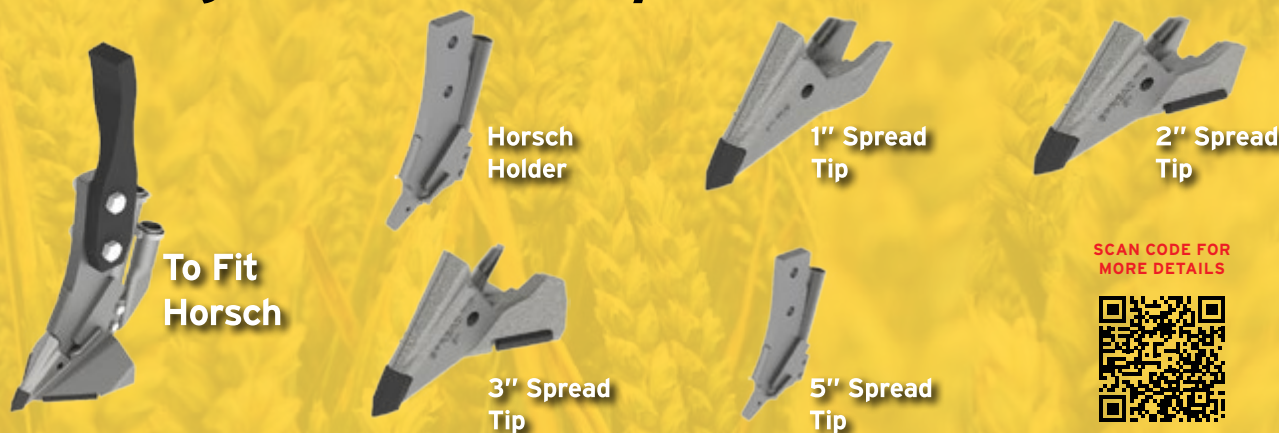
Potash. They produce organic acids and enzymes that help solubilise the fixed potassium into exchangeable form and make it assimilable by plants. They are activated on application and multiply by utilising the food source and or the exudates of the roots. Soil Fertility Services has developed one such product called Bio-K which contains a range of microbes specifically selected for their Potassium-releasing properties. Bio-K is earthworm-friendly, it can potentially replace around 25-30 % of chemical inputs/ fertilisers and activates soil biologically, thereby increasing the natural fertility of the soil.



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FARMER FOCUS

JOHN FARRINGTON



Following on from my 1st article in Direct Driller last summer, a bit of a summary of what's been happening since.

Harvest 2022 was a bumper harvest for some, but I have also heard mixed results which is the camp we fell into. Our spring beans and maize were our crops that stood out, winter oats and wheat were average. Spring beans were direct drilled straight into grazed cover crop at the end of March and with not a huge amount spent on them they yielded 5T/ha which was pleasing. I think the direct drilling and cover crop residue did help retain moisture. Winter oats - we grazed one field with our ewe lambs towards the end of Feb and left one field ungrazed. The grazed field yielded a good 0.3 T/acre more than the ungrazed field. I put some of this increase down to moisture, the grazed field being a more well bodied field than the ungrazed field, which is called Sandybanks - and probably called that for a reason. The wheat was a very mixed bag and nothing to get excited about with yield variations mostly relating to soil type, further investigation is still on going to get to the bottom of this.

The strip till maize was a success and we will be doing more this spring. It was a kind autumn so harvester and trailers didn't make any mess. So I went straight in with our Horsch sprinter and 2" Bourgault points and I am pleased with how it looks. It was grazed by sheep in late January. (See pic, Same field, L - a week after grazing, R - early March)

The wheats have all looked good after fairly kind autumn weather. They certainly have not been lush and thick, but due to a shortage of sheep fodder we have grazed about half the wheat area during Jan / Feb. Half field trials (see pic) have been carried out, the sheep came off wheat on 6th March and onto some winter oats. The fields are split up with electric



fencing and moved regularly. And it's amazing how quickly it greens back up and you soon see the darker wheat patches from the sheep's excrement.

The winter cover crops and turnips weren't as big as some years and then got hit by the hard cold weather in early December. A very wet period followed, 333mm of rain between mid Dec and mid Jan. We have been a bit short of grub and have had to buy some silage bales in to help extend the forage crops by bale grazing the last block of turnips (see pic) and not resort to going onto grass quite yet.

A neighbour used to graze the cover crops, but since having our own breeding flock of Exlana sheep, the dry matter feed value is more important to us as we want the sheep off the grass for as long as possible to give it a good break over winter and to have grass ready for lambing outside in April. Therefore the ideal scenario of graze a third, trample a third and leave a third has not been possible, so we either need to increase the area of winter forage crops or we have to accept that there are always compromises within any system.

Choice of cover crops / forage crop also plays an important role, and we have tried both this year. A good multi species cover crop is great for the soil but does not have the DM feed value (yield) that a turnip forage crop would have. A turnip crop does not have the diversity of species, so we added vetch and berseem clover into turnips this year.

Already having Maize, Beans and OSR in the rotation, the search for another true spring break crop to provide 1st wheat entry continues. We are going to try a spring cover crop after



turnips. This will be a multi species mix that we will plant in April and graze over the late summer before 1st wheat in the autumn. It doesn't bring revenue into the arable enterprise, (not always a guarantee with spring crops anyway!!) but it will help the sheep side of the business, (benefits of now being a mixed farm) and hopefully get the soil in good order for wheat with the added benefit of some sheep poo.

Last harvest all the wheat straw was chopped, trying to put some goodness back into the soil. But in the early years of direct drilling and no cultivations before the following crop, this can cause establishment issues with OSR and cover crops. I am therefore investigating straw for muck deals locally to help with this issue for next harvest and I am hoping we will see the benefits in the future.

We like others are waiting for some grass growth before lambing, our Exlana ewes scanned at 178%, which despite the drought was pleasing. So fingers crossed for a good lambing season soon to be upon us.



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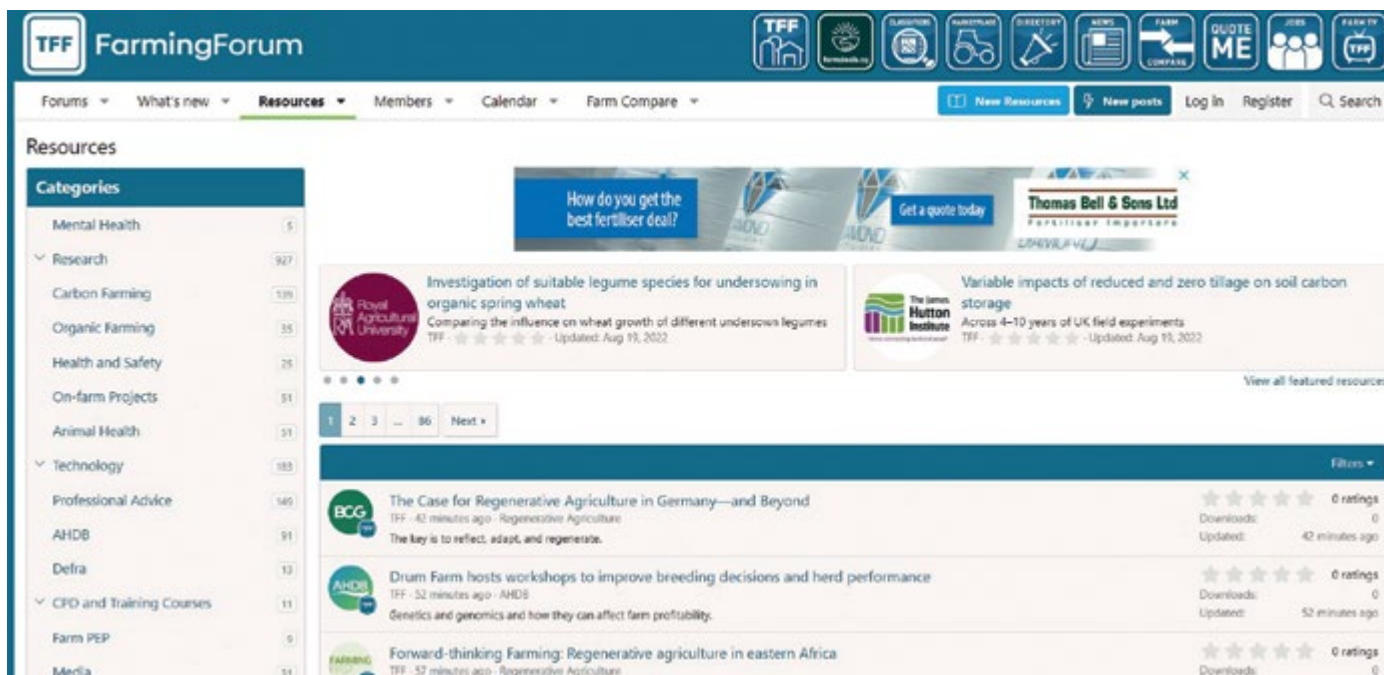
7th and 8th February 2023 - 10th Anniversary AGM Conference – A Decade of “Growing Confidence!”. What a fantastic turnout we had – of speakers and members! Frederic Thomas opened with a short history of BASE, followed by his view of the future of farming, and how we are best placed to help. A hard act to follow but this didn't faze Vicky Robinson discussing the findings of her Nuffield Scholarship on Farmer-to-Farmer knowledge exchange. Duncan Wilson, Tom Storr and Elizabeth Stockdale took proceedings up to lunch after which Becky Willson kept everyone energised with her presentation on the work of FCCT. Alastair Leake provided interesting findings from the Allerton Project and Shaun Dowman discussed other sources of income. The day closed with motivational speaker David Hyner.

Wednesday opened with AGM business followed swiftly by a fascinating presentation from Frederic Thomas on carbon, nitrogen, and soil life. Steve Townsend and James Warne then discussed soil chemistry and the importance of the correct balance and nutrition for disease and pest proof crops, respectively. Lance Charity opened after lunch with an insight into his journey as a young farmer and then joined the farmer panel alongside Duncan, Tom, and Frederic. Joel Williams followed with his presentation on growing together and the day closed with Anna Jackson's energetic talk on working with her father. They haven't killed each other yet! These presentations were recorded and will be available to members via their profile on the website.





**If you would like to know more about how to join BASE-UK,
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or email Rebecca@base-uk.co.uk
We have a wide range of upcoming events, so check out our website calendar.**



SOIL HEALTH KNOWLEDGE ON THE FARMING FORUM

About a year ago a whole new side of TFF was born – we called it Resources. The main part of TFF is for farmer-to-farmer content. The new part was designed specifically for formal knowledge. Including, papers, trials, articles from the wider industry to give farmers the formal and chat on a subject in the same place. Nearly 2000 pieces of knowledge (283 hours of reading) have been added in this time and we have created a number of sections, to help you find more interesting content or for you to subscribe to. It is becoming a fantastic place to read the detail about what is new in terms of research in the farming industry. In the past year this content has been accessed over 1 million times.

