

ISSUE 19 | OCTOBER 2022

DIRECT DRILLER

MAGAZINE

THE FUTURE OF YOUR SOILS

Labelling and Regen Ag

ALSO IN THIS ISSUE

Fix our Food - Page 54

Going No-till in
Wisconsin - Page 8



Supporting Knowledge transfer in Direct Driller



Groundswell

Groundswell 22 -
Show Catchup

Page 50



John Farrington

6



Sap Analysis Part 3

24



Nitrogen Uptake

70

FRONT TANK SABRE DRILL



MADE IN  **GREAT
BRITAIN**

**6° WING PIVOT FOR UNRIVALLED CONTOUR
FOLLOWING AND SEED PLACEMENT**

**QUICK CALIBRATION AND SIMPLE
HYDRAULIC DEPTH ADJUSTMENT**

**2400 LITRE HOPPER CAPACITY
WITH 60/40 SPLIT OPTION**

SIMPLE YET POWERFUL **LOW DISTURBANCE FARMING**

01386 49155
WEAVINGMACHINERY.NET

Ask about our pay as you farm plans.


WEAVING


SEED DRILLS | CULTIVATORS | FLAILS | HEDGE CUTTERS

CONTENTS ISSUE 19

Introduction	4
Reading More.....	4
Featured Farmer - John Farrington	6
No-Till Innovation	8
Another Extraordinary Year	12
Base UK Dates for Diary	15
Wye oh Wye...?	16
Soil Farmer of the Year: Farm Walk.....	20
How to Interpret SAP Analysis	24
Farmer Focus - Philip Bradshaw	28
How can Ecolabels Help?	30
Sometimes you have to disagree	32
Crop and Carbon	38
Agronomist in Focus.....	39
Robert Plumb discusses Biological Farming	48
Groundswell 2022 - Catch-up.....	50
Fix our Food	54
Small Robot Company Launch.....	56
Farmer Focus - Clive Bailie	60
Nutrient Use Efficiency Study.....	62
Does No-Till mean less Nitrous Oxide in the air?	64
Transition Experiences	66
Environmental Impact of Processed Foods.....	68
Farmer Focus - Phil Rowbottom	72
Straw Management.....	74
Nitrogen Uptake and Release in Cover Crops.....	76
Farmer Focus - Andrew Jackson	78
New Developments in Robotisation.....	80
Agroecology Conference in November	84
AHDB: Farmbench Results	86
Soil Health Resource Guide.....	90
New Professional Register for Advisors.....	91
Farmer Focus - Ed Reynolds	92
Nitrogen Stabilisers: Part 1	94
What to Read?.....	96
Direct Driller Patrons	98

DIRECT DRILLER

MAGAZINE

Issue 19
October 2022

EDITORIAL

Editor Mike Donovan
e: editor@farmideas.co.uk

CONTENT MANAGEMENT

Chris Fellows
e: chris@agriwebmedia.co.uk

Clive Bailie
e: clive@agriwebmedia.co.uk

Richard Harding
e: richard@groundswellag.com

GRAPHIC DESIGN

Very Vermilion Ltd.
t: 07745 537299
www.veryvermilion.co.uk

Website: www.directdriller.com

Forum: www.thefarmingforum.co.uk

Twitter: www.twitter.com/directdriller

MEMBERSHIPS

Farm Safety Partnership
BASIS
DairyPro Federation of Small Business

Advertising Enquiries

Mark Hatton
e: mark@thefarmingforum.co.uk
t: 01543 399800

Direct Driller Magazine publishes relevant articles and products as a service to readers, but cannot accept responsibility for the proper application of techniques or the proper safe functioning of projects resulting from information published. Except for the extent that Section 2(1) of the Unfair Contract Terms Act 1977 applies no liability is accepted for any loss or damage of any kind, howsoever caused or arising.

Direct Driller Magazine attempts to verify products claims in reports, and adheres to rigid standards, but cannot assume liability for the accuracy and validity of claims.

© AgriWebMedia Ltd 2022
All rights of reproduction reserved

INTRODUCTION

MIKE DONOVAN, EDITOR

I have some sympathy for the new Defra Secretary Ranil Jayawardena. He got the job on Sept 6 and before the month was out was facing questions over ELMS - the greatest change in UK farming since the 1947 Agriculture Act. Ranil's knowledge of farming is scant and he was surely hoping for time to bone up on the huge industry he now heads. Farming, environment, water and nature do not feature in his CV!

The growing financial crisis of the new government makes a re-think of ELMS look increasingly probable, and Minister Jayawardena will be lobbied from all sides. Government will question the benefits of farm subsidy. The NFU is not happy with present arrangements. Minette Batters wants the scheme delayed, saying "We called for a delay ... because we believe that the SFI [part of ELMS] needed to have more detail and it needs to be profitable. We have always been calling for a better policy, one that does deliver for food production and for the environment." Pro-ecology

NFU members threaten to leave while Batters' supporters want area payments to continue.

On Sept 26 a Defra spokeswoman explained that, while environmental land management remained important, the department was reviewing its plans "given the pressures on farmers, and the government's aims of boosting food security and economic growth". With the economy haemorrhaging as it is she could easily be referring to the UK economy rather than farmers.

She added: "In the light of the current global economic situation, we know that the cost of inputs has gone up, which might make it more difficult for farmers to both improve the natural environment and underpin food production, so we will continue our engagement with the sector to make sure the outcomes that the British people want to see are delivered."

Given the current dismal national financial scene it looks very much as if ELMS will be on the back burner for

some time with a distinct possibility of a cut in overall farm payments.

Direct Driller readers know conventional cultivation methods are from the Steam Age and farming is moving quickly to a period of biology and working with nature. Yet the lobbying power of 'old ag' remains considerable and Mr Jayawardena will need rapid education into the costs, benefits and needs of the new biological farmer. First among this is trials and advice, which is where Direct Driller (and Practical Farm Ideas) can play a part. Read this issue of Direct Driller and you will find a dozen and more vital areas of research, many being tackled by individual farmers.

Finally, I sincerely thank all who have contributed, and invite others to do the same.



READING MORE

CHRIS FELLOWS

We have recently taken part in an Innovate UK competition to try and encourage farmers to read more formal material. Trial results, papers, research, on-farm projects and so forth. The assumption being that farmers who are better informed, make better decisions and thus become more profitable or sustainable (or both hopefully). This same aim being the reason behind this magazine and Groundswell starting at the same time. We wanted to give farmers a view on farming knowledge that wasn't available through conventional sources. This concept was also peer reviewed in a paper by Sumane et al (2018). Farmers who read more information from more sources are more resilient.

It has been an interesting exercise. Some great ideas, like how to integrate

video content into this knowledge exchange process, which we have trialled in Resources on The Farming Forum. It is hard to link contextually to a video without a transcript to it. This really makes you think about the overall knowledge exchange landscape when faced with a problem.

As part of the process, we built TFF Resources to test how we could put formal and informal content on the same site and trial ways to present and promote it. The first thing to note is that TFF Resources now contains over 1200 pieces of knowledge. We have included many around the regen and conversation ag topics. It has also in the last 4 months generated over 150,000 reads of this content organically. We intend to increase this to over 10,000

knowledge pieces over the next few years and create a library of information. But the real challenge is how you help farmers navigate that information and "suggest" what to read next. That is, the content that they will find most interesting and relevant. We don't have all the answers right now, but a solution will help farming as a whole and balance some of the commercial bias that sits behind so much of the knowledge we currently read.

Have a look at the TFF Resources section by scanning the QR Code and see what you can find of interest.





It all
starts with
boots on your
ground

ProCam brings you practical precision farming solutions that create true value to you and your business. It's about dialogue and experience — not just data, downloads and images.

01763 245223

WWW.PROCAM.CO.UK |  

Unit 6, Wireless Station Park, Chestnut Lane,
Kneesworth, Royston, Herts SG8 5JH



PROCAM
procam agriculture

FEATURED FARMER

JOHN FARRINGTON

Farm Facts

245 Ha plus 40 Ha Woodland

Arable, Sheep and Diversification

Crops: Wheat OSR Oats Maize Spring Beans Miscanthus

Rainfall: 850-900mm average. Last 3 years 1200mm.

Soils: Sandy Loam, "Hungry" Soil, Low CEC and Low OM

In the time I have been a reader of Direct Driller Magazine, I have learnt a lot from the magazine's content. While at the fantastic Groundswell event, Chris Fellows persuaded me to write a contribution to the magazine, which I am more than happy to do to give something back, so here is my roller coaster ride so far.

I farm in partnership with my brother, Charlie, based in West Somerset. My father had got out of beef in 1999, contractors had been doing the majority of the arable work, and the grassland was rented out to neighbouring livestock farmers while he concentrated his efforts on old farm building renovations.

When I came back to the farm I gradually took operations back in hand and set about trying to improve the farming system. No disrespect to my father, but the soils had been overworked and under loved. The plough was used up until 2000, then a "min till" approach was taken with a tine and disc machine. Stubble was worked soon after harvest to get a chit and again before a contractors Vaderstad Rapid did the drilling, by the time it had been rolled it was like a sandy beach. At the time it all looked lovely and a perfect seed bed, but often the weather that followed was the down fall of the system. The autumn rain came and capped the surface, and the wheelings of the drill were there to be seen all year on the headlands.



We had to change something.

Not having any FYM on the farm, I used sewage sludge from Wessex water for a number of years, but I stopped using it 3 years ago, concerned about the long-term effects of the chemical based cleaning products that go down the kitchen / bathroom waste pipes. I did use green waste compost for a few years, a combination of haulage costs and plastic in the compost put a stop to this.



I decided to chop all straw to help put some goodness back into the soil. Being blackgrass free, I was concerned about balers bringing it onto the farm, it can be found locally. But chopping straw has had a knock-on effect when establishing cover crops and OSR in a direct drill scenario.

To help the process I wanted to grow cover crops and go down the direct drilling route. I found a 2nd hand 4m Horsch Sprinter that our 150hp copes with on our hills. The Horsch duetts were removed and 4" Bourgault coulters fitted and ran them for 3/4 years. I now also have a set of 2" Bourgault. The 4" generally do cover crops and forage crops for sheep and the 2" do everything else. I have been really pleased with both sets of points and their low disturbance.

Now all crops are direct drilled. We have also done some targeted subsoiling. Crops are certainly looking a lot more even across the field and right out to the edge of the field since we have reduced cultivations.

Cover crops have been grown for a number of years, usually consisting of phacelia, vetch, radish, berseem clover, bought as straights and mixed on farm. Costing around £25/Ha. These were grazed during the winter by a neighbour but now we have more control as our sheep graze the covers. Catch crops are grown when timing allows.

Another trigger for my change in thinking, was taking part in AHDB benchmarking and seeing my chemical costs £40/Ha higher than the group average, being a lower yielding farm than the group this was a concern (wheat average 8.6T/Ha). I was wanting to implement some changes (that we have now done) but I was not getting the support from my agronomist, so I made the change to an Independent who was on the same line of thought as myself, and this has been a breath of fresh air.



Insecticides have not been used on the farm for about 4 years, we are trying to build up natural predators within and around the field. BYDV has not been anymore of a problem than it used to be when using insecticides, other than one field which had a spring/summer

cover crop mix which included oats, the wheat was drilled into this on the green and we had a problem with "green bridge" carryover. I have stopped using all seed dressings and the home saved seed is tested for disease.

In Autumn 2019 we had 2 part fields of OSR and Wheat which we wrote off and used the failure as an opportunity in the spring to put in some small leaved white clover as an understorey in the following wheat crop. This was grazed twice over the summer. Our Sprinter drill wouldn't cope with drilling into the clover so Horizon Agriculture came with their DSX drilling wheat into 4" tall wet clover after 16mm of rain overnight. This was an impressive machine, did a fantastic job, and the wheat looked the best on the farm right up until late May. Nutrition was used instead of fungicides, no pgr and only 125kg N. It combined easily leaving a clover understorey for the sheep to graze a few weeks after harvest. The yield was disappointing at 6.2T/Ha, after how good the crop looked. This was mainly due to the low rate of N. We had hoped the clover would nodulate and provide some N to the growing crop but this did not happen due to the cold spring and the clover using the artificial N rather than producing its own. The winter oats following the wheat/clover looked greener all season where the clover had been and yielded higher than the rest of the field, but the clover ended up being sprayed out with a communication error from myself. The other part field of clover was going into its 2nd year with 2nd wheat, we had to spray the clover off as too many grass weeds were present even after glyphosate and hard grazing before drilling. I see clover being used somewhere in the rotation but it is a challenge to keep grass weeds out with just glyphosate between crops. I need to try it again.

I wish I could justify the Horizon DSX as it was a fantastic product, instead I fitted a set of front cutting discs to run in line with each leg onto my Sprinter. This has been great for cutting through trash and reducing soil disturbance from the coulter.

We always used to be a 4 spray fungicide programme whatever the weather, we now react to the crop/season and try to use more nutrition and less fungicides. Nitrogen has always been 220kg for wheat and we have started to reduce this over the last few years. This year we were at 170kg, Last year we tried to reduce N too quickly and by too much in a few fields and it did show up. I feel it needs to be reduced in

small increments each year.

We moved to liquid fertiliser 2 seasons ago, to help with the accuracy around the headlands on our small fields (average 10 acre), a carbon source of fulvic and humic acids are added to the liquid fertiliser.

In September 2021 we bought our own flock of 500 Exlana breeding ewes onto the farm, forage based, lambing outdoors. Sheep was totally new to us, but it hasn't been a disaster in our 1st season !! This was to make better use of the grassland that had been rented out and have better control of the sheep when grazing cover crops and winter cereals and to bring livestock and some muck back onto the farm. I get reminded that I said "I would never be a livestock farmer." We have survived year one...

As a trail - A cover crop was planted in August 2021 after oats, volunteer oats sprayed out, but no glyphosate, Wheat was direct drilled into this in October, with sheep grazing for a week after drilling. Wheat and cover crop continued to grow together with sheep grazing it again in Jan/Feb. The cover crop was then sprayed out in early March. The wheat yield was a little lower, but this is also the lightest field on the farm so the drought may have contributed. More trials needed.



I have always been against renting ground out for maize/potatoes and undoing all the soil improvements. But this year I planted strip till maize into cover crop. I am taking the financial risk and growing it for a neighbour

so I chose the establishment technique. Currently looking good despite the drought, yet no plough/powerharrow was involved. Fingers crossed for a dry weather when the forager arrives.

I have waffled on for long enough now so In summary... We are learning all the time, got a long way to go, made mistakes and its certainly not all perfect. But we will continue down this route and keep learning. I think my neighbours probably think I'm a bit mad, but you can't worry what they think, and hopefully I am one step ahead of where we may have to be in the future.

My advice would be to get the right people around you to help you with the direction you want to go, if they don't want to change then replace them. Try things out on a small scale, don't feel you need to be spending lots of £££ on new DD drills or expensive cover crops mixes. There is no quick fix and there are many parts involved to get it right - It takes time and don't expect things to change in one season. And finally a lot of it is certainly in the mind - if the mind won't change it won't work. Hope you all have a safe and successful harvest and autumn drilling campaign.

NO-TILL INNOVATION COMES IN LEAPS AND BOUNDS

Wisconsin no-till dairyman Chris Conley thwarts heavy rain and hills with no-till, covers and planting green.

By Brian O'Connor originally published by No-Till Farming

No-tiller Chris Conley took two big steps where other farmers might take one.

Conley farms 120 acres for feed (silages, dry hay and high-moisture corn) for his 52-cow dairy, located down a dirt road amid a small fold of hills in Dodge County. The hills make for stunning views of the surrounding countryside, and his barn and silo. They also pose unique management challenges. Or they did, until recently.



Up until 2018, Conley worked his hilly land using methods that had been handed down to him by his grandparents. They involved chisel plowing to make the land suitable for planting.

"It's just how I learned how to do it," he says. "That's how it was supposed to be done, and I never thought to question it at all."

At the same time, the hills limited his options. Plow in too deep, expose too much soil, and the hillside could alternately wash away and then dry out.

"They dry out so fast, so it's nice to keep the ground covered, to help

the water infiltrate in and protect the soil," he says. "Fertilizer doesn't mean anything if you don't have water. Water's the number one ingredient that you need for growing a crop."

Hill No

The Dodge County Farmers for Healthy Soil & Healthy Water — a farmer-led peer group in the county Conley lives in — started up in about 2017, and Conley remembers being deeply skeptical about no-till. He avoided attending the meetings at first.

"There's no way I'm going to this because this sounds bogus and I don't foresee this (no-till) ever working," he remembers telling a friend who was encouraging him to attend the meetings.

However, the friend persisted. After consulting with his wife, Conley went to a meeting. At the meeting, he saw Ray Archuleta's rainfall simulation demonstration, where water is sprinkled over trays containing no-till and tilled soils. For those who haven't seen it, the water moves rapidly through the no-till soil but tends to pool on top of the tilled soil without going very deep and then it runs off, just like in an erosion event in the field.

"After I saw his rainfall simulator, it made me a believer that no-till can work," he says.

However, the final straw was an episode of public television on the Gulf of Mexico's hypoxic zone.

"There was a segment about fishermen in the Gulf of Mexico," he says. "That's a big point that really made me switch. They were talking about how all the nutrients and fertilizers are going into the watersheds here, then go

into the Mississippi River and down to the Gulf of Mexico."

The hypoxic zone means fishermen must travel further out into the gulf, into more dangerous waters, to catch the same number of fish. The idea bothered Conley's working-class conscience.



"The way I look at it, we're farmers of the land, and they're farmers of the sea," he says. "They have just as hard of a time making money as we do, so if we could do something to help them out down there, I think it's a good thing."

Conley flirted with no-till in 2017, planting a small field to test the results.

He jumped in with both feet in 2018. But not only did he switch all of his acres over to no-till, he took it a step further and planted it all green into a rye cover. He leaves about 20 acres of rye without corn to graze his dairy cows.

Conley doesn't compare yields. Because his operation is focused on milk production, not food crops, he's one step removed from the impacts of a bad season. At the same time, he has reduced labor and equipment maintenance expenses while maintaining profit.

And the soil on his hills stays in place, even under heavy rainfall.



The Atari Planter

Conley's first concern was whether he could no-till without forking over a hefty sum for a new planter. However, when he began his research online, he found numerous examples of farmers using older equipment, and the originators and proponents of no-till using their contemporary equipment to accomplish the same ends.

"They started out with John Deere planters, the same as what I have," he says. "So I'm like 'Well, if they started out with it, there's no reason why I can't

use what I have.'"

More research turned up the fundamental similarities between today's equipment and past equipment. "The concept of putting a seed from the box to the ground is basically the same," he says. "It's just newer planters can go faster.

"If I can go slow and plant my crop with an old planter, I'm still money ahead because I'm not spending all that time in another tractor tilling and all that."

Ultimately, Conley decided to go with his older planter, which he says resembles an Atari game console in its sophistication, but was good enough for his needs.

"My corn planter is a John Deere 7000 from the early 1980s," he says. "The only thing on it is a light that tells if you're planting or not planting."

Conley added May Wes spiked closing wheels, Keeton seed firmers and Dawn row cleaners to his 4-row planter, which is on 36-inch spacing. He puts 50-pound sandbags in each of the planter's insecticide boxes to increase the down force.

He went with second-hand modifications for economy's sake.

Despite the modifications and added weight, he says he would be comfortable pulling the planter with a 50-horsepower tractor, though he uses an 80-horsepower tractor for the work.

The next consideration was herbicides. Conley has his custom applied by the local co-op, which uses a blend of Roundup, Halex, atrazine and Dominance herbicides.

"I don't know much about chemicals, and I trust their judgment on what there is for weeds and what you need for a burndown," he says.

He's looking into the possibility of eliminating herbicide as much as possible, and potentially using roller-crimping to terminate cover crops.

"I'm not saying that I want to be organic," he says. "I want to be able to keep the tool in the toolbox using herbicide."

Conley had previously stopped using phosphorous (P) based on soil testing results. In 2022, he's following a nutrient management plan, and testing showed he didn't need any potassium



Calcifert |  LKAB

Calcifert Lime

Calcifert Lime is a granulated calcium lime proven to neutralise soil acidity. Apply Calcifert Lime to optimise soil pH and ensure the availability and efficiency of nutrients in the soil and applied fertiliser.

Give your crops the best start by applying a quality liming product.

Find out more at www.lkabminerals.com/calcifert



(K), either.

Currently Conley uses 100 pounds of urea and 50 pounds of AMS with his planter. The starter nutrients are placed 4 inches away from the seed trench because he doesn't have no-till fertilizer coulters. He broadcasts an additional 100 pounds of urea at the V5 growth stage, and continuously applies manure from his cows throughout the season.

For his planting green plans, in the third week of May he typically plants corn at a rate of 34,500 seeds per acre into a stand of living rye that had been seeded at a rate of 60 pounds per acre in October (though he has planted as late as Christmas Eve). He bumped the rate up to 100 pounds per acre in 2022.

He terminates his rye cover after planting.

While he's used to the practices now, Conley admits no-till and planting green caused nerves as he launched his new methods.

"When I started this, there were a lot of sleepless nights. I thought 'This is totally not supposed to be working,'" he says. "It was so weird. It was one of the most uncomfortable things I think I've ever done farming. But now I do it, I'm like 'Oh, whatever.' It's normal."

Observations

The Sand County Foundation installed two solar-powered soil probes in his rye field as part of a wider look at soil conditions in various tillage methods. When fall rolled around, Sand County officials reached out to get the probes removed, and Conley asked that they stay in place.

"I had talked to them and finally got them to keep them in because I felt that they were missing a crucial time of the year, over wintertime into spring, of seeing what the water cycle is," he says.

That data will become especially important as winters become warmer.

The results of the study haven't yet been released. Conley says he's seen some data that validates his management decisions, such as more beneficial soil temperatures under cover crops.

"I've taken temperatures between two different types of soil — covered and uncovered — this spring, when the air temperature was 95 degrees," he says. "The uncovered soil was 90 degrees and my soil underneath the manure and cover crop rye was 70 degrees."

Those 20 degrees can be the difference between heat-sterilized biologically dead soil and biologically active soil in the summer months, Conley says.

Water infiltration has also improved, Conley says.

Rain Man

Another data point came in torrents.

Heavy rains swept through southern Wisconsin on the afternoon of June 16, 2022, forcing motorists to temporarily shelter on the sides of Interstate highways. Flash flood warnings were issued for large parts of Dodge County, and other nearby counties.

At the hilly, scenic Conley farm, the rain gauge recorded more than 6.5 inches of rain. Nearby Hartford recorded 3 inches of rain that day, according to National Weather Service Records.

After the rain stopped, Conley and his daughter Mckayla went out to check whether the heavy rains had moved his crops. He saw some movement, but not from his plants.

"The other night, when we got that heavy rain, after we were done in the barn, me and Mckayla were looking out in the field," he says. "There were millions of earthworms out there. When you took the flashlight, you could see the ground move."

On a walking tour the next day, corn plants nestled in among heavy straw from his rye covers. On the small paths and headlands, where patches of some soil were visible, heavy rains had carved inch-deep canyons into exposed mud. The soil under the straw — and under a layer of manure below that — was damp but hadn't moved.

"It's looking good, I think," he says, digging through residue. "How much better can you have soil covered than this?"



For when you want to drive down establishment costs and improve soil health...



...but don't want to compromise on yield.



With 20 years' direct strip-till experience, we know that Claydon drilling is good for your soil and good for your pocket. It dramatically reduces fuel consumption, aids carbon sequestration and reduces soil erosion. Worms just love it. And importantly, yields are healthy too.

To discuss sustainable farming, call your local dealer or Claydon direct on +44 (0)1440 820327.



info@claydondrill.com claydondrill.com

CLAYDON
Establishing a better way



ANOTHER EXTRAORDINARY YEAR

What an extraordinary growing season we seem to have had. In a nutshell, very low rainfall, low temperatures until June and good levels of solar radiation (sunshine) resulting in generally good yields with good specific weight and moderate protein. Especially so as most crops senesced approximately 2 weeks earlier than normal.

Written by James Warne from Soil First Farming.

All the more extraordinary is where we have, once again, been trialing reduced nitrogen rates on production we have seen very little difference in final yield between standard N rates and reduced N rates (until we reach a critical level, then yield drops significantly). Where we have found yield difference this comes from lower grain weight as opposed to reduced plant counts or tiller numbers.

So what can we draw from this wealth of variables? Firstly, autumn 2021 was the kindest drilling season we have had for a couple of years suggesting that most crops went into good soil conditions backing up the adage 'well sown-half grown!' the autumn and winter that followed was certainly dryer and in some areas was probably below average on the rainfall scale suggesting that crops rooted well. Winter was also very mild with very few days of frost and certainly no prolonged periods of cold weather. Wheat tends to be growing at around 5°C and above and I believe that the crops were growing most of

the winter, albeit very slowly probably contributing to root mass development as much as above ground vegetative growth.

Temperature

One of the greatest contributing factors in this year's yield-fest has been the temperature, or rather lack of if we cast our minds back to the early spring and summer. For the majority of us the temperatures were in the comfortable mid to high teens (celcius) occasionally reaching the low 20's but never exceeding this until mid-June. Contrary to popular belief high-temperatures can be one of the greatest yield reducing factors for wheat as it can be sensitive to high temperatures throughout its growth cycle. It is, however, particularly to heat during the period from booting, through ear-emergence and flowering. This sensitivity then reduces after flowering through grain-fill and maturity. Research shows temperature effects can start from the mid-late 20's and become significant once into the 30's.

This is particularly so during the period of pollen formation and fertilisation.

Typically wheat is in flower around the second wheat in June (assuming the midlands of the UK). This occurred 7-10 days earlier this around, early June. The first really warm temperatures occurred around the 15th June onwards this year. By which time wheat had passed through the temperature critical period of pollen formation and flowering. From then on the temperatures typically remained in the low 20's throughout June and into July when the skies cleared and we had prolonged periods of high 20's-30's and clear skies. This warmth and sun, combined with large soil moisture deficits, lead to rapid senescence and ripening. But the critical period of reproductive growth (stem extension and ear formation through to flowering) occurred during steady consistent conditions. The high temperatures came too late to have any potential to reduce yield. Although those in the very dry east of the country probably found the lack of

moisture contributed to a drop in yield.

Nitrogen

It is generally accepted that the crop only receives half its nitrogen requirement from that we apply. The other 50% comes from or via the soil.



With the majority of the nitrogen being taken up in the nitrate form which is very water soluble it is assumed that the plant takes up most of its nitrogen as nitrate in the soil water. With the bulk of the uptake happening from stem extension through to ear emergence. As I have already mentioned above a large chunk of the UK was very dry during this period of April & May with some areas receiving zero rainfall, yet crops were still able to access the nitrogen they required for canopy and ear development. Although it seems perhaps not enough to assimilate into protein but that may also be attributed to sulphur availability. What is really interesting though is where we had reduced the soil applied N by half, combined with a small amount of foliar applied N this gave a very similar yield to wheat which had received a typical nitrogen dose. Where we had dropped the soil applied N further we did start to see a yield drop. I must stress these results were consistent on farms which have been practicing carbon-

building practices as in a Conservation Agriculture strategy, where we believe there to be a greater supply of N available for mineralization by the soil biology. Although another question must surely be if the soil was moisture deficient the biology must surely have been dormant and therefore unable to mineralise the nitrogen! It's also worth noting that while it developed into another low disease year we saw a marked increase in mildew develop in the high N plots compared to lower total N plots. Never forget that nitrogen can help drive disease levels within the crop.

Finally, one of the most perplexing outcomes of this year is if the crop is able to produce the yields we have had when its growing cycle was at least two weeks shorter than average, why do we spend so much time and effort in trying to keep the canopy green? If there is one thing we have been shown this year it's the lifespan of the crop has no direct influence on the final yield....

Successful Direct Drilling starts with Simplicity & Versatility



- Low Horse Power - Lighter Tractors - Less Compaction
- Good penetration - even in high trash volumes & dry soil
- Seed always placed in the soil - no "hair-pinning"
- Soil movement around the seed - mineralising nutrients
- Rapid emergence - no growth check, as with disc drills
- An ability to work in all conditions - wet or dry
- Solid or liquid fertiliser options for all models
- Widths from 3 to 8m



Give your seed the best possible start in life, with the unique environment created by the Inverted T-Slot System

Simtech T-Sem



Simtech Aitchison

Tel: 01728 602178

www.simtech-aitchison.com

DRILL MANUFACTURERS IN FOCUS...