We will cover a couple of sections here:

The section on Regenerative Agriculture on The Farming Forum provides a section for farmers and experts to explain and exchange ideas on sustainable farming practices that can improve soil health, biodiversity, and farm profitability. The discussions cover a range of topics, including soil regeneration, crop rotation, agroforestry, cover crops, regenerative grazing, and sustainable livestock management. Contributors

Regenerative Agriculture

<https://thefarmingforum.co.uk/index.php?resources/categories/21/>



Stats: 220 Resources – 31 hours of reading

share their experiences, insights, and best practices, as well as the challenges they face in implementing regenerative agriculture techniques. The section aims to encourage farmers to adopt more sustainable farming practices and to foster a community of like-minded individuals who share a passion for sustainable agriculture.

The section dedicated to "Soil Science"

contains various resources related to soil management and agriculture. It includes articles, discussions, and papers on topics such as soil fertility, soil health, soil testing, soil conservation, and soil amendments. The section also covers different types of soils and their characteristics, as well as techniques and tools for soil analysis and improvement. The resources are contributed by academics, farmers, agricultural experts,

Soil Health

<https://thefarmingforum.co.uk/index.php?resources/categories/soil-science.22/>



Stats: 113 Resources – 16 hours of reading

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and soil scientists, providing a diverse range of perspectives and insights on soil science and its practical applications in farming.

The section on carbon on The Farming Forum website explains the concept of carbon farming and its potential benefits for farmers. Carbon farming involves implementing sustainable land management practices that reduce greenhouse gas emissions and sequester carbon in the soil and vegetation. By doing so, farmers can generate carbon credits, which can be sold to companies or governments that need to offset their carbon emissions. The section provides information on different carbon farming practices, such as cover cropping, reduced tillage, and agroforestry, and explains how to calculate carbon sequestration and estimate the value of carbon credits.

Carbon

<https://thefarmingforum.co.uk/index.php?resources/categories/15/>



Stats: 139 Resources – 14 hours of reading

It also includes case studies of farmers who have successfully implemented

carbon farming practices and generated additional income through carbon credit sales.

Why we created Resources on TFF?

We know how valuable farmer to farmer recommendations are when it comes to making decisions on farm. It's why the Farmer Focus pieces in this magazine are deemed most useful by our readers. However, it is always useful to get multiple views on any subject. When you can back up farmer anecdotal evidence with trials and research data, then the argument for change becomes overwhelming. We wanted to create a situation where we could present both sides of any argument in one place. We aren't there yet, but the addition of Resources on TFF is a major step to getting there.



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DRILL MANUFACTURERS IN FOCUS...

HORSCH THE FINE ART OF DIRECT SEEDING

With regard to plant production drought and heat are limiting factors. As a result of the climate change extreme weather situations occur more and more frequently. To avoid negative consequences on the yields, methods like direct seeding are used.



Michael Horsch's opinion with regard to direct seeding is clear: "Those who practice direct seeding as a religion forego profit and in the worst case can ruin their farms. We at HORSCH have been dealing with direct seeding for 40 years. With all ups and downs." With regard to direct seeding there are quite a few things to consider. "In the first step direct seeding is not a

question of technology. What is crucial is a good soil structure, a balanced rotation, a good soil covering and the sowing time."

In Europe, direct seeding was mainly used as an argument for building up humus in the recent past. A mix of abandonment of tillage and catch crop cultivation can increase the share of organic substance in the soil. If you take a closer look at direct seeding all over the world, you will find the most different motivations for direct seeding: in the dry regions the focus is clearly on saving water. In the hot, partly subtropical regions the soil has to be covered so that the soil temperature does not rise into a range that is detrimental to the plant. The high-precipitation areas particularly need direct seeding and a soil cover to prevent erosion. And let's not forget the markets with very low yields: Saving costs by sowing directly is another argument.

Direct seeding as a water-saving sowing method

Because of climate changes and the more extreme heat waves (35-40 %) of the past years which some farmers still worry about, farmers more and more think about the topic direct seeding and water-saving cultivation. The problem particularly affects for example parts of Hungary, Romania and Bulgaria. Why could direct seeding be a solution (at least partly)?

"Let's take the above mentioned countries as an example. Maize, winter wheat, winter rape and sunflowers are the main crops.

After rape/sunflower, when it still is very dry in September and October, sowing wheat with the Avatar after an ultra-shallow pass with the Cultro would be appropriate. After maize, too, you normally can quite well sow wheat with a single disc seed drill. Unless there is too much straw on the field. In this case you first have to incorporate the straw a little bit, for example with a disc harrow. If you want to sow maize in spring – this is done for example in Brazil, you have to decide from case to case. For if the soil temperature remains too low, it is a risk!"



The knife roller Cultro can actively stop a catch crop from growing.

A covered soil

Dark cultivated fields do not reflect solar radiation as well as uncultivated or covered fields. They absorb the sunrays and warm up faster. This, of course, depends on the type of soil. Thus, for example dark brown, almost black soils warm up considerably faster than light or even slightly red soils. "We assume that a soil cover consisting of plant residues improves soil protection. For it reduces evaporation, increases the water-holding capacity and reduces erosion."

This is also advantageous for germination and root development, i.e. a crop can develop better if the soils do not tend to be overheated. "Especially in spring, there can be a fine line. For there are regions where in this case the soil does not reach the minimum temperature. What is good on the one hand can also be a disadvantage on the other hand if the soil does not warm up sufficiently." If it is too hot in the soil, a safe germination and root development of the plant is no longer possible. Once the minimum temperature has been reached, the plant stops growing. If the temperature even is exceeded too such an extent that protein degenerates, plant development is completely finished. In some regions that have to struggle with extreme heat, this is a big challenge.

Another advantage of a soil cover is that it keeps the humidity

that is transported to the surface in the upper layer of the soil. Thus, a kind of micro-climate is created where residual humidity accumulates in the topsoil and guarantees a good emergence. "You only have to go barefoot through a wheat population without any residues on the surface in June or July. Even if the population is dense, you burn your feet on the black clay soil – although the soil is covered with growing plants. This shows that there is a connection and that a population keeps up longer if there are residues on the surface."



According to Michael Horsch, we will have to give very much attention to the topic stubbles and stubble lengths to find an optimum way.

Another problem I noticed: if the straw stubbles are too long resp. if the straw remains on the field too long, among others mice feel very comfortable. I saw this only recently in Romania. The rape population did not look too bad but in the field, there was one mousehole beside the other! The same is true for slugs. If there is too long straw and too high humidity for a long period of time, the slugs devour the rape, wheat etc."

Catch crop cultivation and direct seeding

Cultivating a catch crop before sowing directly is always better. But a prerequisite is that the catch crops fit in and that a sufficient water supply is guaranteed.

Catch crops can help to increase the humus content. Moreover, another rotation member always can separate the previous crop from the next crop phytosanitary. "In conventional farming this separation is done by tillage."

If the total precipitations are low, farmers, of course, discuss the question if catch crops do not additionally require water. "It is obvious that this simply is not possible in some regions. For if it does not rain during the cultivation break in summer, the catch crops don't grow either and, thus, it does not make sense to cultivate them."

How can you actively stop the growth of a catch crop? This can either be done by frost, knife rollers or the use of glyphosate. "In this case, you have to check which method makes sense in which region. For in Europe, the use of glyphosate will soon no longer be an option. You then need other measures to stop the growth."

Another question that always is asked when talking about direct seeding is if direct seeding and tillage are inconsistent. Not at all - quite the contrary. "In my opinion, a combination of both might even be the key for the future. The reasons are various. On the one hand, we see that direct seeding only involves high

yields if the soil structure is very good. As I already mentioned, a good soil structure can be achieved and also encouraged by growing catch crops. But there also are situations where there is no time to improve the soil with catch crops. In this case, it, of course, makes sense to loosen the soil so that the roots can grow deeply and reach water in the subsoil.

We notice that even in countries like for example Brazil where direct seeding has already been established for years the soil is loosened deeper at 30 – 40 cm as the soil, despite the catch crop, is compacted."

But what direction will direct seeding in Europe take? And does direct seeding have a future here? Michael Horsch says "We have to act on the assumption that weather extremes will increase and that we will get more hot, dry years and to cope with these I don't think that we will see a pure direct seeding, i.e. without any tillage, in this climate. In my opinion, farms will have to be ready to sow directly in dry years if required. This means: focus on an even straw distribution; keep cereal stubbles as short as possible; reduce compaction/tracks during the harvest through controlled traffic farming CTF.



Due to its individually controlled disc coulters SingleDisc, the Avatar 12.25 SD can be adapted to different sowing conditions and thus is also ideal for direct seeding.

This was about the general use of direct seeding. In the next terraHORSCH we will explain in detail which sowing method (discs, tines) fits where, how it is to be used, which preparatory work, if required, is suitable.

Moreover, we will provide tips with regard to the C:N ratio of residues, stubble lengths and how to handle them.



The angles of the closing wheel can be adjusted depending on the soil conditions. For direct seeding or on very heavy soils they can for example be set aggressively.

AHDB CEREALS MARKET OUTLOOK



The latest Cereals Agri-Outlook takes stock of the current situation and looks forward to what we might expect in the coming months, for supply availability, trade and demand. The volumes below are estimates at the time of writing.

Production

Wheat supply on the global market remains constrained, from the lasting impact of extreme weather trimming production in major exporters last season, exacerbated by the war in Ukraine. However, ample competitive Russian supplies continue to pick up global demand.

Despite global wheat prices coming back down from the highs seen back in May 2022, post the outbreak of the war in Ukraine, prices remain historically elevated. A tight global maize supply and demand too is providing a strong floor for overall grain prices, with concerns surrounding a drought impacted Argentinian crop despite a large Brazilian crop due. Demand now remains a key watchpoint for the direction of global grain prices, considering economic performance and recessionary behaviour concerns across major economies. Price direction will be increasingly influenced by new-crop weather as we head through the second half of the season.

Global price strength this season continues to support domestic grain prices. Dry conditions across the UK saw a timely harvest in 2022, and with a larger year on year opening stocks, there

is increased domestic wheat availability this season. Defra's final estimate for UK wheat production for harvest 2022 is 15.540Mt, up 11% on the year. For other grains, total UK barley production was estimated at 7.385Mt (up 6% on the year) and UK oat production was estimated at 1.007Mt (down 10% on the year). Yields were strong, despite dry conditions in many eastern regions of England especially.

Looking ahead, the Early Bird Survey for plantings and planting intentions for harvest 2023 shows a strong continuation of winter cropping given the favourable autumn drilling conditions. On a national level, the wheat area is forecast up 1% from 2022 and winter barley up 4%. However, the spring barley and oat area is anticipated to shrink, forecasted down 6% and 4% respectively. Using these intended areas, production scenario projections for harvest 2023 can be made.