KUHN'S PERFORMER OFFERS FOUR LEVELS OF CULTIVATION

The KUHN Performer is a deep cultivator, available in working widths from 3 to 7 metres, designed to prepare the soil for minimum tillage drilling. The Performer fulfils four cultivation tasks in one, by chopping, mixing, loosening, and levelling the soil in just one pass.

At the front of the machine there are two rows of hydraulically adjustable, 510mm cutting discs. The discs are capable of cutting through crop residues and root systems and can be used independently for stubble cultivation at depths of 10 centimetres, even at higher speeds.

The discs are followed by hydraulically pressured tines with options for 80mm standard points, 50mm carbide points with deflectors, or 80mm and 50mm carbide points. The carbide coating provides strength and durability, making the tine longer lasting. The tines can be adjusted to operate at depths of 5 to 35 centimetres, depending on the point chosen, to cover a wide variety of soil types.

Behind the running wheels, are four rows of tines set at equal widths that perform an in-depth mix, incorporating any residues and straw into the soil. Also available as standard on the Performer are 350mm carbide wings.

In addition, a single row of star shaped levelling discs provide



a fine tilth. At the rear of the Performer is a double U-shaped packer or the option of an HD liner roller to roll the soil and leave an even finish.

All of the Performer's functions are adjustable from within



Matt Harrison

North Yorkshire arable farmer, Matt Harrison, bought a Performer 4000 for his family farm in Wistow, near Selby. It has become the primary cultivator for the 1500-acre farm following a decision to move away from a plough-based system. Mr Harrison said:

"I have been so grateful for the time savings the Performer has brought to the cultivation work on the farm. It is very easy to set up and requires far less maintenance than previous cultivators I have used. I don't have to grease the legs and discs to prepare the machine, which means I can take advantage of every opportunity I get."

This time and labour saving is due to the Performer having easy to change depth settings and fewer greasing points. "It also has a control box in the cab that

makes life so much easier. Using just one spool I can control the whole machine and quickly make alterations for the changing land we have on the farm," he added.

The machine is also helping to reduce the amount of fuel needed to prepare the land. When using a plough-based system his tractor could use 600 litres of fuel in a 10-hour day and only cover 30 acres. Whereas, with the Performer the same tractor can cover 60 acres using the same amount of fuel, which has halved its fuel cost. "We use a 2009 CAT Challenger. It is not the newest machine, but it is perfectly suited to the Performer and the cultivation work we do here. The fuel savings with a min-till system make a big difference. Especially with the recent rise in fuel costs," he concluded.

the cab using KUHN's KTH 105 selector terminal which only requires one double acting valve for the axle and a single acting valve for the safety legs. The discs can be operated independently for stubble cultivation and the roller can be lifted and carried above the soil when not required.



The Performer range is designed for tractors with outputs of between 180 horsepower for the 3 metre machine and 420 horsepower for the 7 metre model. It also folds to less than 3 metres, making it ideal for tight gates and narrow lanes.



BASE-UK is a nationwide, knowledge exchange organisation led by farmers for farmers and individuals passionate about the regenerative agricultural system increasing the sustainability and health of our soil, crops, livestock and therefore our industry.

I hope that by the time you read this you will have safely got harvest 2022 in and been able to start (in some cases, finished) drilling despite the extreme weather we seem to have experienced this year so far. It has been fascinating to see how direct drilled crops have coped with the drought.

Dates for the diary:

13th October – Members meeting with Aulden Dunipace and Ian Brown – Are Plastic Tree Guards a Thing of the Past?

20th October – Members meeting with Andrew Voysey – Carbon Payments – Cutting Through the Mist.

23rd and 24th November – Croptec Show, Peterborough - Find us on stand number 1.102.

7th and 8th February 2023 - 10th Anniversary AGM Conference – “Growing Confidence!” - details are available on our website www.base-uk.co.uk

Don't miss out – book now!

We are delighted that Frederic Thomas, founder of BASE France and mentor of our group will be joining us for this event along with Vicki Robinson, Andrew Howard, Duncan Wilson, Tom Storr, Alastair Leake, Becky Wilson, David Hyner, Rick Clark, Liz Stockdale, John Miles, Lance Charity, and Ian Waller. A fantastic mix of science and farmer knowledge exchange to be savoured.



If you would like to know more about how to join BASE-UK, please visit our website: www.base-uk.co.uk or email Rebecca@base-uk.co.uk

WYE OH WYE...?

The River Wye intertwines the border of England and Wales. Once the nations "favourite" river it now probably has more designations than actual fish and continues to regularly feature in the media as the poster girl for agricultural pollution. In this article I hope to provide some insights in the complexities behind the headlines.

WHY THE WYE?

It is designated as a Special Area of Conservation (SAC) and a Site of Special Scientific Interest (SSSI), it contains an Area of Outstanding Natural Beauty (AONB), Nitrate Vulnerable Zones (NVZ) and Drinking Water Safeguarding Zones (DWSQZ) yet none of these protections have prevented its deterioration. SAC rivers have to meet tighter water quality targets to, in theory, protect their sensitive and rare ecology. So the Wye along with about fourteen other SAC rivers in the UK are trying to metaphorically tighten their belts much more than others.



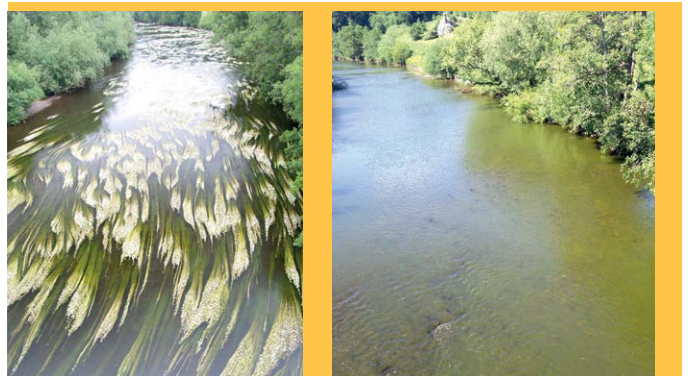
Is it as green as they say? Algal blooms are caused by a combination of factors, including periods of warm sunny weather and low flows. However when these conditions are combined with a source of nutrients, and in particular phosphorus which acts the same in water as it does in soil, it fuels algae growth.

Algal blooms have occurred for decades in the lower reaches of the Wye and are generally attributed to soil and nutrient losses as a result of decades of reasonably intensive agricultural production in Herefordshire, we're an innovative and industrious lot. However algal blooms are now also occurring in minor tributaries way up in the catchment, which indicates that the pattern of nutrient loss is changing and becoming more widespread.

Thick algal blooms can have severe effects on the river's ecology. By discolouring the water, essential sunlight is prevented from reaching plants like our precious river crowfoot (ranunculus). Plants play a vital role in the river's ecology, providing food and habitat for a range of invertebrate, fish and bird species.

SO WHERE IS IT ALL COMING FROM?

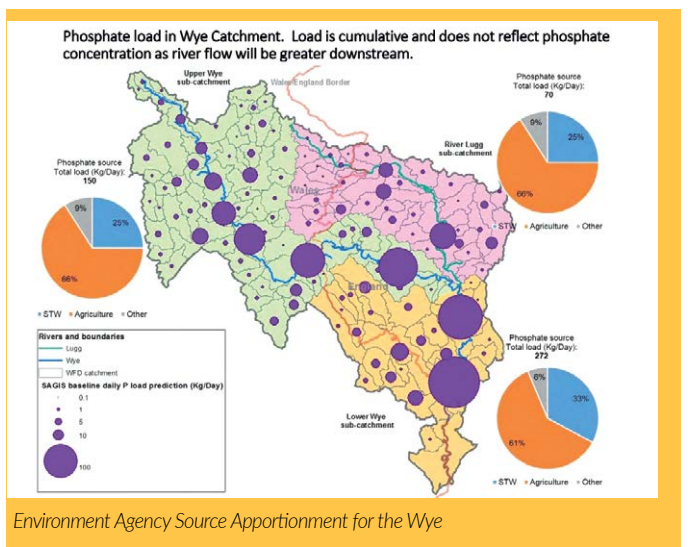
The predominant cause of pollution historically in the Wye was due to the poor quality of sewage treatment, however investment over the decades has improved this significantly and source apportionment indicates that Welsh Water are now responsible for only 25-30% of the nutrients in the river. On the other hand, agriculture as an industry is responsible for the lions share at 60-65%.



Left: The Wye at Bridge Sollers, a few miles upstream of Hereford, in July 2013 showing clear water and extensive beds of ranunculus.

Right: Same location in June 2020 with the green tinge of an algal bloom and a significant reduction in ranunculus.

If you stand behind the "its not us Guv" rhetoric of the farming unions, or simply have no faith in our Government and their statutory bodies to undertake their roles effectively (more on that later!), you may question the datasets and dispute these figures. So let me assure you that the same if worse conclusion was also reached by a team of independent researchers at Lancaster University. After a three year study called "REPHOKUS" the Lancaster team have provided significant insight in to the root cause of the Wye's green waters, detailing how the phosphorus (P)



burden in the catchment accumulates and how losses are compounded by our circumstances. Their conclusion was that agriculture accounted for 70% of the P load and that we were accumulating an excess of approximately 3000t of P every year in the Wye.

WHY ALL THE CHAT ABOUT CHICKENS?

The REPHOKUS project identified the largest import of P into the catchment as livestock feed (ca. 5000 t P/ yr), nearly 80% of this is attributed to poultry sector, then 18% to cattle and sheep, and 2% to pigs. Fertiliser P imports to the catchment are just over 1000 t yr. From Sun Valley in the 1960s, to Cargill and subsequently Avara, Herefordshire has long been a major producer of broiler chicken. And with the move from cages, a significant number of free range sites have been established to keep up with consumer demand. We are indeed, for want of a better word, a hotspot. The figures thrown around are 20million birds, but no one yet has been able or willing to calculate the exact number. The fact that its chickens we have a lot of is neither here nor there; a lot of anything isn't good for you.

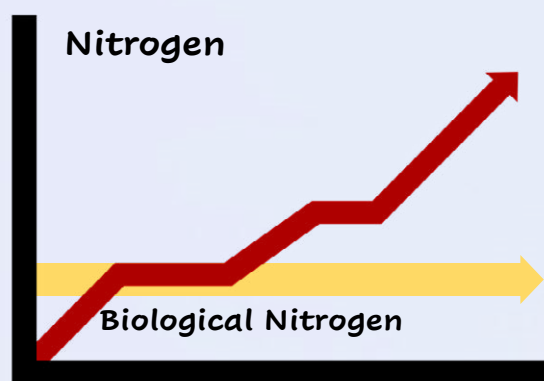
I alluded to compounding circumstances earlier; the Wye soils are predominantly sandy and silty so are less able to hold on to nutrients, they are "leaky". And despite what I was taught, P can be lost in solution like N. Once the soils capacity to hold nutrients is exceeded, which for much of the Wye soils appears to be anything above a P Index of 2, it can be lost in soil pore water and starts coming out in the drains. And having an excess of 3000t P every year for quite



some time means that we have been building our P indices fairly rapidly.

And there you have it, the perfect storm; an ecologically sensitive river, leaky soils and an intensively farmed catchment with a huge excess of Phosphorus.

You Know THE COST OF NITROGEN HAS ROCKETED!



What will YOU do this year?

The price will NEVER return to what it was -

**BIOLOGICAL NITROGEN
IS A SERIOUS ALTERNATIVE**

*Again we have a finite amount BUT
early reservations are now being taken.*

Call and ask about

Natural Bio-N

"I have to admit to be being pleasantly surprised as it didn't look as good, but on 5 different fields, you can't tell the difference on the yield maps between a full N programme & 100kgs N plus Bio-N. Mr R. McKenzie

Soil Fertility Services: 01366 384899
www.soilfertilityservices.co.uk

PROJECT CASE STUDY

Through our retailer funded projects (Tesco, Coop and M&S) we have now worked with 48 free range producers in the Wye. Noble Foods have provided details of their supply chain and encouraged their suppliers to engage with the advice and grants on offer through the project. The farmers have been positive and proactive in engaging with us to identify opportunities to reduce soil and/or nutrient losses from their enterprises. Grant support has been offered for 55 interventions, with 27 accepted to date. The 27 interventions delivered have a total value of £126k, funded 50:50 by the project funders and participating farmers. The improvements delivered seek to reduce sediment and nutrient losses directly or indirectly to water, including reseeded range areas, improving clean/dirty water separation, trialling wetland systems, roofing veranda areas directly outside the sheds and increasing tree cover in the range.

WHO THE HECK AM I ANYWAY?

I grew up in Herefordshire, in the nutrient rich fields of my family's dairy farm for the sake of transparency, a love for rivers sparked way back in school Geography lessons which led me to spend my working life to date trying to improve their condition. (Early retirement looking less and less likely!)

Desperate to learn about how other countries had used finances, education and regulation to address issues with soil and water I applied for a Nuffield Farming Scholarship in 2015. My studies allowed me to see regulatory approaches, funding models, voluntary and educational programmes around the world. I rapidly came to the conclusion that no single mechanism, if implemented alone, could achieve the long-term positive change we needed. There is a sweet spot somewhere in the middle and in the 7 years since my scholarship we still haven't managed to secure it in the Wye...

What's actually being done? With my team of advisers at The Wye & Usk Foundation, a charitable rivers trust, we provide support to about 300 farm businesses a year. This work includes the submission of more than £20m worth of Countryside Stewardship Schemes in the last 4 years to help deliver the recommendations we make. In a normal year we hold about dozen on-farm events with local partners, plus provide facilitation for three farmer groups. These enable peer to peer learning, farmers learn best from farmers, those who have changed practices are best placed to explain what motivated them, how they overcame barriers, provide insight to their methods and moral support for others following suit.

Much effort has been put in to work more collaboratively between partners operating in the same space. The Farm Herefordshire partnership brings together NGOs like ourselves and Herefordshire Meadows with local delivery staff for the AHDB, Catchment Sensitive Farming and CLA to name but a few, to share resources and deliver more effectively together.

Through our Wye Agri Food Partnership, part of the wider Courtauld Commitment instigated by WRAP, we are delivering collaborative projects with key businesses sourcing or producing food in the Wye. With the support of the Rivers

Trust and WWF our work in the Wye currently involves projects with Tesco, Coop, M&S, Muller, Avara, Noble Foods, Stonegate, Kepak and most of the major soft fruit growers. We are working proactively with these businesses to reduce pollution risk at all levels of their supply chains, see our Project Case Study as an example.

Several businesses are also independently exploring new technologies to enable the export of excess P from the catchment. If these are successful they could take our P load back in to balance, and ideally in to deficit so that we can start to run down the P backlog...

To do that we need a funding framework that facilitates farming within the limits of our environment. I hoped DEFRA would agree with this ambition and submitted an application to Landscape Recovery Scheme but it was unsuccessful. We now need to find alternative routes to deliver solutions.

Along with a significant number of like minded farmers, my vision is to develop long term funding streams that would support us in delivering two key actions: 1. Running down existing high P levels by farming at low or no P input on soils at high risk of losses, and 2. Construction of wetlands downstream of high P fields to buffer the nutrient losses in the meantime.

WHAT'S MISSING?

One of the essential ingredients from my Nuffield learnings that is still lacking is regulation. Our Governments have little appetite to deliver on their promises and therefore their agencies have no capacity to do so either. Our Ministers and their teams in DEFRA are delusional to think that generic nationwide legislation like Farming Rules for Water could secure the necessary improvements for specific issues like those faced in the River Wye, especially when they instruct their agencies not to enforce and allow farming unions to lobby the life out of them. As a result, we are left with yet more ineffective legislation and the need for more and more layers to be added on top of all those that have gone before in the hope that one may finally do what should have been achieved long ago.

Any conclusions? The river is in a poor state. Portions of blame can be placed far and wide; water company, local authorities, farmers, processors, retailers, all of us living in or eating food produced from the catchment. But the greatest share of blame falls squarely at our Governments door. There is much good will amongst farmers, retailers and processors to deliver the necessary change and if improvements are secured it will likely be despite our Governments not because of them. In the meantime we continue to persevere, idealistic or not I believe a balance is achievable where food can be produced within the limits and to the betterment of the local environment.

*Kate Speke-Adams, Head of Land Use, Wye & Usk Foundation.
@HfdshireKate*



NUFFIELD
Farming Scholarships



#FUTUREGROUND

PREPARE THE SOIL WITH TECHNOLOGY THAT
OPENS UP NEW OPPORTUNITIES.

We develop innovative agricultural equipment for tillage, sowing and crop care to turn the challenges of agriculture into opportunities. We adapt quickly to changing conditions across the agricultural industry to help protect the economic future of farming. **HORSCH.COM**

TOGETHER FOR A HEALTHY AGRICULTURE



FARM WALK

FARM WALK WITH 2022 SOIL FARMER OF THE YEAR RUNNER-UP ANDREW REES

In the first week of August a range of farmers and industry professionals met at Moor Farm in south west Wales to hear the 2022 Runner-up to the Soil Farmer of the Year competition, Andrew Rees, explain how he has developed a dairy system with soil health at the centre.

Moor farm is a 160 hectare grassland farm near Haverfordwest, which over the previous five years has been undergoing a holistic regeneration away from winter brassicas and a high input system to a fully rotational grazing system integrating diverse species-rich swards. Andrew has seen significant benefits to his business from this change of approach, including a reduction in fertiliser cost and usage alongside better herd health demonstrated by the vast reduction in veterinary fees.

Experimenting with different

mixtures and management has led Andrew to create a system intended to provide year-round forage for his dairy herd. Moving away from pure perennial ryegrass leys has had its challenges, but Andrew explains

"Working to a 21 day grazing rotation is stressful, you can quickly run out of grass during adverse conditions, the aim of using herbal and diverse leys was to increase the resilience of the grazing platform. Now we have much more ahead of us and much more flexibility within the system where we aim for a 60 day rest period, but this

can be up to 120 days in some cases".

He adds,

"We started by sowing simple herbal ley mixtures, but as they were still managed like ryegrass we lost a lot of the diversity and therefore also potential yield. Now we have much longer rest periods between cutting or grazing to allow for regrowth and the leys are far more resilient."

Fields are divided into 0.1 hectare blocks and animals are moved according to need. Andrew now has a keen eye for how much forage his grazing groups require despite the wide diversity of covers across the farm. When asked about his system Andrew states,

"We use a leader-follower approach whereby the R2 cattle (10-22 months old) follow the R1 heifers (3-10 months old), with 24 hours between the groups in each grazing cell. Having the smaller cattle grazing first means they have preferential grazing and we are not limiting their intake in any way, not forcing young animals to graze down also helps lower worm burdens. Older animals can then be pushed a bit harder and are able to deal with the more mature forage"

He further adds,





The R1 heifers from this spring moving onto a new block of grazing. Andrew uses a portable watering system to make sure troughs are easily accessible regardless of where the cattle are grazing.

"Anything which isn't grazed is hopefully trampled; that is when we know we have the stocking density and number of moves per day right – if the ley is starting to become a bit stemmy we move them more often, up to three times per day."

This trampling action which Andrew integrates into his system has wider benefits for the soil in that it is better protected from environmental conditions and also now of higher quality with the constant organic additions from the leys above. Andrew fully promotes this system outlining to the group,

"Changing grassland management has given conditions for native seeds to germinate. We don't want bare soils that cap and produce the conditions for weeds to appear. By keeping the surface covered with either growing plant matter or the trampled residue, we reduce our weed burden."

Since the transition to more species-rich leys Andrew has found,

"The different rooting systems we have in the fields open the soil up and improve the structure, therefore we

are removing the conditions in which weeds can become dominant."

The system Andrew has created focusses on a long rotational grazing platform for both the milking herd and young stock combined with deferred grazing to provide areas for out-wintering cattle. He explains,

"We used to have kale in the rotation to provide over-winter feed but were finding that there was far too much damage and soil wash. We now use a deferred grazing system to out-winter our R1 heifers which are between 8 to 10 months old. We position bales when the land is dry and travels well, ready to provide additional feed throughout the winter period."

The condition of the soil and the health of the livestock are the key priorities when outwintering stock, to manage this Andrew explains,

"Heifers that are outwintered are scheduled to move every two days, but this can increase to three times daily to avoid soil damage if conditions become wet. This system works for us as our heifers are light and we still have the capacity to bring

them in-house if the weather or soil requires it."

Following these outwintering processes, fields are re-seeded, with Andrew tailoring off-the-shelf mixtures to suit his system,

"We have started reseeding with a half-rate Cotswold herbal ley mix, with half-rate Barenburg Barrmix (this was more because it's what I had in the shed to give right balance of clovers and herbs) with additional annuals to provide a boost to performance in the first year whilst the other species establish".

When establishing his leys, Andrew aims to use as simple and minimal cultivation system as possible, removing old or tired leys with low rate glyphosate buffered with humic and citric acid to lower the pH. He then drills the seed in two directions to increase the eventual cover with an application of seaweed to give a starter boost of nutrition.

Andrew has, on average, reduced nitrogen usage by 140kg per hectare whilst still producing silage for the milking herd. He has recently started silaging the herbal leys which are highly diverse and contain species such as pea, barley, vetch, sunflowers, linseed, radish, chicory, plantain and a mixture of clovers. This will be analysed when the clamp is reopened and fed as part of the usual ration. In addition to regularly analysing silage, Andrew also frequently tissue tests his leys – results suggest the mineral content of his leys are double that found when they were in a perennial rye grass system. The species composition has a naturally far lower demand for nitrogen compared to perennial ryegrass and is much better at scavenging existing nutrients within the soil, further reducing the need for artificial inputs.

Andrew uses slurry in combination with a Tow and Fert system to help maintain fertility and production across the farm. Fields destined for silage are given slurry before and after the 1st cut with a 25kg sprinkle of N prior to cutting. The Tow and Fert is used to top up fine lime, phosphate and humates alongside some foliar potassium. Andrew samples a fifth of the farm every year, with the whole



Attendees to the farm walk gather in a spring established diverse ley which was previously used as deferred grazing this past winter.

farm last sampled in 2018 – having this up to date data allows him to understand where his nutrients are most required and move away from broadacre applications. Fine lime is regularly used across the farm with Andrew detailing, “Applying fine lime helps increase the free exchangeable calcium in the system, we are aiming to have calcium at luxury levels which will take time but will help with the longevity and palatability of the tall covers.”

As a dairy farmer, herd health is a main priority for Andrew. Through implementing changes to grazing species composition and management, alongside reducing the nitrogen use across the farm, livestock performance has seen vast improvements. The dairy herd are also grazed on diverse summer cover crops, being turned out for a few hours after milking.

Andrew explains this strategy, “Having the cows grazing across the diverse leys has improved butter



fats and allowed us to stretch out the grazing season where historically we may have run out of grass. This means that the herd is currently balanced between herbal leys, traditional grass pasture and silage in the yard when they come in to be milked. The additional grass means we only need to supplement feed them around 4kg of cake per day, massively reducing costs.”

The cows are now found to be far more content, with lower nitrogen covers thought to lower the free nitrates in their system, reflected in the results of the milk testing. This contentment has also improved fertility and the health of the dairy herd. Empty rates have decreased from 10.5% in 2019 to 5.5% in 2021 with mastitis per 100 cows also

reducing from 19.7 in 2019 to 3.5 in 2021.

The increased fertility in the herd has also allowed Andrew to move his spring calving system later so they can calve to match the grass growth, reducing the housing requirement as calves are weaned on grass with outside grazing access from 4 weeks of age. Worm burden has also drastically reduced and consequently, so has the requirement for anthelmintic products. Faecal egg counts are conducted to see if any wormers are required, however Andrew has found that due to the long-grass grazing system with animals biting higher up the plant in combination with chicory rich pastures, very little, if any, are required.

When asked about how he would advise others beginning along the herbal or diverse ley journey Andrew has these words of wisdom,

“Start by drilling the leys in the spring as this gives a much better chance for establishment whilst you are experimenting with your system. If you are going in later when the conditions could be dryer or colder it might be tough on the clover to get up and away.”

At Moor Farm, the leys are highly diverse and full of many different species. Andrew’s thinking behind this is,

“When you establish herbal leys you can often see a drop in yield compared to a perennial ryegrass whilst they establish, therefore we also drill in summer annual species to



The milking herd grazing following afternoon milking, the whole herd is mob grazing this 0.1 hectare paddock full of highly diverse species.



The remaining cover approximately 1 week following grazing ready to be re-drilled compared to one of Andrew's diverse leys which has recovered following previous grazing.

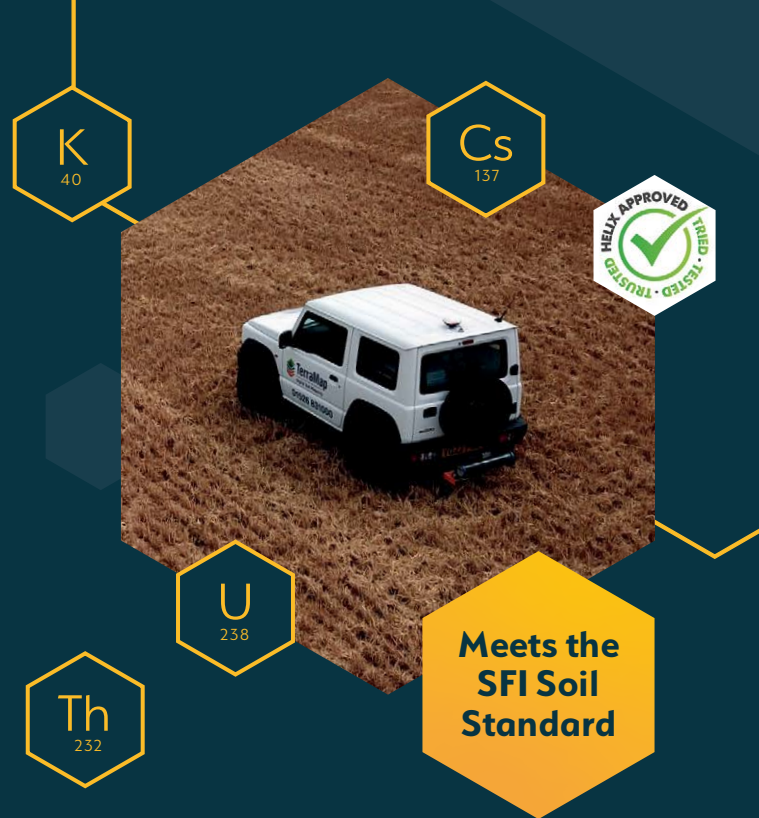


help build the quantity of forage available to graze. If we are establishing a ley in the spring, we would expect to be able to graze it that autumn. However, this would be a lighter graze than in the second year and not as tight, just to make sure we don't stress the plants too much".

The next challenges for Andrew focus further around nitrogen reduction, as he discussed with the group,

"The aim would be to be using zero chemical nitrogen whilst managing to maintain our current production. I want to be able to leave the land in a better condition than when we started whilst also being financially profitable."

During the Soil Farmer of the Year competition, the judges found Andrew's approach highly innovative, understanding how to maximise the health of the soil to produce high quality, mineral rich forage for his cattle using less inputs, but instead through his grazing and nutrient management system. The benefits Andrew has observed upon the health, welfare and productivity of his cattle through diversifying the leys has been highly successful – also giving him additional flexibility in other areas of the farming business now he is secure in the growth of forage on the farm, developed through increasing the resilience of his system.



 **TerraMap**
Digital Soil Mapping

➤ High Definition Soil Mapping

**Why have one data point per
hectare, when you can have 800?**

Accurate mapping regardless
of soil moisture, compaction,
crop cover or cultivation state

For more information visit
omniadigital.co.uk

Powered by SoilOptix® Technology

SoilOptix® is the
registered trademark
of SoilOptix Inc. and
is used under license.