As at 29 November, our domestic winter wheat crop was rated 87% in good-excellent condition, up three percentage points (pp) from the same point a year earlier. The wheat crop has established well so far and overall prospects look good. Across the board, domestic crops

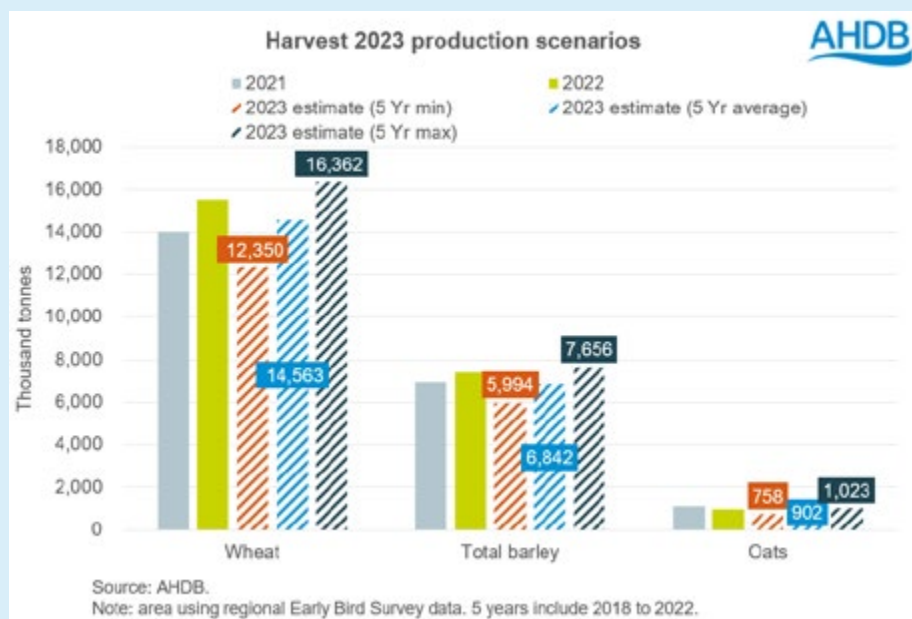
are faring well. Though the winter/early spring drought conditions held back growth, the rain in late Feb/March has done much to balance the forecast from the National Drought Group, and water supplies to crops is now much improved.

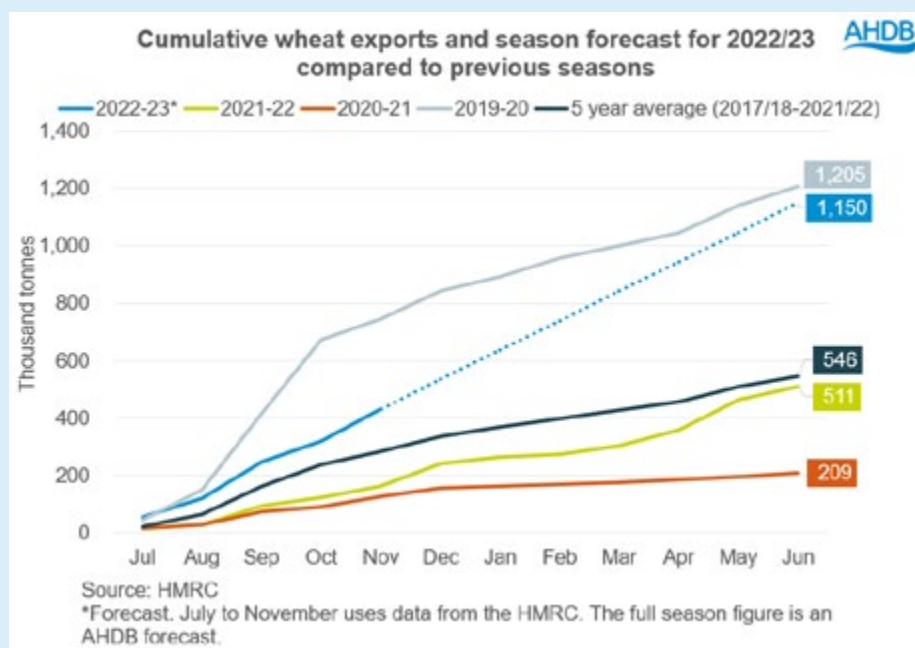
Due to continued high fertiliser prices, many growers will be reducing P & K application for harvest 2023. This is crucial to watch, especially considering the strong winter cropping forecast, plus what this may mean for higher specification grains. With domestic production of ammonia paused, imported ammonia continues to be used to produce ammonium nitrate domestically.

Trade

The UK is currently forecast to marginally remain a net importer of wheat this season (July 2022 to June 2023), but should we see the export pace increase, this could change. Total wheat imports are forecast at 1.225Mt for 2022/23, down 39% from 2021/22. Domestic milling wheat quality is good, despite lower protein content, and millers are expected to use slightly more domestic wheat this season. However, a proportion of imported high protein milling wheat will still be required to ensure continuity in the grist. Furthermore, while it is expected to be lower this season, a proportion of feed wheat will still be imported into Northern Ireland.

With a larger carry in from last season, coupled with a large 2022 crop, outweighing a rise in usage, the balance of domestic wheat supply and demand is up 39% on the year this season. Exports are currently forecast at 1.150Mt, up 639Kt from 2021/22. Season to date (July to November 2022) the UK has exported 432Kt of wheat, up 168% from last season. To reach this season's forecast, a minimum of 100Kt per month will need to be shipped from December to June. If we see increased farmer selling, which has been reportedly slow, we could see this export forecast rise to match or exceed wheat imports this





season. Price competitiveness too on the global market will be crucial for a stronger export pace.

Looking to barley, full season exports are currently forecast at 1.000Mt, up 31% from 2021/22. A larger crop year-on-year has boosted domestic barley

availability. From July to November 2022, UK barley exports totalled 474Kt, up 24% from 2021/22. However, the export pace is expected to slow slightly as we head towards the end of the season, as the supply dries up.

Oat exports are forecast this season

at 115Kt, down 7% on the year but remaining historically strong. In the season to date (July to November 2022) oat exports have started strong, totalling 74Kt, nearly five times the volume exported at the same point last season. However, exports are expected to slow as we progress through the season, with a slightly reduced domestic availability.

Demand

Animal feed

Overall animal feed demand is expected to fall this season, and as such, so is cereal usage. Total cereal usage for animal feed is currently forecast to be the lowest since 2016/17, mostly due to challenges across the monogastric sectors. Cereal inclusions in animal feed rations are also forecast to fall year-on-year, due to the relative price of protein meal. Pig feed production is expected to continue to fall back on the year, as the backlog of pigs on farm, caused by labour shortages at abattoirs, is thought to be all but cleared. The poultry sector especially faces challenges from avian flu and tightening margins. Cattle and

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Steering a course through this topsy-turvy world

We know there's no 'one size fits all' for farm management. Yet time and money saving ideas are always worth consideration. Among the **Made it Myself** items in the current Farm Ideas issue (31-4, issue #124) you'll see an **electric fencing 'carry-all'** which simplifies moving all the fencing components both within a field and from one field to another. Arable farmers who are introducing grazing know the importance of control, and the electric fence is an obvious option. Here is a well thought out way to move the kit, including solar panel, batteries, stakes and wire reels. You can make it with all spare parts. The issue also has a **clever way to make camera mounts** using worn hydraulic fittings. Then there's a novel 1/2 tonne **tractor weight which slides sideways** for working on slopes. **Crimping cereals** has many benefits, and this issue explains it all.

The Financial Focus is on fraud, tips on how to detect both scam and scammer, and using the Small Claims Court to get bills settled.

Government's been busy with The Environment Act 2021 and the associated Plan and this issue puts the legislation into plain English.

Our visit to Lamma involved following the future farming trail and we report on each business that took part.

The Farm Walk reviews how a dairy farmer has invested in the future, working on the basis that the next generation will be less interested in milking cows and resulting in a low stress environment.

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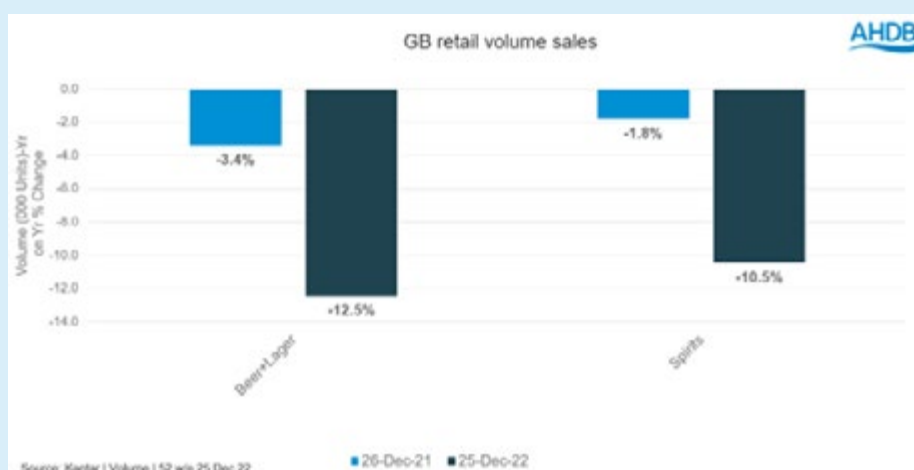
sheep feed production is expected to remain slow this season. However, with the hot/dry conditions over the summer, some regions have poorer forage quality/availability which has boosted some feed requirements. The cost-of-living crisis remains a key watchpoint across all livestock sectors.

As a proportion of cereal inclusions, wheat remains a key feature, with large availability on the domestic market and a lessening price in recent months. The discount of spot UK average ex-farm feed barley to feed wheat sat just below £20.00/t as at 02 February. However, in the previous week the discount had reached below £7.00/t (as at 26 January 2023). Despite strong maize imports at the start of this season, looking forward, the large domestic wheat supply and relative price of maize is likely to cap maize inclusions in rations.

Milling

The quality of this season's domestic milling wheat crop has been described as functional for millers. The results of the 2022 AHDB Cereal Quality Survey reflect strong specific weights and Hagberg Falling Numbers, but below average protein content. Despite lower average protein content, flour millers are expected to use slightly more home-grown wheat this season, considering the relative price to import. However, to ensure continuity in the grist, the UK will still need to import a proportion of high protein milling wheat.

This season, flour production is expected to remain relatively stable, though wheat usage by millers is forecast to decline slightly due to higher extraction rates from larger specific weights. The impact of the cost-of-living crisis on flour demand as well as some premium and alternative products,



remains something to watch.

Human and industrial usage for oats is forecast up 2% this season from last, though the demand outlook has slowed since forecasts earlier in the season. Additional oat milling capacity is expected to come online next season. While it is not expected to impact 2022/23 demand, it is a key watchpoint going forward into next season.

Biofuels

Usage of home-grown wheat in bioethanol production remains a key watchpoint this season. Following the introduction of E10 by the UK government in September 2021, Vivergo reopened, meaning both UK bioethanol plants are operational. It is assumed both plants will remain in operation for the whole of 2022/23. However, they are not expected to be running at full capacity, in part due to longer maintenance periods.

Considering the relative price of maize currently, wheat is pricing more favourably for bioethanol usage. However, maize is not expected to drop out of inclusions altogether.

With high input costs for bioethanol production and significantly lower bioethanol prices, the outlook for

bioethanol cereal usage has diminished significantly from forecasts earlier in the season and remains a key domestic demand watchpoint.

Brewers, Maltsters and Distillers (BMD)

Cereal usage from the BMD sector is forecast strong this season, across the board. Human and industrial usage for barley is forecast as the highest this century, considering strong demand seen so far this season and increased capacity in Scotland. Wheat usage too is expected to be strong for distilling and starch production, with increased capacity.

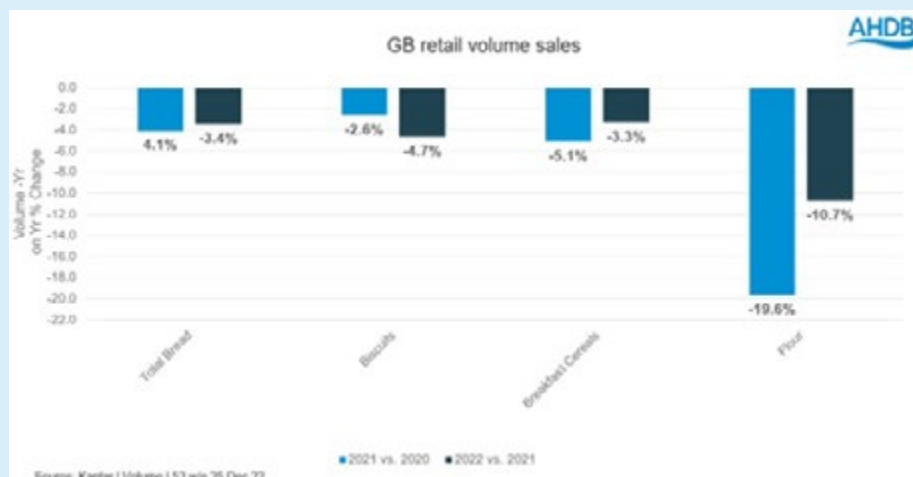
The cost-of-living crisis remains a key watchpoint for the industry, considering 4.5% of licensed premises open at the end of 2021 were closed by the end of 2022 and the impact on higher costs on smaller, independent BMD operations.

What could the outlook mean for GB prices?

With the UK having a heavier balance of cereals this season and a subsequent larger exportable surplus, UK prices are tracking European and global market movements closely and will likely continue to do so. Large supplies of Russian wheat are currently weighing down on markets. However, escalations to the war in Ukraine over recent weeks and strong EU wheat export demand has led to some support.

Over the next couple of months, the war in Ukraine will continue to add volatility to markets, especially as we near the expiry of the already extended export corridor deal on 21 March. Looking further ahead and US crop conditions will come to the forefront, as any crop damage caused by the extreme cold/dry conditions is assessed.

While the developments in Ukraine,



strong EU exports and potential US crop damage could all add support to markets over coming months, it is unlikely prices will rise back up to levels we saw last May (unless another major global incident occurs), as a surplus of Russian supply will continue to limit gains somewhat.

Cereals consumption trends

The gap between spend and volume sales has widened as inflation continues to impact the market and consumers change their shopping habits.

In-home consumption occasions are down 2.3 percentage points year on year but remain above pre-pandemic levels (Kantar Usage). As inflation has hit the market it has started to counter the trend of people returning to eating out of home post-, and we see more consumers favour in-home consumption. With this, there are greater opportunities for retail sales.

We are simplifying our meals more which is likely a result of a need for cheaper meal options. The simplification trend is evident at lunch, where more consumers are having lunch featuring sandwiches, up two percentage points vs 2021 (Kantar Usage, 8 w/e 02 October 2022). This provides good

opportunity for bread, which currently sees volumes down 3.4% year-on-year because of people buying less often and less volume per trip (Kantar, 52 w/e December 2022).

Biscuits has seen a volume decline of 4.7% year on year, a result of shoppers buying less volume per trip (Kantar, 52 w/e 25 December 2022). Snacking occasions are down versus 2021 and we also see a reduction in the proportion of treat-orientated snacks (Kantar Usage). Given that 75% of people think that sweet biscuits are an affordable treat, communicating value for money will work in its favour.

Breakfast cereal volumes are down 3.3% year on year with the decline driven by shoppers buying into the category less often (Kantar, 52 w/e 25 December 2022). We have seen a move away from hot breakfasts recently which could benefit breakfast cereals alongside the need for simplification and convenience (Kantar Usage).

Flour has seen the steepest declines year on year, with volumes down 10.7%, with the decline driven by shoppers buying into the category less often (Kantar, 52 w/e 25 December 2022).

As consumers stay at home more to manage spending, this could help boost baking occasions as an affordable leisure activity.

Despite minimal price increases spend and volumes are down year on year for beer and lager and spirits. Volumes are down 12.5% for beer and lager, driven by consumers buying into the category less often. Spirit volumes are down 10.5%, primarily caused by a loss in shoppers (Kantar, 52 w/e 25 December 2022). Alcohol remains an ingrained social ingredient, with 59% of consumers stating they usually drink alcohol when with friends. In response to the cost of living crisis we could see some movement towards social occasions in-home.

IGD predicts that food inflation will peak in early 2023 then slow over the subsequent 12 months. For now, we are still at the height of the economic crisis and the outlook is still one of managing spend to ride out the storm. The movement towards simplicity and convenience could benefit bread, breakfast cereals and biscuits, whilst a move towards in-home social occasions could benefit alcohol.

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RUST IN PEACE: PATHOGENS VERSUS CEREAL VARIETIES



With extreme diversity locked into yellow rust and brown rust populations, the latest UKCPVS event (1 March 2023) examined how highly adaptable pathogens affect UK wheat and barley varieties.

With a focus on wheat, Jason Pole, who leads AHDB's crop disease communications, provides an overview of some of the key developments.

Rust diversity

Cereal rusts often grab the headlines at the annual UK Cereal Pathogen Virulence Survey (UKCPVS) stakeholder event, especially wheat yellow rust.

The yellow rust population is diverse and dynamic, which makes disease resistance ratings less stable. So, the high level of interest in these foliar pathogens is unsurprising.

However, from a rust perspective, the current decade has got off to a relatively calm start. It sits in stark contrast to the 2010s, which saw the Warrior yellow rust race start a population take-over.

The UKCPVS 2022 event article (next article) explains why this race was so successful in tumbling the ratings of many high-profile varieties.

At the time, the rapid change shook the Recommended Lists (RL) disease-rating system and put everyone on tenterhooks. Could the 1-9 rating system be trusted?

Based on trial data, the ratings reveal what has happened (in recent seasons), not what will happen – they are not predictive. However, the data does contain clues about what the future might hold.

Yellow rust watch list

To provide predictive power, AHDB looked at RL data in a new way. It culminated in the release of the yellow rust watch list in 2021.

Updated annually, the watch list indicates varieties that performed out of line with their main RL disease rating in some trials.

Varieties that appear to be

'misbehaving' can be monitored more closely and treated with rust-active fungicides, where disease pressure merits it.

A recent analysis of the performance of the watch list over its first two seasons of operation (2021-22) suggests that the system is working. It is helping to highlight varieties at the greatest risk of falls in resistance ratings.

The latest yellow rust watch list (released in March 2023) provides little evidence that a dramatic change in fortune is on the cards.

Currently, most RL varieties are performing as predicted from their RL rating. In general, varieties have also performed as expected in the UKCPVS yellow rust field trials.

So, the recent calm appears to be continuing, which is good news for management and plant breeders. Genetics has caught up in the race –

the RL now boasts 18 winter wheat varieties with a yellow rust disease rating of 9.

Unfortunately, it doesn't mean we can relax. Yes, the watch list can spot unusual events happening at the local level, but it will never be a fool-proof crystal ball. For example, it will not predict the arrival of a new aggressive yellow rust strain blown in from overseas.

Brown rust 'blip'?

This year, AHDB added a brown rust watch list to its growing list of resources.

On the current winter wheat list (RL 2023/24), very few varieties are highly resistant to brown rust – just one variety has a resistance rating of 9, and only two have a rating of 8.

The good news is that, in general, the brown rust watch list suggests there is little change to be concerned about. Like yellow rust, most varieties are performing in line with their RL rating. Once again, this holds true in the UKCPVS trials.

However, one of the 8-rated varieties stood out at an RL trial site in Devon: Theodore, with a relatively high level



Figure 1. Limited symptom development in two winter wheat varieties following inoculation with stem rust (isolate 1 or 2). Typical symptoms shown for comparison

of brown rust (18.8%). At this site, only Crusoe, brown rust rating of 3, had more disease (25.0%).

This is where the watch list comes into its own. It suggests that a change in the pathogen population has occurred. With implications for commercial varieties, it is a situation that merits closer attention.

Interestingly, UKCPVS received a brown rust sample from Theodore just down the coast (Dorset).

The sampler noted infection levels of 3%, in addition to relatively high disease levels (up to 10%) in some patches (foci). This is much higher than would be expected for a variety with a disease rating of 8.

UKCPVS growth room screening tests, conducted in 2022, suggest that the Dorset isolate may be able to unlock a specific resistance (leaf rust, Lr) gene – Lr24.

Brown rust pathogens able to unpick the Lr24 lock had not been detected by UKCPVS for a little while (since 2017). As a result, this isolate of interest will be included in adult plant trials to help determine its significance to varieties.

It is important to note that the abundance and distribution of isolates in the UK population ebb and flow, increasing and decreasing over seasons. Disease ratings can go up as well as down. This isolate could fizzle out in the population once more. Time will tell.

In general, Theodore has a reputation for being a strong performer against cereal rusts. In addition to its main 'adult plant' yellow rust rating of 9, it also resists yellow rust and brown rust at the young plant stage. The latter is a particular achievement – being the only variety on the current (RL 2023/24) list to possess this trait. It also appears to resist wheat stem rust.

Wheat stem rust

Over the past 25 years, UK conditions have become more conducive to stem rust infection. Ten years ago (2013), stem rust was recorded in UK crops for the first time in over 60 years. Since then, the disease has been observed for several years at several sites.

Although not routinely screened, the UKCPVS team did test two stem rust isolates, sampled from UK fields in 2022, on the full set of recommended and candidate varieties.

Symptom development photos provide a clear picture of Theodore's ability to check for infection (Figure 1).

RGT Wolverine was also able to limit pustule development.

Unfortunately, it appears that many UK wheat varieties are highly susceptible to the disease. However, good control levels can be achieved with rust-active azole fungicides, especially tebuconazole.



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BREEDING WHEAT TO BEAT YELLOW RUST



Over the last decade, major changes to the UK's yellow rust pathogen population have added complexity to the plant-breeding puzzle. Jason Pole, who leads on AHDB's crop disease communications, outlines key points from a recent presentation on the topic.

Our UK Cereal Pathogen Virulence Survey (UKCPVS) project is essential to plant breeders, according to Rachel Goddard of plant breeding company Limagrain.

Rachel presented at the recent UKCPVS event and said that information, hard work, investment and time are required to ensure that winter wheat variety developments match the pace set by adaptable yellow rust populations.

The UKCPVS monitors cereal rusts and mildews. Through disease observations (phenotypic work) and analysis of pathogen genetics (pathogenomics), UKCPVS results help the plant-breeding pipeline deliver strong disease resistance to Recommended Lists (RL) varieties.

Yellow rust evolution

Rachel's presentation centred on the challenges of breeding for yellow rust resistance.

Over the last 50 years, major breakdowns in yellow rust resistance have occurred relatively frequently (Figure 1) – in cycles of around 5 to 10 years.

When new pathogen variants arrive, they can spread rapidly (in just a few seasons).