HUTCHINSONS
Crop Production Specialists

HOW TO INTERPRET SAP ANALYSIS

In the third part of our series on sap analysis, Mike Abram learns how to interpret the results

You've taken your leaf sample, packaged it up and sent it to the Netherlands, and now the results have landed in your inbox. There's a whole ray of bars and numbers for just about every nutrient you could possibly wish to measure. But where do you start when trying to interpret the results, what does it all mean, and how can you use the information to make better decisions?

NovaCropControl's analysis is split into four sections – at the top are the sugar, EC (total dissolved salts) and pH levels of the sap, followed by the cation nutrients, the anions and at the bottom the trace elements.

For each nutrient the report shows what the current level is for young leaves in a light green bar, and older

leaves in dark green. There are target values for each nutrient, which are calculated from analysis of at least 500 samples from different fields and growers. The bars are split into three sub-sections representing levels that are too low, good, and too high in the sap.

Broadly there are four stages to interpreting the results, suggests Eric Hegger, a consultant with NovaCropControl.

“Always start with which elements are high, which are low – are there any in excess or deficient. The next thing is the difference in uptake between young and old leaves, looking at nutrient mobility.”

As explained in more detail in Direct Driller, July 2022, it's important to

understand which elements are mobile in the plant, and which are immobile to recognise which leaves are more critical to be looking at.

“Then look at the interactions within the cations and / or anions, and if you still don't have an answer to why any of the elements are too high or too low in uptake, look at what environmental factors might have influenced mineral uptake – for example, climate, pH, soil life, etc.

“In the end that should give most of the answers to know what corrections might need to be made,” he says.

So what might it mean if an element is in excess or deficient in an analysis you receive? Let's use examples of a barley crop from Australia and Ireland (see

What the Australian analysis shows?

The low sugars, calcium and boron levels are an indication of the crop likely being under climate stress and not growing well, suggests Mr Hegger, while the high ammonium is almost certainly due to the length of time the sample has been transit.

Another sample should be taken in three weeks to see what changes in climate cause to the crop and sap.

High potassium levels are likely to be blocking calcium and magnesium uptake so, while foliar applications of those could be tried, a more long-term solution is adjusting potash inputs on the field and attempting to raise magnesium and calcium in the soil perhaps.

Total nitrogen is on the high side so lower inputs could be considered.

Boron and manganese deficiencies could be treated with foliar sprays.

Mineral		Current Level	Optimum			
Total Sugars	%	0,3	0,7 - 3,7	1		
	%	0,3		2		
pH		6,5	6,2 - 6,7	1		
		6,2		2		
EC	mS/cm	19,3	13,4 - 16,7	1		
	mS/cm	20,1		2		
K - Potassium	ppm	8039	5550 - 7300	1		
	ppm	7975		2		
Ca - Calcium	ppm	391	725 - 2150	1		
	ppm	605		2		
K / Ca		20,58		1		
		13,19		2		
Mg - Magnesium	ppm	127	190 - 390	1		
	ppm	142		2		
Na - Sodium	ppm	44	46 - 183	1		
	ppm	55		2		
NH4 - Ammonium	ppm	728	180 - 465	1		
	ppm	1206		2		
NO3 - Nitrate	ppm	41	< 150	1		
	ppm	32		2		
N in Nitrate	ppm	9	< 34	1		
	ppm	7		2		
N - Total Nitrogen	ppm	3239	2150 - 3340	1		
	ppm	3809		2		
Cl - Chloride	ppm	2333	730 - 2390	1		
	ppm	2493		2		
S - Sulfur	ppm	527	350 - 670	1		
	ppm	739		2		
P - Phosphorus	ppm	599	250 - 560	1		
	ppm	540		2		
Si - Silica	ppm	41,2	25,4 - 45,7	1		
	ppm	51,6		2		
Fe - Iron	ppm	3,03	2,30 - 4,15	1		
	ppm	7,56		2		
Mn - Manganese	ppm	2,68	2,80 - 7,20	1		
	ppm	5,08		2		
Zn - Zinc	ppm	4,63	2,35 - 4,60	1		
	ppm	2,33		2		
B - Boron	ppm	0,22	0,40 - 1,60	1		
	ppm	<0,20		2		
Cu - Copper	ppm	0,55	0,55 - 1,15	1		
	ppm	0,33		2		
Mo - Molybdenum	ppm	0,08	0,05 - 0,20	1		
	ppm	<0,05		2		
Al - Aluminium	ppm	0,61		1		
	ppm	3,45		2		

Chart 1 - Example sap analysis in barley from Australia

charts) to help explain the importance of each different variable analysed.

Total sugars: Often this will be linked to level of nitrate in the plant, with high sugars meaning low nitrate and vice versa. "If the plant takes up a lot of nitrate it has to convert it to protein to use for growth. But if the plant takes more nitrate up than it can use for growth it starts to build up, and you measure that in the sap as higher nitrate levels."

High nitrate in the plant means a lot of vegetative growth, which in turn means a lot of water in the plant which dilutes the level of sugars," explains Mr Hegger.

"High levels of sugar in the plant could be an indication of good crop health, as we know that means lower nitrate levels and the moment nitrate gets too high the plant is more attractive to pests and diseases."

Another possible reason for low sugars

is there is not enough photosynthesis for sugar production and active growth.

Typically, growers should be looking for total sugar to be relatively high, especially in younger leaves, although too high levels can be caused when there's not enough water movement – for example, very hot weather causing plant stomata to close drying the plant out and causing the sugars to concentrate.

pH: In plant sap analysis, pH is not usually that informative, Mr Hegger suggests. "It is nothing to do with pH of the soil, usually doesn't vary much from sample to sample, so in most cases I don't look at this much."

EC: In contrast, EC, which is a measure of the total dissolved salts in the plant, is very important to look at as it gives a measure of whether there is enough nutrition uptake, or the transport of nutrition into the new leaves.

"For example, if the new leaves are very low and the old leaves very high that could indicate the weather has been extreme and the plant has stopped evaporating and couldn't transport

enough nutrition to the new leaves," Mr Hegger explains.

"But in most cases the EC shows if there is enough nutrition uptake."

Cations (Potassium, Calcium, Magnesium): In the previous article, the antagonistic behaviour of the cationic nutrients was discussed – if one is too high, uptake of the others can be blocked.

In the example (chart 1, left) that's clearly the case with potassium in excess, while calcium, magnesium and sodium to a lesser extent deficient, Mr Hegger says.

"It's possible there is enough calcium and magnesium available in the soil but the plant cannot take it up because of the high potassium, so the grower has to do something about his potassium input. Mostly it comes from manure or compost, and maybe the input is too high.

Your Farm,



Your Soils,



Your Solution.



Are your soils working for you?

The SSM analysis can identify your **soil type, traits, strengths and weaknesses.**

WHAT IS INCLUDED:

- Understanding of soils' biological, chemical and physical aspects and how to balance them for increased productive potential
- Soil nutrient properties calculated in Kg/Ha
- Integration with precision farming systems
- Comprehensible results and practical advice for direct action and solutions

We transform statements about your soil into strategies for your business.



Be more informed about your soil

soiladvice.com
+44 (0)7970 286420
ian@soiladvice.com
Twitter: @ssmsoilhealth

Sustainable Soil Management
Weasenham Lane
Wisbech, PE13 2RN

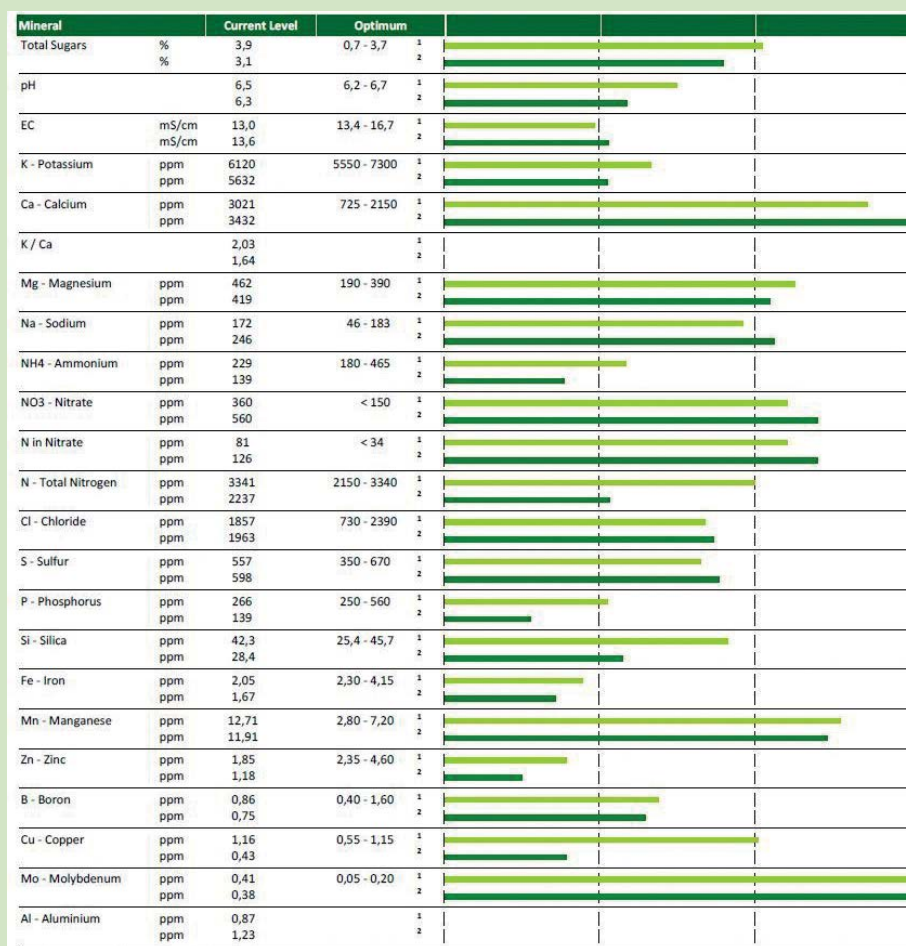


Chart 2 - Example sap analysis in barley from Ireland]

What the Irish analysis shows?

Sugar levels are good in this crop, which shows it is growing well. Calcium and magnesium levels are high, but potassium is within the target values so no immediate issue. However, could the grower do something to reduce calcium and magnesium levels for the next season to avoid risk of blocking uptake of potassium?

High nitrate levels suggest supply might be high, although total nitrogen is within target values. This suggests the crop has taken up a lot of nitrate but cannot convert directly to proteins – potentially an indicator of disease or pest problems in the crop, as there isn't a lack of other nutrition in the form of magnesium, sulphur, manganese and molybdenum preventing conversion of nitrogen to protein.

A follow up sample to confirm low phosphorus would be beneficial, while high manganese is probably blocking iron uptake.

“Eventually that could influence crop health and quality.”

Potassium deficiencies usually start in old leaves as it is a mobile element, and the young leaves will take potassium from the old leaves. For calcium it is important to look at the result for the young leaves because it is an immobile element and deficiencies will show there first.

There are no target levels for the potassium to calcium ratio as even if the ratio is correct both could be too low or too high. It's less important for grain crops, but in fruit crops, such as tomatoes, it's critical for fruit quality.

As with the other cations, if magnesium is too high it can often block uptake of potassium and calcium.

It is quite common the cations are not optimally balanced in sap analysis and treating the excess rather than the deficiency is likely to have better results. However, in the field it can be relatively difficult to manipulate these elements very quickly, Mr Hegger admits.

“Before you plant the crop, when you

use base fertiliser or apply compost or manures, you set the base for the entire season. During the season it's not possible to do big corrections on the soil. You can do a foliar spray to try to make a correction if something is really too low, but don't expect you're going to make big changes in the crop.”

In the first year of analysis, often it is trying to learn from the results

and understand how longer-term management, particularly of soil nutrients, can help, he says. “It can take more than a year to make a correction in the soil, before you see a reaction in the plant.”

Environmental conditions can also play a part. For example, high temperatures and light intensity can block calcium uptake. “It's why it is

Sap analysis interpretation

- Start with excesses and deficiencies
- Look at differences in uptake between young and old leaves
- Consider interactions between cation elements, and between anions
- Are there environmental factors influencing results
- Treating cations excesses may help more than treating deficiencies
- Cations are less receptive to in-season corrections
- In cereals, total nitrogen is important – too much means poor health, not enough will give poor growth
- Trace elements easier to treat with foliar applications

important to take samples every two to three weeks to see how levels change in the crop. If it is weather that is blocking the calcium and three weeks later the weather is normal, the levels might be back to the target levels."

Sodium doesn't have to be in the target values for grain crops, although it is important for some crops. "If it goes above the target values, then it can block the uptake of the other cations."

There are four measurements related to nitrogen: ammonium, nitrate, nitrogen in nitrate and total nitrogen. Ammonium levels can be affected by the time the sample is in transport, says Mr Hegger. "If it is high that's something to consider, otherwise it is an indicator of stress in the plant."

In barley and wheat, nitrate is almost directly converted to proteins, so if it is too high it is an indication that too much has been supplied, Mr Hegger suggests. "Generally, it is important to get your nitrate levels as low as possible, as long as your total nitrogen levels are high enough.

"In barley and wheat total nitrogen

is more important as this gives an indication of crop growth. If it too high, the plant will be more sensitive to pests and diseases.

"As long as total nitrogen is not getting below the target values, you know it is good enough, and fortunately nitrogen is easier to correct."

N in nitrate is a measure of the health of the plant. A high proportion of N in nitrate compared with total nitrogen is an indicator of lower plant health in some crops, such as tomatoes. "Unfortunately we can't use that trick in cereals because of the low nitrate levels in the crop, so it doesn't mean so much."

Chloride, like sodium, is not particularly important as long as it is not too high. If it is higher than the target value it can block uptake of other anions.

Sulphur is an important element for many processes in the plant. Like

calcium it is relatively immobile so look at the young leaves for signs of deficiency.

Ideally, phosphorus levels shouldn't be too high, so aim for these to be within the target values. "If it is too high, inputs can be reduced as it will block iron, manganese, or zinc uptake."

Aim for silica to be within the target values, as it helps with uptake of calcium and the health of the plant. "You can try to correct with a foliar spray, but it is not easy depending on crop."

Iron deficiency will show first in younger leaves, but it doesn't matter too much if the old leaves are too high, while manganese can easily get too low. "For the plant it is like a sweet – it's the easiest for it to take-up, but also one of the easiest to leach out of the soil."