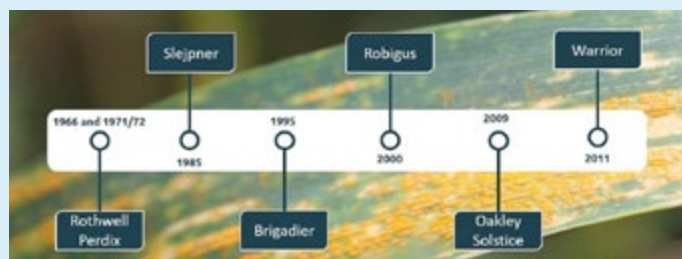


Figure 1. A timeline showing key years for wheat yellow rust population change in the UK

In 2011, the presence of the Warrior yellow rust race in the UK was confirmed. Compared to previous changes, Warrior was highly unusual for several reasons, including:

- It was derived from a sexual recombination (outside of Europe)
- It was first identified in many countries in the same year
- It caused yellow rust on many wheat varieties
- It was complex and varied
- Compared to the previous population, it was highly adaptable. It:
 - o Tolerated a greater range of temperatures
 - o Had a shorter time from infection to sporulation
 - o Produced a greater number of spores
 - o Developed black telia relatively late in the season
 - o Broke many resistance genes and gene combinations

In fact, Rachel said that post-Warrior “yellow rust was like a

new disease”.

A major reason why Warrior affected so many varieties was because it unpicked a single, major adult plant resistance gene – YRClaire – one that had been extensively used in plant breeding since 1997.

The post-Warrior explosion in the diversity of the yellow rust population was so large it demanded a change to the way new variants were named. Today, new races are assigned to a genetic colour group and given a sequential number – unique to the varieties on which they cause disease (pathotype).

Since the incursion of Warrior, the red group of isolates has dominated the population – with it featuring over 50 pathotypes.

Frequencies of these pathotypes vary over time and space: even across a short distance in a field, the pathotypes present can vary substantially.

The three most dominant pathotypes represent around a third of the population, according to the most recent UKCPVS results.

Post-Warrior, the yellow rust population has changed so much that its ability to unlock resistance in some old varieties (from the 1990s) may have, in essence, been forgotten. This includes Brigadier (Figure 1), which features genes known to counter the Warrior population of races. Therefore, historic genetics may offer solutions for the varieties of tomorrow.

Plant breeding challenges

However, UKCPVS pathotype information (presence and frequency) guides plant breeding efforts. The provision of representative pathotypes to breeders – for artificial infection (inoculation) of varieties in disease nurseries – also helps to maximise the chance of successful variety selection.

There is a continual hunger to introduce new sources of resistance, as the elite wheat gene pool is narrow. Breeders turn to wheat's wild relatives, direct ancestors, and landraces to help expand it. However, this route takes as much as three times longer than elite crosses due to the need to flush out undesirable traits.

Genetic technologies, such as marker-assisted selection, are helping to speed up the plant breeding process. Despite the changes to the yellow rust population, many RL varieties have strong resistance to the disease at the adult-plant and young-plant stages. It shows the ingenuity of plant breeders.

Adult plant disease rating	Number of winter wheat varieties (RL 2022/23)
8–9	22
6–7	9
5 or less	7

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PROSPECTS FOR UK AGRI-FOOD EXPORTS



This analysis examines export opportunities for UK producers, both ones that exist currently and those that may emerge over the coming decade.

Pinpointing the opportunities

The expansion of the middle classes in emerging markets across the globe is strengthening the demand for protein and imported foods. And globally the British brand is well-regarded, being associated with quality and high safety standards. So how can UK producers and exporters capitalise on these favourable circumstances?

Who is this analysis for?

We aim to help producers and exporters build an understanding of the opportunities and challenges of trading in different world regions. Policymakers and trade negotiators will also find useful the review of economic potential in overseas markets.

Analysis by world region

Europe: The EU remains one of the UK's most important trading partners and will continue to be a key opportunity in the future due to the proximity of the market and well-established relationships.

Asia: Asia holds significant potential for UK exports due to its large population, increasing middle-class wealth, rising meat consumption and consumers' high regard for food safety and quality.

North America: The main opportunity for UK exporters in North America will be for premium red meat and dairy products which are differentiated from domestic production.

Middle East and North Africa (Coming soon): MENA offers significant opportunities for UK exporters, especially for the lamb and dairy sectors due to the region's strong population growth together with limited production capacity driving food imports higher over the next decade.

Central/South America (Coming soon): There are limited export opportunities for the UK in Central and South America, primarily due to the proximity of the big exporters such as the USA, Brazil and Argentina who are the main suppliers of this market.

Sub-Saharan Africa (Coming soon): There's room to expand on the amount of commodity level red meat the UK currently exports to Ghana, Cote d'Ivoire and South Africa as well as increasing premium cuts into South Africa.

Where does the UK currently export Cereals to?

The European Union (EU) remains the UK's most important

trading partner. But now the UK is free to strike trade deals with other nations, so it is worth exploring where the most fruitful opportunities lie.

Wheat

- The amount of wheat exported by the UK depends on production in any given year and can vary considerably
- The EU is the most important trading partner for the UK wheat market, with over 90% of UK wheat exports shipped to the trading bloc over the past five years on average

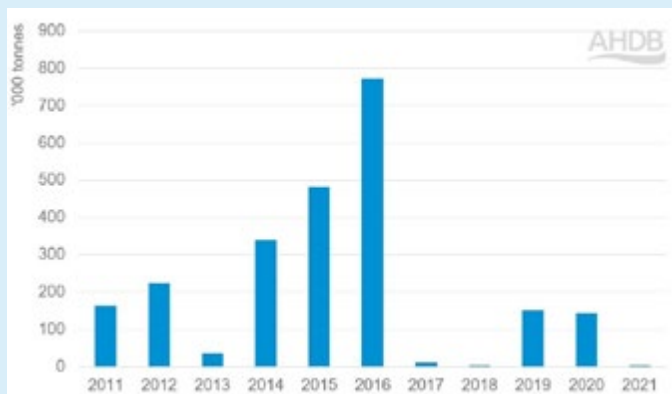


Figure 1. UK wheat exports to non-EU destinations, 2011–2021
Source: UK HMRC compiled by Trade Data Monitor LLC

- Domestic production and supplies around the world, particularly those of the UK's main competitors and the relative competitiveness of UK grain, are all key factors determining the level of exports in any given year
- In recent years, UK wheat has been exported to Algeria, the United States, Iceland and Turkey, with an average value (2018–2021) of £5.0m, £2.5m and £0.8m, respectively
- A shipment of over 100,000 tonnes of wheat was also sent to Nigeria in 2020, although this is a one-off situation
- Morocco has also been a key export destination over the past decade, although exports to the country have tapered off since 2016
- Morocco, Spain and Portugal are key customers of UK biscuit wheat

Barley

- While the EU is also the primary market for UK barley exports, considerable amounts have been shipped to non-EU countries
- Following a period where over 300,000 tonnes of UK barley was exported to countries outside the EU annually between 2013 and 2016, volumes have

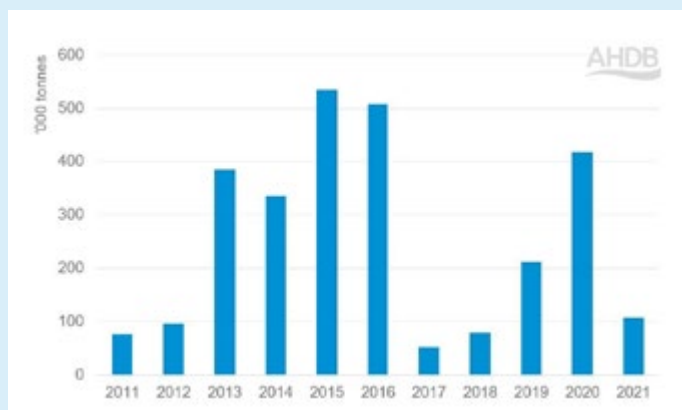


Figure 2. UK barley exports to non-EU destinations, 2011–2021
Source: UK HMRC compiled by Trade Data Monitor LLC

dropped in recent years with the exception of 2020

- Key non-EU destinations for UK barley exports (2019–2021 average) were Tunisia (£9.1m), Morocco (£11.2m), Algeria (£8.1m) and Saudi Arabia (£6.1m)
- UK barley exported to these countries is feed grade rather than malting barley

What drives international demand?

We present data on gross domestic product (GDP), population growth and income per capita.

World GDP growth

Gross domestic product (GDP) is a measure of the size and health of an economy over time. The larger the GDP figure, the healthier the state of the economy. Figure 1 shows how the global economy has fared in recent years and forecast growth to 2024.



Figure 3. Global GDP growth, with predictions from 2022 onwards
Source: World Bank

Disruption to economic growth

In 2021 COVID-19 caused the sharpest global recession since the Second World War. A brief rally followed, but the world economy is now suffering again. This time the cause is high inflation and slow growth (stagflation). Even if a global recession is averted, this period of stagflation could last for several years. The war in Ukraine, surging

interest rates and inflation have combined to slow world economic growth, which is forecast to drop from 5.9% growth in 2021 to 2.9% in 2022.

The impacts of Ukraine

The Ukraine conflict is leading to soaring prices and volatility in energy markets. Energy exporters have fared relatively well but this has been more than offset by net energy importers. The invasion of Ukraine has also led to a significant increase in agricultural commodity prices, which is exacerbating food insecurity and extreme poverty in many emerging markets and developing economies (EMDEs).

The adverse effects from this war will be most keenly felt in Europe and Central Asia, where output is forecast to contract sharply in 2023. Output growth is projected to slow in all regions except the Middle East and North Africa, where the benefits of high energy prices for energy exporters are expected to outweigh those prices' negative impacts on other economies in the region.

Following the negative shock to global activity in 2022, no rebound is projected for 2023: global growth is forecast to fall to 1.7% that year. Many headwinds—in particular, high commodity prices and continued monetary tightening—are expected to persist. Moreover, the outlook is subject to various downside risks, including intensifying geopolitical tensions, growing stagflation, rising financial instability, continuing supply strains, and worsening food insecurity.

Population growth

The global population reached eight billion in November 2022 – three times the size it was in 1950. The latest projections by the United Nations suggest that the world's population could grow to around 8.5 billion in 2030 and 9.7 billion in 2050. It is projected to reach a peak of around 10.4 billion people during the 2080s and to remain at that level until 2100.

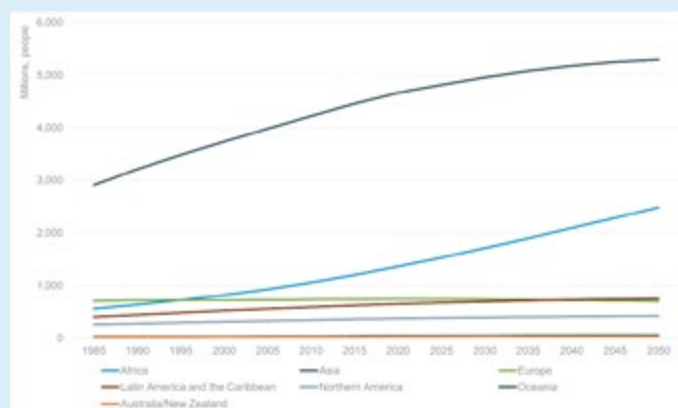


Figure 4. Global population by region, 1985–2050
Source: United Nations 2022

Global population distribution

The world population in 2021 was distributed as follows:

- 61% of the global population lives in Asia (4.7 billion)

- 17% in Africa (1.3 billion)
- 10% in Europe (750 million)
- 8% in Latin America and the Caribbean (650 million)
- 5% in Northern America (370 million) and Oceania (43 million)

China (1.44 billion) and India (1.39 billion) remain the two most populous countries of the world, representing 19 and 18% of the world's population, respectively. India is projected to overtake China as the world's most populous country by 2027, while China's population is projected to decrease by 31.4 million, or around 2.2%, between 2019 and 2050. (Source: World Population Prospects 2019)

Between now and 2050, more than half of global population growth is expected to occur in Africa, which already has the highest rate of population growth globally. The population of sub-Saharan Africa is projected to double by 2050.