Trace elements, which also includes zinc, boron, copper and molybdenum are easier to treat with foliar sprays.

No target levels are given for aluminium as ideally, for most crops, you don't want any showing up, Mr Hegger says.

AUTO-LEVEL SERIES



Auto-Level Series

- Self-levelling technology
- Advanced electronic proportional controls
- 5.5m or 6.8m telescopic reach
- Flail & Rotary head options

t: +44 (0)1905 347347 e: info@razorbackuk.com w: www.razorbackuk.com



FARMER FOCUS

PHILIP BRADSHAW



I ended my previous article noting the challenges ahead, but with some optimism for the season, and the forthcoming harvest. However, I had underestimated how exciting it was to get, and how much volatility we would come to enjoy!

Our crops continued to look well through the spring and early summer. The spring beans established nicely and grew quickly. Sometimes with all crops, it was a challenge to keep on top of treatment timings, especially when I spent some time away on off farm work.

I managed to buy a lot of our inputs at the right time, but unfortunately, I had to buy some of our Nitrogen fertiliser at the higher prices. I offset this with some appropriate wheat sales, and while I can't claim to have got everything right, we will have good averages on both input acquisition, and crop sales for harvest 2022. Thankfully, with our system fuel use is very low, and we have been reducing nitrogen use steadily for some years, which has given us the confidence to appropriately use even less for this harvest year.



The incredible summer weather we enjoyed did speed crop development, and our annual roguing season at Whittlesey was a joy, with little in the way of blackgrass to be found. We even found time to have a couple of fantastic days at the Groundswell show, in a hired campervan, and enjoyed seeing lots of interesting speakers, meeting friends old and new, and the evening refreshments!

Harvest for us started with the Winter Barley, and it was our best barley ever. The yields varied from 11t/ha on some heavier fields to 9t/ha on lighter land, so we ended up with an average of just 10t/ha over a weighbridge, despite a drought and seasonally reduced inputs.

Sadly though, the OSR which followed was less exciting. We drilled on two occasions last August, with rain forecast

within days, that never came. As such, some areas were very thin. I wrote some off before the winter Astrokerb application, and this was re drilled with beans, but with hindsight I should have written a little more off. The average harvested yield was 2.56t/ha, which is half what we used to yield a few years ago, but there was too much thin crop pulling down the average. The price though is decent, and the input costs were low.

The wheat was a much better story and was consistently decent across all farms. The farm at Newborough was all KWS Firefly, and this has averaged well over 10t/ha. At Whittlesey we achieved a similar average, but with some variation. The second wheat KWS Zyatt averaged 10t/ha which was pleasing and lifts the farm margin by reducing our area of less profitable break crops, and our first wheat KWS Extase and KWS Firefly averaged 11 t/ha.

With little storage on farm, and the early harvest pressures on the grain trade and central stores we had to wait to clear wheat before we could cut the beans, but the dry weather continued, and they were all done before the Bank Holiday. Sadly, the beans were a little disappointing. Last year we averaged almost 6t/ha across all the beans, and this year we are only just above half that. Those super-hot days that we enjoyed in July effectively killed most of the crop off, and we had very small beans. Overall, though, with most of the farm in wheat and barley, we had a good harvest, with no drying, and good prices so far – a memorable season.

As usual, we did some on farm trials. Philip Wright, our friend, and consultant helped with trials on tyre pressure, and soil loosening with the paraplow. The tyre pressure trial was similar to last years, and was interesting, as we drilled in autumn 2021 in drier conditions than 2020. The result was that while there was a little difference between the low and medium pressure area compared to untrafficked land, there was still a more significant yield loss in the high pressure area.

The soil loosening trial gave interesting results. In field analysis through the season showed better biological activity and rooting in the paraplowed area, particularly





where we also applied biological amendments, and this showed in yield assessments at harvest. On the paraplowed land there was a tiny gain with the amendment over that without. However, the unmoved land had a substantial yield penalty over the loosened land. Obviously these are not extensive replicated trials, but they do show that when required loosening is appropriate, and I will continue to add biological amendments expecting a cumulative effect over time.

The final trial I did was with a field of KWS Extase. I decided after our N1 application on a whim to do a low input trial, so 2 ha of the 12 ha field had only the first N dose of 46kgN/ha as a liquid, and no more fertiliser, and I also reduced the already modest fungicide and PGR programme on the low input area. Again, this is a basic farm experiment, with little replication, but the results were interesting.

The weighbridge calibrated yield monitor on the combine harvester gave an average full header yield of 12.24t/ha low input, against a 12.36t/ha for the control area which had normal treatment including 110kg/ha N as liquid. This surprised me, and may be a quirk of the season, but I will push lower still with N next year, particularly on the skirt fen soils. However, it was clear from the delivery results, that the low input area had lower proteins, and this will need to be considered in a milling wheat situation.

Unfortunately, the clover living mulch crop that we planted ahead of beans has failed. Like the OSR last August, the rain never came. I want to try it again and may try and under sow some in the spring.

So, for next year what are our plans? The dry weather and soils post-harvest have ruled out planting OSR or clover here this

year due to the risk associated with the dry conditions. I did plant about half of the planned catch/cover crops with a multi species blend. This was done with the GD disc drill rather than the Sabretine to try and preserve the moisture. Keeping living roots in the soil is an important part of the system for us, but in a dry season like this we need to react accordingly.

We are paraplowing the 20% of the farm at Whittlesey that wasn't done last year, and this will be pressed to reconsolidate. Our home saved wheat seed has tested clean for disease, so it will be cleaned on farm and treated only with Tiros before drilling from mid-October.

Looking ahead we need to refine our system further and reduce artificial inputs when possible. The challenge though is achieving a balance between reducing inputs appropriately, while also maintaining a decent level of crop output to be profitable. The inflation in our costs, including last year's rent rise, is substantial, and the risks associated with farming now are more significant than ever.

BOURGAULT TILLAGE TOOLS

VOS & Speed-Loc™ Quick Change System



VOS (Versatile Opener System)

Drill into a wide variety of situations across a range of soil types with less soil disturbance, less draft and greater consistency in seed placement.



Speed-Loc™ Quick Change System

Quickly change between BTT openers, fertiliser knives, sweeps and spikes. Consistent depth control for seeding and tillage.

E help@bttuk.com

T 01733 971971

[bttuk.com](https://www.bttuk.com)

BTTUK

SUSTAINABLE FOOD:

HOW CAN ECOLABELS HELP TRANSFORM ENTIRE VALUE CHAINS?

With sustainability being placed higher and higher on consumers' agendas, people are turning to high-emitting industries to ask how they are playing their part in reducing environmental impacts on the planet. The food industry alone accounts for one third of emissions globally – and with population rising, the challenge of feeding the planet while lowering our footprint is becoming more real than ever.

By Laura Nolan and Cliona Howie, Foundation Earth

An increasing number of brands are making efforts to green their products, be more sustainable and communicate that to their buyers in a credible way. Many green claims are being made left, right and centre – but how do you back up and qualify a food product's eco-friendliness in an accurate, transparent way? What is being measured exactly, and what information and data can we access to verify such claims? How can we move towards a food system that doesn't just reward client-facing brands, but also farmers and producers who contribute to making value chains more sustainable?



The role of ecolabels

One example is the use of ecolabels placed on products, that show consumers just how much that item costs the environment in an easy, accessible way (you've most likely seen those traffic light systems on your home appliances!). This trend isn't new: 84% of consumers believe it's important for each person to contribute to sustainability (Source: Kerry Group, "Sustainability in Motion"), and many companies are starting to respond to the demand for corporate transparency - from fashion, to beauty, electronics and of course,

Agriculture alone accounts for 70% of global freshwater consumption (Source: FAO).

Food systems are responsible for **one third** of human-caused **greenhouse gas emissions** (Source: Nature Food).

Our global food system is the primary driver of **biodiversity loss**, with agriculture alone threatening **86% of the species** at risk of extinction (Source: Chatham House).

Agricultural expansion drives almost **90% of global deforestation** (Source: FAO).

On top of this, feeding an estimated world population of 9.1 billion people in 2050 would require raising overall food production by 70% (Source: FAO).

food.

But what do ecolabels show exactly? Well, there are over 500 environmental labels out there: a lot of them focus on carbon footprint (CO2 emissions), some will tell you if a product is organic or not, and others try to look at a broader range of measures like water use, water pollution and biodiversity. Some even include other ethical indicators such as working conditions or animal welfare. The scopes are large and diverse, there is no "one size fits all", and there isn't a consistent, harmonised approach.

Regulation is underway – the European Union has worked towards the development of a unified method to communicate environmental information of products across the European Union - the Product Environmental Footprint (PEF) Method - since 2013. PEF, for example, measures 16 different environmental impact categories. The French

government has also been building a national environmental scoring system for food products, and similar initiatives are underway in The Netherlands and Denmark.

We need better data!

And yet, current approaches to assess the environmental impacts of individual food products remain limited. Often, proxy data is used to generate an estimate of a product's impact, and the true impact of a specific product is never known. That means that if an actor in the value chain (for example a farmer) is making active efforts to green its processes, that most likely won't show up in the final score due to the use of averages.

Impact scores based on secondary data are easier, quicker and cheaper to obtain, but without accurate information on a product-by-product basis, environmental impacts cannot be



meaningfully managed and the climate crisis will intensify. And without an accurate per-product understanding of where the highest environmental impacts are in a supply chain, food producers are not incentivised to grow, manufacture, transport or sell their products more sustainably.

Here's the thing: ecolabels don't only help consumers choose a product – when the assessments are done accurately and in-depth, using methods such as Life Cycle Assessments (LCA) for example, they can also help food producers reduce the environmental impacts of their production and produce in a better way. They act as key source of intelligence to help industry players pinpoint where their highest impacts are, and what can be done to improve them. That's when ecolabels also become a powerful data-driven tool to build more sustainable food systems.

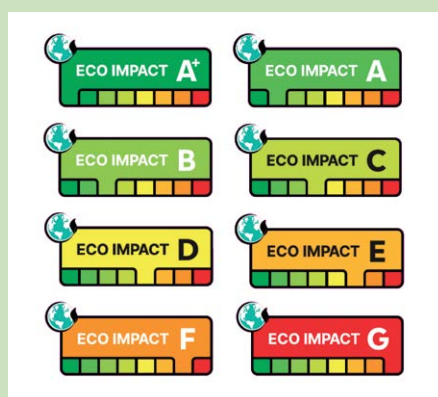
At Foundation Earth, we are working to develop a method that scores food products in the most accurate way possible, based on LCAs using the highest quality data available. We map the supply chain, assess the impacts throughout and tell brands where they might be going wrong. At the same time we are comparing different existing methods to pull out the best of them all and create a single method that will allow brands to have a comprehensive view of their supply chain and know where improvements can be made.

Recognising actors across the supply chain

So, brands are starting to place more and more emphasis on their sustainability efforts – but what does this mean for the other actors along the supply chain? The nice shiny label

is sitting on the product pack, but how does that help all food players, from farmers to marketers, to demonstrate their sustainability efforts?

For now, it doesn't really. Everyone in the chain has contributed to that final score (either negatively or positively!), so why do they miss out on the acknowledgement? At Foundation Earth we believe there is a real gap here, because to transform entire food systems we need to recognise the do-gooders and incentivise others to join in these efforts. If a farmer is doing their best to place sustainability at the heart of their business model, and probably even seeing the direct benefits of their actions on biodiversity around them – for example – this should be celebrated. Because every effort counts.



That's why we are launching new pilots calling all pioneers to be part of Foundation Earth's trials and pave the way for food system transformation. We are aiming to deliver a standard, scalable product footprinting system not only for brand owners but also producers and retailers, that will connect entire value chains and give recognition where it is due by delivering our label across the chain. This will in turn unlock commercial value for businesses and support all actors in achieving their net-zero goals.

A food ecolabel for all

What will this look like concretely? We already have our scoring system for final products - remember that traffic light system mentioned on your home appliances? Our Foundation Earth Eco Impact labels apply a similar system: our scores range from A+ to G (A+ being

green and representing the lowest environmental impact, G being red and representing the highest) and are re-certified yearly, making it possible for products to improve their grade. But instead of labels just being on final, packaged products, ingredients and processes could be certified at each step of the value chain as well, bringing recognition to all those businesses applying sustainability principles and helping business-to-business (B2B) buyers find alternative, sustainable options.

Transforming food systems for the better will take active participation from us all. And it's only by recognising and celebrating efforts that we will build a movement big enough to create actual change and leave way for food systems that won't harm the planet.

Highlights

Sustainability is being placed high on consumers' agendas, and as a result being reflected more and more in brand's business models.

Ecolabels are a powerful tool to give consumers the confidence to choose more sustainable products.

There are many existing ecolabelling schemes and methods, that look at various indicators. The European Union has worked towards a unified method, the Product Environmental Footprint (PEF).

Currently a lot of methods use proxy data - industry averages - which don't reflect the true impact of an individual product.

Undertaking Life Cycle Assessments (LCA) on individual products enables accuracy and generates intelligence to help businesses produce in a better way.

We need to not only recognise the brands, but all producers from farm to retail. A certification scheme across the value chain could reward those sustainability efforts and incentivise others.

SOMETIMES YOU HAVE TO DISAGREE

Written by Tony Gent

A couple of articles caught my interest in the July additional of this Magazine, First What's Your Colour written by James Warne and Farmer Focus by Andrew Ward. The theme of both is somewhat similar in questionable understanding the principle of how soil degradation works and putting in place appropriate practice to start a sequence of improving organic matter and resulting biology.

Since the evolution of tillage mainly to establish a single species crop with reduce competition from other species - a weed, mass food production evolved highly successfully. What we now understand is that success was based on what some compared to mining products from the soil. The way soil evolved over millions of years to work before man's intervention vegetation growth and subsequent die back were in



balance I.E., organic carbon, fertility and nutrition release were at the same rate with no artificial soil movement taking place.

When soil fertility is naturally high soil movement results in robust crops due to

the cultivation induced increased rate of nutrition release. This is particularly so as soil movement technology gets more and more aggressive particularly with development of inversion tillage such as the plough. What we now have as a

For the perfect seed placement - let's get straight to the point



We all know that the key to good plant establishment is perfect planting depth control and excellent seed/soil contact. So bring on the Primera DMC direct seeder which does both of those things by the bucket load.