In contrast, the populations of 55 countries or areas in the world, predominantly in Europe, are expected to decrease by 2050, of which 26 may see a reduction of at least 10%.

Growth of the middle class

Increases in GDP and population growth in many countries and regions of the world have led to an increase in the so-called 'middle income' or 'middle class'. These terms are used interchangeably to describe those above a certain income and consumption level per capita. Taking into account inflation, the income range for middle-class families can be expressed as \$11 to \$110 pppd in 2011 Purchasing Power Parity (PPP) terms. As Tables 1 and 2 show, the numbers of middle-income consumers, their % share of the global population and % share of spending power, particularly in Asia-Pacific, are set to increase dramatically.

	2015		2020		2025		2030	
	#	%	#	%	#	%	#	%
North America	335	11	344	9	350	8	354	7
Europe	724	24	736	20	738	16	733	14
Central and South America	285	9	303	8	321	7	335	6
Asia Pacific	1,380	46	2,023	54	2,784	60	3,492	65
Sub-Saharan Africa	114	4	132	4	166	4	212	4
Middle East and North Africa	192	6	228	6	258	6	285	5
World	3,030	100	3,766	100	4,617	100	5,412	100

Table 1. Number (millions) and share of the global middle class by region

Source: Kharas 2017 – The unprecedented expansion of the global middle class

2015(%)		2020(%)		2030(%)	
Country	Share	Country	Share	Country	Share
USA	4.7	13 China	6.8	16 China	14.3
China	4.2	12 USA	4.7	11 India	10.7
Japan	2.1	8 India	3.7	9 USA	4.7
India	1.9	5 Japan	2.1	5 Indonesia	2.4
Russia	1.5	4 Russia	1.6	4 Japan	2.1
Germany	1.5	4 Germany	1.5	4 Russia	1.6
Brazil	1.2	3 Indonesia	1.3	3 Germany	1.5
UK	1.1	3 Brazil	1.2	3 Mexico	1.3
France	1.1	3 UK	1.2	3 Brazil	1.3
Italy	0.9	3 France	1.1	3 UK	1.2

Table 2. Middle-class consumption (PPP, constant 2011 trillion \$, and global share) – top 10 countries in 2015, 2020, and 2030

Source: Kharas 2017 – The unprecedented expansion of the global middle class

According to World Bank data, between 2012 and 2019, the global middle-income population increased from 5.4 billion to 5.8 billion. The pandemic is estimated to have erased a year of growth, leaving the global middle-class

population unchanged from 2019 to 2020.

The effect of the COVID-19 economic downturn on the middle class and other income tiers shows distinct regional differences. South Asia has been the most affected, followed by East Asia and the Pacific. Meanwhile, in advanced economies, the middle class is estimated to increase as countries move from the high-income level to middle income.

Despite the many challenges, forecasts indicate that it will be this emerging middle class in East Asia and India that will show the biggest growth in demand for goods and services over the coming decades.

Continuity of supply

When examining the UK's potential to maximise exports, it's important to determine how much the UK produces of each agri-food product and how much is available to export.

Wheat

UK wheat production has averaged around 14 Mt over the past decade, but from year to year there can be fluctuations depending on the weather. For example, Figure 4 shows how between the 2019/20 and 2020/21 crop years, the UK wheat harvest fell from 16.2 Mt to 9.7 Mt, a decline of 40%.

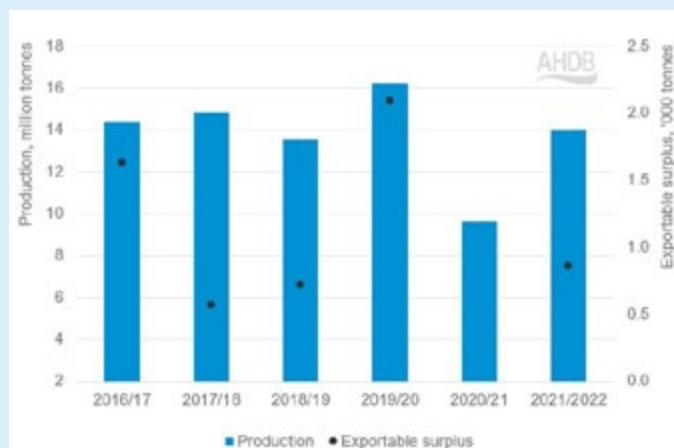


Figure 5. UK wheat production and exportable surplus

Source: Defra, AHDB

The UK has been a net importer of wheat seven times in the past 10 years (2012–2021). Even in years where the UK produces a bumper crop, a certain level of imports will always be required. This is because the milling sector requires a proportion of high-protein wheat that cannot be grown domestically, to ensure continuity in the grist. High-protein hard wheat for milling is imported from Canada, France and Germany.

On average UK flour millers use 80% homegrown wheat and 20% imported wheat each year, but these proportions change depending on the quality and quantity of the domestic crop.

As Figure 4 shows, the exportable surplus of wheat (the amount left over once domestic demand and stock requirements have been taken into account) also fluctuates considerably. These factors, combined with other issues (such as tough competition from big global producers)

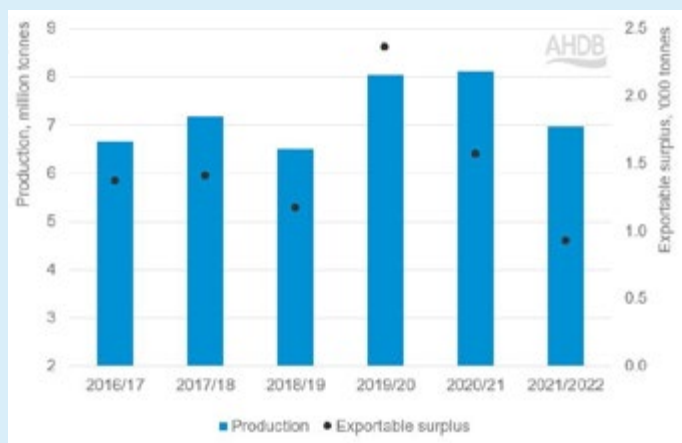


Figure 6. UK barley production and exportable surplus
Source: Defra, AHDB

mean that the UK is unlikely to become a major wheat exporter any time soon.

However, there are opportunities in the niche soft wheat market. UK soft wheat is favoured by Spain, Portugal and Morocco – especially when there is a disruption to supply.

A challenge for the UK is that soft wheat area has been declining as farmers prefer to grow higher-yielding varieties. Soft wheat area is on average around 20% of the UK wheat area.

Barley

UK barley production has averaged around 7 Mt over

the past decade. Output has been fairly stable, varying between 6 and 8 Mt. The UK is a net exporter of barley and the exportable surplus is usually over, or close to, 1,000 t (Figure 5).

Spring barley dominates over winter varieties, comprising around 65% of the total UK barley area. Most of the barley produced is used for animal feed (4.3 Mt based on 2016/2017–2021/22 average), with around 1.8 Mt consumed by the UK malting sector.

The UK's exportable surplus of barley is around 1.5 Kt on average (2016/17–2021/22). Key markets include the EU for both feed and malting barley and the Middle East and North Africa region for feed barley.



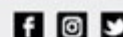
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UK'S FIRST AGROFORESTRY SHOW TO EXPLORE THE PERKS OF **FARMING WITH TREES**

Hundreds of farmers and foresters can discover the benefits of farming with trees for sustainable food production in the UK's first Agroforestry Show.

The event, hosted by the Woodland Trust and Soil Association and sponsored by lead partner Sainsbury's, will explore the boost that trees can deliver for nature and climate as well as delivering resilience and productivity for farm businesses.

It will bring together a thousand guests spanning across farmers, foresters, tree nurseries, growers, graziers, advisors, funders, food businesses, policy makers and agroforesters.

Tickets are now on sale for the two-day gathering, on Wednesday 6 and Thursday 7 September, which will include:

- Knowledge exchange workshops and inspiring talks
- Farmer and forester led discussions
- Agroforestry field walks
- Live equipment demonstrations
- Exhibitions and market stalls

Soil Association Chief Executive Helen Browning will be hosting the event at Eastbrook Farm, in Wiltshire, where she runs a mixed farm with an agroforestry project that has been running for seven years.

She said: "We are delighted to be working with the Woodland Trust to host the UK's first ever Agroforestry Show. Agroforestry holds so many of the answers to the climate and nature crises, and it has also been proven to boost farm productivity. Trees improve soil health, provide habitats for wildlife including beneficial insects, give shelter and forage to livestock, and cut carbon emissions. And they do all this while providing additional funding streams through fruit, nuts and timber. Much more than a trade show, this two-day gathering will inspire hundreds of land stewards to collaborate and get involved with agroforestry."

Agroforestry offers huge

opportunities to the forestry sector and this show will be a catalyst to strengthen the relationships between the forestry and farming sectors. Working together the two sectors can identify solutions to help overcome the current knowledge and financial barriers to widescale up take of agroforestry.

The Woodland Trust has a decade of experience in supporting agroforestry and at the show they will highlight how we support landowners and farmers to adopt agroforestry on their land, via a range of subsidised tree offers and expert advice. The trust aims to tap into the demand from farmers wanting to do more for the environment and help to unlock this potential with this event.

Helen Chesshire, Lead Farming Advocate at the Woodland Trust said:

"Having many more trees within our farmed landscapes could bring so much good. Trees make an important contribution to tackling climate change and helping reverse biodiversity declines. Agroforestry supports farm businesses to adapt to climate change and become more resilient to the types of financial, social and environmental shocks that are likely to be a part of the future.



"This event is about making trees work for farm businesses and the local environment that they operate within and rely on. It is a sign of hope that there are solutions to grasp - if we take them. We will highlight this and more at September's show."

The event, also sponsored by the Forestry Commission, Defra, Tillhill, Farm Carbon Toolkit and Royal Forestry Society, comes hot on the heels of a ground-breaking report, funded by the Woodland Trust, which showed how a major increase in agroforestry – farming with trees – in England, is essential if the country is to meet nature and climate targets, whilst at the same time securing long term food production.

The report was developed from new analysis commissioned from Cranfield University which revealed arable farms that integrate trees within arable crops – known as silvoarable systems – could lock up eight tonnes of CO₂ per hectare per year over 30 years. Eight tonnes of CO₂ is equivalent to the annual emissions of an UK citizen.

Buy your tickets now (<https://www.agroforestryshow.com/tickets>)

Two-day tickets are offered on a tiered ticket scale to make this event as accessible and affordable as possible. Single day tickets will become available when the event program is launched. Early bird tickets are available now but will go fast.