With a huge clearance from point to point, the chisel openers perfectly follow every little contour and cope with any amount of trash, so the Primera DMC is ideal for working in a cover crop, after a cover crop, after a cash crop or just well - drilling!

So if you are looking for a direct seeder that will cope with life's up and downs - look no further than the Primera DMC.



Each individual hard-faced chisel opener is guided at the perfect planting depth by the following Reflex rollers.



www.amazone.co.uk



Contact your local dealer
or phone us on 01302 755 725



AMAZONE



result of cultivation causing instance of retention and release is soil which is out of balance with its biology resulting in degradation or as we say total mining of the soil-based resource.

The dilemma so many farmers are faced with, with soil in this situation is putting in place practices that turn the corner towards restoration of biology and protecting the short-term risk as they see it to the income stream from the farm. Also, judgement and assessment of what's happening can become massively clouded and confusing with reduced soil movement reducing artificial soil structural correction, but which still compromises natural biological build up.

Particularly farmers with heavily degraded soil that has been vigorously attacked with more and more power and forced soil manipulating technology for timelier establishment and finer seed beds. The awareness of what other farmers have achieved in a No-Till position where they are growing very respectable cost-effective crops doing nothing. Their thought process is all too often that's ok but I think there is an opportunity to do less, but if I continue to do something it's got to be better than doing nothing. We have learned that again particularly with heavily degraded soil that logic is partly correct, but it must be applied from a different standpoint. It doesn't work if just removing some elements of what you are doing now and leave others in is "OK I'm doing less". The problem is that what you were doing even with so-called min-till had an element of primary tillage or initial soil breaking in it, followed by seedbed preparation either prior to drilling or in conjunction with drilling. The problem as I have described is often a bad compromise first not achieving carrying soil along in its degraded state or doing a suitable operation to not compromise biology recovery and so just bumping along in the tough of doing neither of artificially doing nature's job completely or treating the soil correctly to allow biology to recover and the soil and moving to a point of soil largely looking after itself as nature intended.

The first absolute rule in all this is do nothing if it is not needed and then only in suitable weather and rotational situations and opportunity. Also experience has shown us that grass related crops I.E, cereals have much stronger rooting than many break crops and usually tolerate heavily degraded soil with little or no

COUSINS OF EMNETH LTD

Helping to solve your problems in the field for 70 years.

CONTOUR ROLLS

With a horizontally folding frame
and the heaviest weight per
metre in our range, the Countour
HD HZ Rolls offer excellent
ground following.

Working width 8.4m to 18.4m

22", 24" or 26" ring options

7 section models available

Optional brakes

Optional Springboard Levelling Tines

Selected models in stock



01945 584600
sales@cousinsofemneth.co.uk
www.cousinsofemneth.co.uk





loss of yield, so long as establishment is robust and there are no compaction or drainage issues. Break crops such as oil seed rape and beans though are weaker rooting and soon show their dislike to less than reasonable soil structure.

When you stop tillage of degraded soil so long as the previous crop and this is by far the best way to judge the structural state of a field was robust and suffered no signs of compaction or drainage problems and no severe damage was done to the soil removing the previous crop, then it's completely rational to expect if its grown one successful robust crop why shouldn't it grow another one, without any interference with the soil. With the first year or two of No-Till that's usually the case. But after that an element of weather luck and rotational circumstances creep in. The soil starts to forget the artificial structuring help you have been giving it and as I have said is yet to be at the stage to compensate for this. In practice and this is where weather luck starts to play a part usually with our maritime climate a wet sowing period compromises crop establishment and results in a less than ideal robust crop. Because soil recovery relies on the soil being active and full of roots and activity,

We have found the approach to the doing something to help for us has been low disturbance vertical tillage. With us there are two stages to this - repair and get soil going in the right direction and the much more laid-back simple rotation opportunistic rotational maintenance, of which as biology increases you need less and less. Very important you must not confuse soil hard or firmness with soil compaction - soil is naturally hard or firm, particularly in dryer conditions, but with the honeycomb built up as biology is restored firmness is not a problem. The big big misconception is trying replicate this structure with cultivation, it does not work like that. The more you cultivate the soil structural the weaker

it becomes and wet and dry conditions and trafficking it just slumps together into one big hard lump or slush, and the cycle of obliterating it with cultivation must begin again. Also worms and microbes have no chance in this cycle of obliteration to slump.

Methods of establishment also plays a part in this with a fixed tine or disc approach. Tines range from the type



that moves all or most of soil creating an affect that's basically one pass cultivation and obviously compromises massively No-till and biology recovery to a very narrow low disturbance tine which is much better, but most still have some element of disruption and inversion effect on the soil. All tines have the disadvantage of blockage in residue, especially in cover crops. Discs generally have much lower surface disturbance and are much better at handling residue and as with tines there are various different approaches to design. The main difference is that most create the opening by displacement of the soil sideways soil against soil, which results in compression soil damage and smear in wet conditions that is synonymous with most design limitations. An under-cut

disc such as the Weaving GD is much kinder to the soil as there is little or no sideways movement and the opening is created with a natural sleight upwards action, resulting in minimal disturbance and pressure on the soil allowing the seed to be placed under the tilth. Soil friction is generally less than a tine because the disc rotates with the soil flow, resulting in less pressure needed to firm the soil around the seed leading to reduced shrinkage and slot opening, also the seed is predominantly placed to the side away from the primary cut therefore generally slightly away from any hair pinned residue.

Recently the theory of cover cops has come to the forefront, which is great, and no doubt could help with particularly the transition enormously, but the practicality has many challenges, particularly with the establishment window. As I write - ok its early and we have plenty of time and opportunity, but no moisture and as we have seen with small seed crops if you put them in the ground and they don't immediately grow they lose vigour and often are a complete failure, even when it does eventually rain. Wet seasons often are cold and late also which compromises establishment before the autumn growing period tails of into winter. Also, with a later harvest workload becomes a compromise and cash crops must take precedence.

By all means embrace no-till, especially to address soil degradation and make sure your methods facilitate an improvement in soil biology. This is absolutely vital to allow the soil to recover, some appropriate help maybe needed to win in the long term, together with a little patience.



GLYPHOSATE STEWARDSHIP

Applied correctly, glyphosate as a non-selective herbicide can deliver very high levels of weed control. However, experience around the world shows that glyphosate is not invincible, weeds can develop resistance to it. Fortunately, there are no known cases of glyphosate resistance in the UK but once weeds become resistant, there is no cure, so taking steps to reduce the risk is essential to retain this highly effective herbicide.

KEY CONSIDERATIONS

1 RESISTANCE RISK

The possibility of glyphosate resistance developing is real and needs to be taken seriously. Factors increasing the risk range from high weed populations, reliance on few or only one method of control, insufficient application rate for the target weed, repeat applications to survivors, poor application timing and technique

2 FRAME WORK FOR SUCCESS

The framework developed by WRAG will help reduce the resistance pressure on glyphosate, the weed pressure in the crop and prevent excessive seed return

3 MAXIMISE PERFORMANCE

Use the appropriate dose rate for the target weed, target small weeds and optimise application practices. Partner products (and adjuvants) cannot substitute for an effective dose of glyphosate, do no cut rates

4 MONITORING

It is important to monitor the success of the overall herbicide programme and investigate reasons for poor levels of control

5 WRAG GUIDANCE

For further information on the latest revision of the WRAG guidance, visit <https://ahdb.org.uk/wrag>



Source: WRAG guidelines for minimizing the risk of glyphosate resistance in UK (2021)

DRILL MANUFACTURERS IN FOCUS...

HORSCH

HORSCH AVATAR 12.25 SD UPDATED WITH NEW EQUIPMENT OPTIONS

The latest 12m HORSCH Avatar 12.25 SD, launched in early 2022, has been updated with new equipment options, including a new control concept. The intuitive handling system is based on ISOBUS and makes it easier for the farmer to adjust, operate and monitor the drill. The terminal interface can be adapted to the user's requirements and, with the new hardware and software, HORSCH has created a platform which can supply an almost unlimited number of components when metering.

Thanks to the well-proven folding design the transport dimensions are very compact. With an outside width of 3 metres, it is also ideal for road transport. There are various tyre versions from 520 to 900 tyres and twin tyres.



This additional hopper has a capacity of 400 litres and is often used for seed, granulates or slug pellets. Filling stops can be reduced and up to 3 components can be metered at the same time.

The seed wagon layout increases the drilling window with the large tyre widths reducing compaction even in wet soil conditions. The double support wheels at the wings ensure low tracks and optimum adaption to the soil. With its 1-row design with SingleDisc coulters and a row spacing of 25cm, the Avatar 12.25 SD is ideal for mechanical population control, but also for the most different sowing methods, such as direct seed, mulch seed and into standing catch crops.

The new LED headlight system, WorkLight Pro, allows for driving at night and, like all HORSCH Avatar models, the HM skid as well as the newly developed HM Plus skid provide enormous stability and longevity of the seed coulters.



The newly developed seed hopper platform has a capacity of 6500 litres and can be ordered as a double hopper with a 60:40 ratio. To increase the range further, especially for rape seed, a MiniDrill G&F is now available as an option.

MADE GREAT IN BRITAIN
AGRIWELD
AGRICULTURAL MACHINERY MANUFACTURERS
THE ASL
Minimum Disturbance
Toolbar
Provides options to help
reduce crop establishment
costs in line with modern
tillage methods
Complete with auto-reset leg protection system

Models available:
3m rigid - 6L
4m rigid & hydraulic folding - 8L
6m hydraulic folding - 12L
01377 259140 www.agriweld.co.uk sales@agriweld.co.uk

AUROCK

Progressive seeding



ALL DRILLING OPTIONS



EMBOSSSED OPENER DISCS

- Cut through residues and avoid seed hair-pinning
- Adjustable for inter-row cropping
- Wavy disc available for min-till conditions to produce more tilth

AUROCK FEATURES & OPTIONS



CRIMP
ROLLER



VISTAFLOW
TRAMLINING VALVES



SEEDING
DISC



SUPPLEMENTARY
SEEDER

be strong, be **KUHN**

www.kuhn.co.uk



CROP AND CARBON: OPTIMISING THE DOUBLE YIELD

Written by Thomas Gent, CEO Agreena UK



It's no secret that employing regenerative farming techniques – minimal soil disturbance, the use of cover crops and organic manures, applying carbon-rich fertilisers – both reduce the amount of farm-generated greenhouse gas (GHG) emissions and add to the amount of carbon stored in the soil. These GHG reductions and carbon storage initiatives can then be quantified annually, depending on the practices carried out over the harvest year. This, in a nutshell, is what's referred to as carbon farming.

The quantification of GHG reduction and carbon storage is measured in units called carbon certificates; one certificate represents one tonne of CO₂-equivalent emissions (either removed or reduced). If you're a typical farmer who's practising carbon farming, you can expect to yield between one and two carbon certificates per hectare per year. But that's just the beginning. The exciting bit comes when you're able to optimise and garner a double yield, meaning both crop yield and carbon certificate yield. This is where I'd kindly like to ask you to pause for a moment, take a deep breath and reflect on this perspective:

A carbon certificate yield should be thought of as a crop yield.

Here's why: Both yields take place once a year in line with the typical summer-to-summer crop cycles we're all used to. This means you have the potential to harvest two crops from your field: one wheat crop and one carbon crop, for example. Once you've harvested your carbon certificates, you need to decide what to

do with them. Much like a normal cash crop, they can be kept, used for your own purposes or sold to an end user. You can even work with a company to take them to market for you.

As a farmer myself, I'm constantly researching new and innovative ways to turn my farm into a battleground for combating climate change. Caring for the soil under my feet to sequester carbon from the atmosphere is a profitable and sustainable way to optimise my farm's carbon negative position while at the same time producing a new asset in the form of a carbon certificate. But it isn't just me; I've spoken with many farmers in the area who have recently transitioned to carbon farming through the Agreena certification programme and are now yielding and earning from their carbon harvest.

They're using Agreena to help them strategise how they can move further away from their established baseline to increase their yield of carbon certificates per hectare – moving more fields over to direct drilling, for instance. Still others have found that crops in the rotation with a high carbon yield, such as pulses and linseed, are inherently less profitable. The carbon payment they've received has topped up their profitability and improved their soil.

Other key takeaways from these conversations have been that the most 'carbon yielding' crops are those that

have a cover crop before them. This has helped reduce the need for artificial fertiliser in the cash crop that follows, which can help save big considering the current high price of fertiliser. Planting an over-the-winter crop and following it with a spring cash crop can also generate a lot of carbon certificates and allow you to address problematic, annual winter weeds. This is a win-win for carbon yields and addressing long-standing weed problems.

The Agreena soil carbon platform, aptly named AgreenaCarbon, works to support you in the quantification and planning that's necessary to begin earning carbon certificates after each annual harvest year. Employed by farmers in 14 countries, the internationally accredited soil carbon certification programme works with world-leading regenerative agriculture technology and external verification partners, so there should be no doubt for corporate buyers and farmers that the programme delivers high-quality carbon certificates. The programme is available to all farms of all sizes and types, and makes a transition to regenerative farming practices financially viable. Perhaps best of all, no matter where you are in your regenerative journey, you can enter the programme.

To learn more about AgreenaCarbon and how you can start optimising your double yield in the field, visit www.agreena.com



AGRONOMIST IN FOCUS...



RICHARD HARDING

Always start with why...?

Four years ago, John Cherry and I were having an enlightened conversation while seated around his kitchen table discussing the future of agronomy. This was now several years since John and his brother Paul along with Paul's son Alex, had founded the Groundswell Conference in Hertfordshire. Attending Groundswell, meeting Frederic Thomas, being a BASE member and the other people I have met along the way, have all been defining light bulb moments in my agronomy career. They allowed me to join the dots of mainly subconscious observations made throughout my career and some conscious ones too. I particularly remember one day as a harvest student getting out the tractor cab while waiting for the combine. I noticed the soil in the field under the stubble was loose and friable, it had a sweet smell and good worm activity – a perfect growing medium. Why then were we about to turn this soil upside down in an attempt to recreate the exact same result? That made no sense apart from that's what everyone does, isn't it? It felt like this conversation in John's kitchen was another of these lightbulb moments. We were debating what should the agronomist of the future look like and indeed the type of service they should be offering in a regenerative system?