A limited number of bursary funded places are also available for those who require additional support to attend the event. Get in touch for more information at: info@agroforestryshow.com

An advertisement for Acres Insurance. The background is a photograph of a green tractor with a yellow implement in a field under a blue sky with clouds. The text "Acres INSURANCE" is at the top in a serif font. Below it, "CALL US DIRECT" is written in large, bold, white capital letters. Underneath that, in smaller white capital letters, is "CONTACT US FOR AN INDEPENDENT INSURANCE QUOTATION TODAY". At the bottom, the phone number "01536 607070" is displayed in white. Below the phone number are two lines of text: "HELLO@ACRESINSURANCE.CO.UK" and "WWW.ACRESINSURANCE.CO.UK".

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AGRONOMIST IN FOCUS...

HEALTHY SOIL ... WHAT DOES THAT ACTUALLY MEAN?

Written by Dick Neale from Hutchinsons



Dick Neale

Hutchinsons launched its Healthy Soils Assessment service in 2016. Since then the overall understanding of what goes into making a soil healthy has increased massively.

Shared knowledge, research, observation, plus a clear increase in grower interest have all combined to accelerate the learnings and engagement across the industry.

Everyone now appreciates that soil is a living, breathing entity and that microbiology and increasing microbial biomass is as important

an objective as increasing organic matter.

Our Healthy Soils Assessment, Gold Soil test and now the combination of these with TerraMap soil mapping in TerraMap Gold, are vital components in creating a starting point of information with which to make clear decisions on what future interventions may be needed, be they physical, chemical or biological.

Over the past seven years we have identified some clear common denominators with regards to soil health

- The seeding zone of seedbeds tends to be overworked
- Overworking leaves seedbeds at risk from slaking during heavy rain events
- Slaking or capping of the seedbed creates anaerobic conditions in the seeded zone and severely impairs crop establishment
- Poor infiltration of surface rainfall due to capping is incorrectly identified as poor drainage and addressed via deeper tillage passes.

Modern tillage machinery can create good seedbeds quickly, but problem grassweeds such as black grass or ryegrass require delayed drilling to be practised for good cultural control.

The two elements of delayed drilling and early creation of finely worked seedbeds are rarely compatible, frequently leading to capped and anaerobic seedbeds.

The assessment of baseline issues and the farming requirements like grassweed control allows us to work with customers in addressing all issues beyond just having a focus on healthy soil or just achieving good weed control, a plan allows all elements to be positively impacted at the same time.

Soil structure and the soil's own innate ability to maintain a resilient structure is a combination of factors, but understanding that soil moving implements never create good soil structure is a major shift in understanding.

Good soil structure is created via natural processes, the building of aggregates by microbiology, binding of these together via growing roots and creation of burrows by worms, all together creating stable resilient soil, with good gas exchange, water movement and storage.

Soil moving implements change this structure, and always in a negative way for the long term. However, farming soil damages soil and cultivation interventions are frequently needed to address problems such as compaction at depth, or shallow compaction.

Assessment of compaction depth is a vital component in good soil management - shallow compaction is not addressed appropriately by deep tillage. In all cases tillage can be used and frequently should be used, to remove a structural problem where identified, but tillage does not create good soil structure - natural processes do that. Tillage only improves or removes a structural problem in the short term, long term the issue will return if other interventions are not used in combination.

Deep tillage breaks up natural soil structures and produces a 'soft' loose structure which is easily recompacted via the passage of heavy machines during the farming year. The recompacted soil is again deep tilled to alleviate the compaction facilitated by the original deep tillage. We have to break the cycle, but doing that successfully again requires a plan centred on an assessed baseline for your farm, a plan that transitions to an agreed approach, a plan that anticipates both the positives and potential negatives of the transition period, a long term plan that incorporates all the elements for resilient and healthy soil.

- Vital elements
- Soil assessment
- Gold test
- Utilisation of cover and catch crops
- Appropriate cultivation when required
- Understanding of chemical, biological and physical impacts on soil structure
- Initiating processes to cycle nutrients within the soil
- Never lose focus of growing strong and healthy cash crops.



Stand-alone 6m with optional rear packer roller



Front and rear mounted on the same machine

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- » Fully steering legs and discs, reducing frame and leg stress as well as allowing for steering and reducing overload.
- » Huge leg stagger, 260mm point to point to minimize blocking.
- » Large diameter discs (500mm) with deep penetration minimise disturbance of the leg.
- » Heavy duty frames.
- » Maintenance free composite bushes on all pivot points.
- » Shear bolt or Auto-Reset leg protection.
- » Special versions for wheel track eradication with adjustable leg spacing.
- » Available in 3, 4, 5, 6 and 8m working widths.



Toolbar when fitted with optional rear hydraulic linkage/towbar to pull secondary cultivation equipment or drill



Front mounted 4m running with combi drill



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"CONSERVES" PROJECT FOR RESEARCH ON BIODIVERSITY IN INTENSIVE FARMLAND

Three-year project to maximize ecosystem performance - eight project partners from four E.U. countries - DLG is professional partner and will communicate findings

A group of eight professional partners has just launched the international "ConservES" project for research on increasing biodiversity in intensive wheat farmland, without reducing yields. The DLG (German Agricultural Society) will contribute with its biodiversity know-how and additionally lead the communication of project results to the agricultural community.

Van Baaren.

The benefits of hedgerows and flower strips as habitats for pollinators and natural enemies of pests and weeds will be the focus of the international research project, which is coordinated by the University of Rennes, France, with the professional partners Julius Maximilians University of Würzburg, Germany; Living Lab CLEF, France; Université catholique

draws on resources from each member.

The project will explore the importance of habitats that exist naturally alongside farmed land, such as hedgerows, or habitats that have been established as "linear semi-natural elements" such as flower strips, serving to improve the abundance and diversity of organisms, pest and weed control, and pollination.

As wheat is the dominant crop produced in the areas studied - western and northern France, Wallonia, Belgium, southern Germany and western Czech Republic the project will focus on conventional fields of wheat or other small-grain cereals.

The ConservES project is multidisciplinary and based on the combination of four approaches:

- The concept of the real laboratory
- Bioblitz field data collection in each of the five study regions
- Field trials to increase plant species diversity
- Simulations through spatial modelling within the five study regions.

Along a climatic gradient, it is expected that the climatic context will play a major role on the potential of ecosystem services in each area, as temperature is a key effect of climate change.

"Involving local farms is one of the most important activities and a key factor for the success of the project," says Stephanie Timm, project manager at DLG. "The concept of the real lab is to work with farmers to develop scenarios for expanding diversity within, near and around fields to optimize agroecosystem diversity at



For the start of the new project "ConservES" all partner organizations convened at the Station Biologique de Paimpont, part of the University of Rennes, France.

"The goal of the three-year project is to increase biodiversity in intensive agricultural areas without causing yield losses to farmers," said Joan Van Baaren, professor at the University of Rennes. "We expect the project to deliver results that can help achieve the significant ecological benefits of floral enrichment for biodiversity as well as ecosystem services on conventionally farmed land," added

de Louvain, Belgium; DLG (German Agricultural Society); Crop Research Institute as well as the Association for Innovation and Sustainable Agriculture, both Czech Republic.

With the appropriate project description "Living-lab approach to floral enrichment as a tool to conserve biodiversity and maximising ecosystem services in European agricultural landscapes", the ConservES project



Flower strip (source: Pixabay, Thomas)

the farm and in the countryside generally. The farmers will be involved in biodiversity conservation and ecosystem health,” she adds.

The project's activities also aim to build an effective network of research and farming practices to communicate the value of ecosystem services and establish the application of the solutions developed beyond the project.

The activities of the project is also expected to build an effective network of research and agricultural practice to communicate the value of ecosystem services and establish the application of the solutions developed beyond the project.

The DLG is active in several biodiversity projects, including “BioMonitor4CAP” (Project number 101081964) funded by the European Union's Horizon Europe research and innovation program, that aims to develop, evaluate and test affordable and reliable systems for monitoring biodiversity for application on agricultural land. This project focuses on specially protected areas for rare, endangered or vulnerable natural habitats and species of plants or animals.

We will report the finding of the studies in future issues.



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Step 2

Ask your friends to join the deal too – the more farmers join the better the final price.

Step 3

We put all the demand together in regions and ask suppliers to quote.

Step 4

We send you a price for the product Collective you have joined.

Step 5

NO If the price isn't right for you – then you just decline the offer, and we will try harder next time.

Step 5

YES If you like the price, you confirm the actual quantity you would like to order (this can be more or less than your original estimate) – then you click accept.

Step 6

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FUTURE PROOF FARMING



UP-TO-DATE SCIENCE CRITICAL WHEN IT COMES TO NAVIGATING NATURAL CAPITAL

Farm businesses should be taking control of all of their natural capital assets regardless of supply chain directives, as data shows a positive link between sustainability improvements, reduction in emission levels and the bottom line.

Dr Alasdair Sykes, managing director for sustainability at Trinity AgTech says it's not enough to only consider the emissions produced at an individual field or crop level.

"To truly capitalise on this information and gain wider analytics about your farm as a whole, it is crucial to be using up-to-date scientific data and models that accurately represent UK agriculture," he says.

"Gathering all available data is vital. This gives baseline measurements and the opportunity to put in place longer term business strategies and a clear road map going forward."

Moving with the times

Achieving net zero within agriculture is a hot topic across the supply chain and at a government and global level.

But it may not be the right strategy for your farm, at this time, to focus on net zero as the absolute target. Indeed, some farms may never achieve net zero, but that doesn't necessarily mean they cannot and are not making steps towards carbon improvement.

We need to move the narrative forward as an industry. What may be more important is to actively focus on improving sustainability and productivity metrics appropriate for the farm's system and land characteristics.

Before you can move forward at all, it's vital you have a complete understanding of what natural capital you have to work with on your farm. That includes all aspects of carbon, biodiversity, water, soil and woodlands. Biodiversity and water quality are other key aspects to understand as they also have an

inherent value.

"Getting on top of your emission levels now and knowing what your whole picture for natural capital looks like is a no-lose situation as it is something all farms and business are going to be required to do in the not too distant future," says Dr Sykes.

"Ensure you are ahead of the curve and choose what's best for your farm. This will avoid being backed into a corner by stakeholders higher up the supply chain, especially those who may be looking to audit your emissions using a tool that incorrectly reports on your data.

"This could result in huge injustices for you and your farm," says Dr Sykes.

"It's also true that the space around reducing emissions is very volatile at the moment, so by urgently prioritising getting baseline measurements

in place, you can start proactively implementing positive change, armed with the data.

“With regulatory requirements and policy constraints, it can feel like an ever moving landscape and difficult to navigate what should be recorded and when. It also often depends on where you are based in the country and what schemes available to you.”

However, he notes that there will never be a penalty to getting the farm in a position of understanding your farm data and your ability to manage it. But it will deliver information and insights to talk to customers and other stakeholders.

Using the right tool for the job

Dr Sykes explains: “When looking to conduct a natural capital audit on your farm, it’s important to be able to navigate through your own data, and pull from additional land based information such as topography, weather etc.

“This means a tool which will help you make decisions and that looks at the variation in your outputs and management processes as you move forwards.

“First generation tools are typically not reliable when calculating carbon emissions. This is because they rely on out-of-date scientific data which makes sweeping generalisations of arable farms and their practices, often resulting in wildly incorrect emission levels.”

He adds: “Choosing a navigator that covers a range of metrics is important. Farmers are very aware of the different pressures placed on them particularly around carbon and GHG emissions.

“However, it’s also important to cover biodiversity, water protection, nitrate leaching and soil protection. It is very likely that in the coming years these results and statistics are going



to become increasingly desirable from stakeholders up and down the supply chain.”

One size doesn’t fit all

“It’s important to remember that improving on-farm sustainability is a unique journey for every farm,” says Dr Sykes.

“The options are vast and will be preferable depending on a range of factors and differences including business goals, farming system, land use and soil type to name a few.

“However, much of the science and data behind first generation calculators and tools, does not account for these differences.

“To correct this injustice and offer a clear roadmap to reduce farm emissions while supporting farm business profitability, it is vital that on-farm software has the analytical capabilities to not only deliver a credible assessment but to also guide decision making,” he adds.

“Having the ability to scenario plan and be supported continuously

through the decision-making means that farmers are truly able to utilise their land and resources.

“This can also ensure that changes to management processes and farming practices not only help reduce farm emissions, but also work to support the future of the people working on the farm and the businesses longevity,” concludes Dr Sykes.

What is Sandy?

- Award-winning navigator software for measuring, managing and optimising natural capital
- The only next generation platform providing scenario planning to future proof your farm
- ISO accredited and based on the latest science to create the industry’s most credible register of on-farm natural capital assets including biodiversity, carbon, agroforestry, and water quality
- Completely independent and easy to use
- Created for all farms, of all sizes, everywhere

To book a demo or find out more about Sandy visit:
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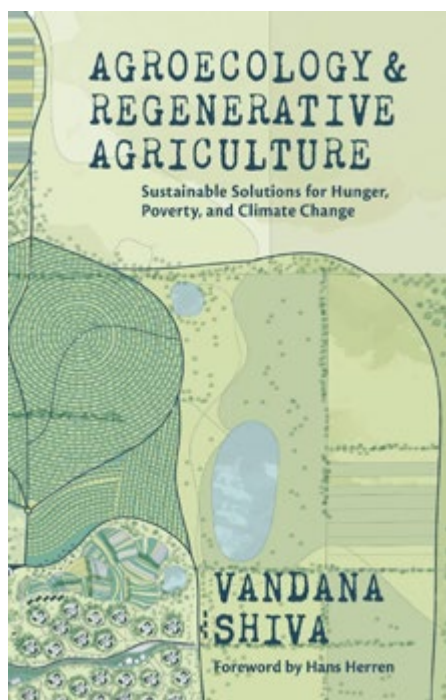
WHAT DO YOU READ?

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.

agriculture based on working with nature rather than abusing ecological laws can regenerate the planet, the rural economy, and our health.

humanity, by developing ecologically friendly farming practices, nurturing biodiversity, and recognizing the invaluable role that small farmers can play in feeding a hungry world.



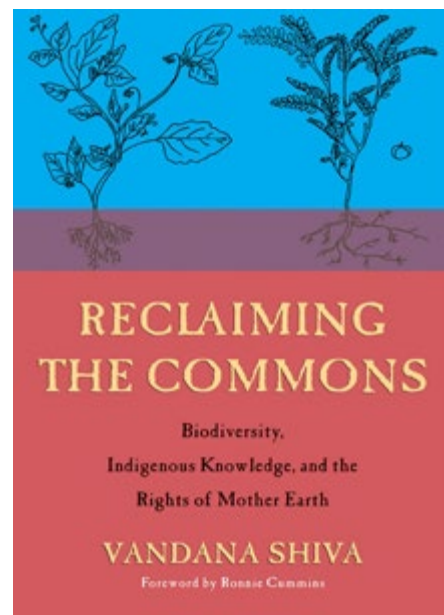
Agroecology and Regenerative Agriculture: Sustainable Solutions for Hunger, Poverty, and Climate Change

The book is an interdisciplinary synthesis of research and practice carried out over decades by leaders of the agroecology and regenerative organic agriculture movement. It provides detailed analysis of the multiple crises we face due to chemical and industrial agriculture, including land degradation, water depletion, biodiversity erosion, climate change, agrarian crises, and health crises. The book lays out biodiversity based organic farming and agroecology as the road map for the future of agriculture and sustainable food systems, both locally and globally. With detailed scientific evidence, Agroecology & Regenerative Agriculture shows how ecological



Who Really Feeds the World?

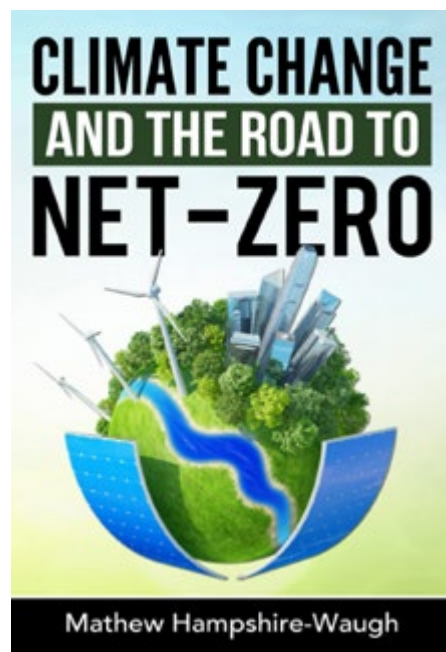
The world's food supply is in the grip of a profound crisis. Humanity's ability to feed itself is threatened by a wasteful, globalized agricultural industry, whose relentless pursuit of profit is stretching our planet's ecosystems to breaking point. Rising food prices have fuelled instability across the world, while industrialized agriculture has contributed to a health crisis of massive proportions, with effects ranging from obesity and diabetes to cancers caused by pesticides. In *Who Really Feeds the World?* leading environmentalist thinker Vandana Shiva rejects the dominant, greed-driven paradigm of industrial agriculture, arguing instead for a radical rethink of our relationship with food and with the environment. Industrial agriculture can never be truly sustainable, but it is within our power to create a food system that works for the health and well-being of the planet and all



Reclaiming the Commons: Biodiversity, Traditional Knowledge, and the Rights of Mother Earth

Reclaiming the Commons: Biodiversity, Traditional Knowledge, and the Rights of Mother Earth lays out the scientific, legal, political, and cultural struggle to defend the sovereignty of biodiversity and indigenous knowledge. Corporate war on nature and people through patents and corporate Intellectual Property Rights has unleashed an epidemic of biopiracy resulting in important legal battles fighting efforts to patent the rights to many plants, including basmati, neem, and wheat. The author presents details of the specific attempts made by corporations to secure these patents and the legal actions taken to fight them. The book goes beyond the legal struggle to position the necessary solutions to corporate control including the exploring the Rights of

Nature and proposing a framework for a Universal Declaration of the Rights of Mother Earth. It is the first detailed legal history of the international and national laws related to biodiversity and Intellectual Property Rights.



CLIMATE CHANGE and the road to NET-ZERO

CLIMATE CHANGE and the road to NET-ZERO is a story of how humanity has broken free from the shackles of poverty, suffering, and war and for the first time in human history grown both population and prosperity. It's also a story of how a single species has reconfigured the natural world, repurposed the Earth's resources, and begun to re-engineer the climate. The book uses these conflicting narratives to explore the science, economics, technology, and politics of climate change. NET-ZERO blows away the entrenched idea that solving global warming requires a trade-off between the economy and environment, present and future generations, or rich and poor, and reveals why a twenty-year transition to a zero carbon system is a win-win solution for all on planet Earth.

There Is No Planet B

Feeding the world, climate change, biodiversity, antibiotics, plastics,

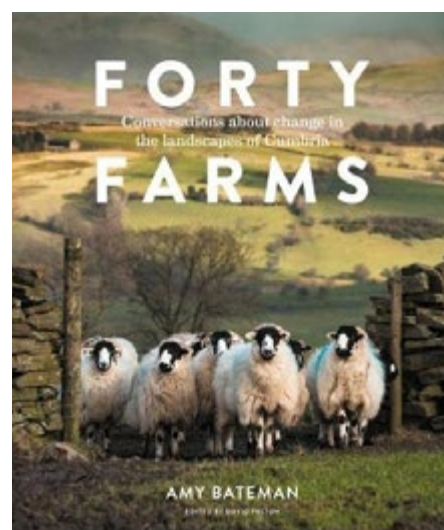


pandemics - the list of concerns seems endless. But what is most pressing, and what should we do first? Do we all need to become vegetarian? How can we fly in a low-carbon world? How can we take control of technology? And, given the global nature of the challenges we now face, what on Earth can any of us do, as individuals? Mike Berners-Lee has crunched the numbers and plotted a course of action that is full of hope, practical, and enjoyable. This is the big-picture perspective on the environmental and economic challenges of our day, laid out in one place, and traced through to the underlying roots - questions of how we live and think. This updated edition has new material on protests, pandemics, wildfires, investments, carbon targets and of course, on the key question: given all this, what can I do? counterintuitive idea that stress can keep us productive and healthy. We discover why the stressors associated with a pasture-based farming system are beneficial to animals and humans while the duress of factory farming can make us ill.

- a vintner in Sonoma, California, who reveals the principles of Integrated Pest Management and helps us understand how this gentler approach to controlling unwanted bugs and weeds might be used to treat invasive cancers in humans.
- a farmer in the Bronx who shows us how a network of gardens

offers health benefits that extend far beyond the nutrient value of the fruits and vegetables grown in the raised beds. For example, did you know that urban farming can lower the incidence of alcoholism and crime?

- finally, an aromatic herb farmer in Washington State who teaches us about the secret chemical messages we exchange with plants—messages that can affect our mood and even keep us looking youthful. In each chapter, Farmacology reveals the surprising ways that the ecology of our body and the ecology of our farms are intimately linked. This is a paradigm-changing adventure that has huge implications for our personal health and the health of the planet.



Forty Farms

Forty Farms will, first and foremost, be an immersive and evocative exhibition of large-format photographs, supported by film, words, sound and crafted products from some of the featured farms, curated for the Gallery at Rheged in Cumbria.

A legacy of the whole project will be a gorgeous hardback book, Forty Farms. This has more than 340 pages of images and conversations, each conversation exploring aspects of change in the working landscape of Cumbria and each image capturing something of life on this land today.

DIRECT DRILLER PATRONS

Thank you to those who has signed up to be a Direct Driller Patron after the last issue. Our farmer writers are now rewarded for sharing their hard-earned knowledge and our readers have the facility to place a value upon that. The Direct Driller Patron programme gives readers the opportunity to “pay it forward” and place a value on what they get from the magazine. But only once they feel they have learned something valuable.

We urge everyone reading to consider how much value you have gained from the information in the magazine. Has it saved you money? Inspired you to try something different? Entertained you? Helped you understand or solve a problem? If the answer is “Yes”, please become a patron so that we can attract more new readers to the magazine and they can in turn learn without any barriers to knowledge.

Simply scan the QR code to become a patron and support the continued growth and success of the magazine. Pay it forward and pass on the ability to read the magazine to another farmer.

Clive and the rest of the Direct Driller team

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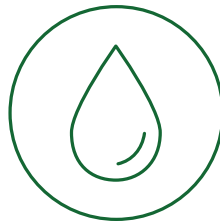
Are You Looking To Reliably Measure The Potential Of Your Farm's



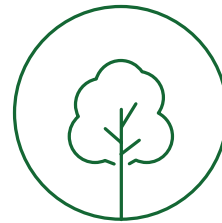
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