Fast forward to today and Groundswell Agronomy has enjoyed it's second year successfully attending the Groundswell Conference 2022. During our conversation in John's kitchen, I suggested what might appear to be a flawed business model and that was to make myself redundant in



No-till potatoes

ten years. Not because I don't immensely enjoy what I do, but if one of the overarching principles of the agronomist of the future is to make a regenerative farming system the solution, we have to do things differently. Rather than the current model of an in season, short term solution from a can focusing on margin over input costs. We know intuitively that we need to take a far more long-term view. Taking inspiration from organic systems or any system for that matter, where nutrition is considered rotationally rather than crop specifically.

Regenerative farming is nothing new, when you

PLANTING COVER CROPS THIS SEASON?

Treat with SR2 Mycorrhizal Fungi &
Rhizobacteria

Inoculate cover crops
Improved growth and soil health
Increased mycorrhizal levels for follow on crop

SR2 for application on cover crops, herbal leys and forage grass at a nominal rate of 10Kg/Hectare.

Available for mixing with seeds on farm, or pre blended by your seed supplier

For further information:

T:+44(0)1795 411527

M:+44(0)7990042473

natalia.gulbis@plantworksuk.co.uk

smart.plantworksuk.co.uk



**MYCORRHIZAL
FUNGI
& RHIZOBACTERIA**

100% UK Origin

interrogate the principles of such a system, they are what good mixed farming has always been about albeit with a better understanding of the “why” something works. Our understanding of soil biology is just one example of an area that during my studies was barely mentioned. Today we are aware of its importance and seek to understand it in far more detail than ever before.

Over the last year we have seen huge volatility in input and energy prices which makes one of the key drivers behind my interest in a conservation or regenerative model so important, and that has always been to future proof the rural farm business (acknowledging most farm businesses are very diversified), maximise the return on investment and the management time employed. One challenge that a regenerative system currently faces and one that is having an increasing effect on the practical agronomy of these crops, is a consistency of core values. Regulation brings a degree of structure missing from regenerative agriculture at the moment. While I’m definitely not a fan of highly regulated industries having a framework to work within would bring credibility for the system and clarity to the consumer. There are fundamental principles that are well accepted within a regenerative system however these are interpreted slightly differently, depending on the individual’s interpretation of these principles and depending on their world view. Their attitude to risk, the time of the year and most definitely this year, changes in grain prices all derail the best of intentions.

Which means that communication between the grower and the agronomist becomes ever more important. I often

joke about the need for farmers and agronomists to have couples therapy, but it is vital for everyone involved in growing the crop to have a clear understanding of the overall objectives, the businesses attitude to risk and the fundamental “why” behind the decision making. Why is such a powerful word and it’s not until we ask ourselves why at least four times can we rarely get to the reality of why we’re thinking and feeling a certain way. While we are skilled at crafting a rational justification for what we do. The reality can be sometimes quite different.

In trying to answer the question “is there another way” to farm. It has led me to question every decision we make as agronomists. As I researched further seeking to properly understand soils and how to manage them, I moved from thinking things were simple to very complex before realising what seemed complex was actually very simple. However, the key when working more closely with natural systems is to always have a plan B, C, D and E. Irrespective of farm size this is very possible, but it requires a very different way of thinking and being flexible and open to change. An example of this, and one that may seem extreme is that if we accept as farmers, we are ultimately trying to farm sunlight and if we’re to manage soils better, permanent soil cover is a fundamental goal of the system. Then when we plant something, we don’t necessarily know whether that crop will be a cash crop, a forage crop or a cover crop? We are used to controlling nature and I suggest we can learn more by taking inspiration from nature to create a truly efficient system.

All the while being aware as humans, we are very good at self-sabotage. We need to be aware of the cycle of SELF-SABOTAGE and be compassionate when we fall victim to this process particularly when we are trying to adopt a new system or approach. We favour doing what feels comfortable - we then decide to make a change - we take steps to change - the change feels good - this feels different - we feel uncomfortable - we question the changes made - our subconscious craves familiarity, and the cycle begins again.

While it’s easy to explain a concept by going to extremes and to some a regenerative system can seem extreme, if it does nothing else but to make you stop and question your approach there is a value in that alone. There are always aspects of the system which can provide benefit and fit into a more conventional approach.

To find better ways of doing things to some extent ignoring labels can be helpful and shifting the focus on the value of each individual technique being deployed. One thing that is clear from other parts of the world is in order to make an alternative system work well it involves far more trusting and intimate relationships with the rest of the supply chain. Only by challenging convention throughout the supply chain will we achieve success. We need to reimagine everything from the soil up.

So, while having these grand aspirations is all very well, what does that look like day to day in the field and where could farmers trials, as well as more formalised trials start investigating? Here are a few conversation starters to have with your agronomist the next time you have your therapy



Bi-crop spring oats and beans received no inputs, Use crop competition to suppress weeds

session together!

1. Alongside trials, one starting point is to begin with knowledge exchange and financial benchmarking peer to peer, facilitated by the agronomist is essential first step. Many growers would be dismissive of the concept of no-till potatoes as unrealistic but such projects while extreme are a way to interrogate a different way of thinking. We need to ask what elements of this approach could have value whatever the system?

2. Where does your advice come from? Maybe growers should swap their agronomist every three years to maintain innovation? This was an idea suggested by Mark Dewes at a panel discussion at Groundswell in 2021. Mark had recently completed a Nuffield Scholarship into looking at different agronomy models around the world.

3. Our cover crop knowledge is very much in its infancy, and everyone is trying to achieve different things. The starting point is to know the value of the benefit you are getting from that particular cover crop. Aiming to ideally make every cover crop a cash crop. Relay cover cropping and blurring the line overlapping a cash and a cover crop can be a more nuanced way of getting the best return on investment from that cover crop. Quantifying the true value cover crops bring to improving nutrient use efficiency would give more confidence in using cover crops more widely.

4. Maintain a balance; as farmers we love the production element of growing but maintaining a balance accepting for a regenerative system to work our attention needs to be focused, 50% on marketing and 50% on growing in that



Sample tubers



Practical solutions to unlock your soils full potential

Gold package

- Broad Spectrum soil health test and practical interpretation
- Complete nutritional, physical and biological soil analysis and detailed report



"Agrovista Soil Health is a new way of operating. It gives us a good indication of what's happening in the soil physically, chemically and biologically before we put a spade near."

CHRIS MARTIN
Head of Soil Health



enquiries@agrovista.co.uk

www.agrovista.co.uk/soilhealth



Strip-till maize with mulch between the rows to suppress weeds this spring



We don't need expensive soil tests to tell us what's going on

order and irrespective of whether the product leaves the farm as a 29ton bulk lorry or a single branded 500g bag. The best example of farmers making the system work around the world is through diversity of crop and market. It

may be a contentious question, but why exactly in a more normalised year are we growing so much wheat, while historically farm profitability has been declining for some?

5. Is our idea of efficiency flawed – a question for another day but something to ponder?

Lastly, an interesting question. Why is it that Microsoft is reportedly the second-largest employer of anthropologists in the world? In essence it can be summed up by the fact that in order to know where we were going we must first know where we have come from. There is nothing new in farming or farming regeneratively just the way we think and join the dots. **richard@groundswellag.com**



oakbank

CREATING THE PERFECT HABITAT

Cover Crop Seed
Experienced Advice
Living Mulch
Soil Health
Grazing
Carbon Sequestration



For more information
please contact us on
01480 890686
or email
info@oakbankgc.co.uk
www.oakbankgc.co.uk



RYETEC
Specialist Machinery For Forestry, Amenities & Farming

**WORKS AS DIRECT, MIN TILL,
OR CONVENTIONAL
DISC DRILL**
TRAILED 3 -6 METRES
PNEUMATIC OR BOX DRILL
UPTO 250KG PER COULTER

Ma/Ag No Till Drill – For Minimal Disturbance

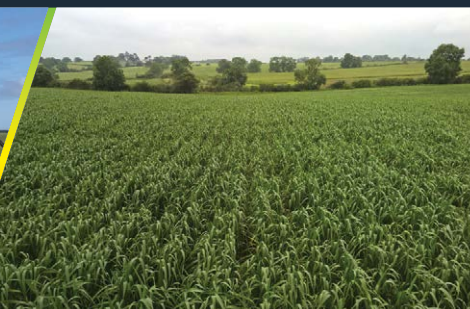
CHOICE OF PRESS WHEELS

Individually
floating coulters



PERFECT SEED COVERING

Uniform seed
depth control



STRAIGHT OPENING DISCS

Perfect weight
distribution



LOWER POWER REQUIREMENT

Even coulter
pressure



SIMPLE AND ROBUST

Individually
floating coulters



RELIABLE RESULTS

Cost effective
establishment



DRILL MANUFACTURERS IN FOCUS...



EXCELLENT RESULTS FROM THE 2022 HARVEST, BUT WHAT NEXT?

With the harvest safely gathered in Jeff Claydon, Suffolk arable farmer and inventor of the Opti-Till® direct strip seeding system, discusses the results and looks ahead to next season.



18 August 2022

It has been a very strange year for weather in most parts of the UK. Here in Suffolk, where annual rainfall is just 600mm making it one of the driest regions, the exceptional conditions brought back memories of 1976. That year, almost no rain fell between March and September and during a visit to the county then Minister of Agriculture, the late Fred Peart, described the drought as a tragedy, urging the public not to panic. Sounds familiar!

Between New Year's day and the end of May this year our farm weather station recorded 196.8mm of rain, well below the long-term average. April brought only 18.6mm and in May 41.6mm fell, followed by 34.4mm in June and a miniscule 10.4mm in July, contributing to a total of just 244mm for the year to date. Much of that came in the form of short, localised showers, so the water evaporated very quickly and produced little benefit.

One positive of the exceptionally dry conditions was our earliest-ever harvest. The 12m Claas Lexion 600 Terra-Trac had an uninterrupted run from the time we cut the first oilseed rape in mid-July until the last spring oats which were combined during the first week of August.

With daytime temperatures consistently in the mid-to-high 30s and little in the way of overnight dew we were able keep going for as long as we were physical able to do so. It was a very tiring couple of weeks, but with help from my sons, Oliver and Spencer, harvest was completed in record time and with wheat coming into store at 11-12% there were no drying costs.

Too dry to drill

The downside of the prolonged dry weather is that currently the land is too dry to drill oilseed rape. Normally, the crop

would have been in the ground a week or two ago but, with no moisture to start the germination process, drilling it then would have been a mistake. Patience is the key as we await some meaningful rain!

The ground is so dry and cracked that undertaking any form of conventional cultivations would be very expensive in fuel, excess wear on machinery and ground-engaging metal. Breaking down the large clods created by that approach would also be very time-consuming and expensive but driving around the area those drawbacks have not stopped some from trying.

On our own heavy clay land, the Claydon Straw Harrow has been successfully deployed across the whole farm, the main limitation being keeping dust to a minimum by restricting forward speed when operating close to houses in the village, especially if they have washing on the line!

With our rotation having changed from wheat and oilseed rape to include more spring-sown and break crops, the aim is to use land destined for spring drilling to help reduce the weed burden and seed bank using Opti-Till® stubble management techniques which move no more than 2cm of topsoil. This enables us to control weed seeds and volunteers without herbicides, other than one full-rate application of glyphosate just prior to drilling.

Effective stubble management has become particularly important following the loss of neonicotinoid seed treatments and some products to control grassweeds due to the inherent fear that the aphid vectors of Barley Yellow Dwarf Virus (BYDV) will increase significantly. However, BYDV can be reduced considerably by using the Opti-Till® system to manage stubbles and eliminate the 'green bridge' effect. It also enables drilling to be delayed, but to do that with any degree of certainty you must be able to get the crop in the ground quickly, which means not having too many operations before sowing.

Last night's 2.4mm of rain was just enough to make conditions perfect for the Claydon Straw Harrow, a simple, robust, fast, and very effective stubble management tool with many uses. Operating at 15 - 25km/h, it is equipped with sprung steel tines which vibrate rapidly to break up straw and expose chopped crop residues. They also create a 'boiling' action which uproots weeds and volunteers, as well as destroying slugs and slug eggs. An additional upside of the hot, dry conditions has been that slugs have had a very tough time and have been unable to breed, so we will not have to worry about them this season.

The Straw Harrow creates a fine micro-till in the top 20-30mm of soil, providing ideal conditions for rapid germination of weeds and volunteers, which can then be raked out and destroyed with another pass before they become established. When glyphosate is eventually applied, it is as a single, full-

strength dose prior to drilling, which maximises its effectiveness and reduces the risk of weed resistance

Even during a prolonged dry spell and high summer temperatures the difference between harrowed and unharrowed soil is clear. Unharrowed soil is hard and baked with shrinkage cracks; soil that has been harrowed has a crumbly, fine tilth and crop residues have been broken into small pieces.

20-Year Anniversary

This harvest marked 20 years of establishing all crops on the farm using only Claydon Opti-Till® products. These consist of the Straw Harrow, occasionally the TerraStar® light rotary cultivator where slightly more soil movement is required, together with the Claydon direct strip seeding drill, followed by the TerraBlade inter-row hoe.

My last article for Direct Driller mentioned that our crops were showing exciting potential, and they certainly lived up to expectations. That was a pleasant surprise given the lack of rain and the fact that we backed off on the nitrogen due to concerns that it would not be fully utilised in the dry conditions. This was a good decision, made easier because we only grow feed wheats. Winter wheats received 190kgN/ha, 50 - 60kgN/ha less than our normal 240-250kgN/ha, and oilseed rape a similar amount, again less than normal.



In a couple of small areas where nitrogen was missed when applying it through our 36m self-propelled sprayer, for which I can only blame myself, the yield plummeted, highlighting the importance of this major nutrient. Without fertiliser and agchems yields would quickly regress to 1970s levels, around 30cwt for barley and 2 tons per acre in 'old money' terms, or 3.7t/ha and 5t/ha respective in modern parlance.

The key difference between the 1970s and now is that there are more mouths to feed. According to the Office of National Statistics the UK population was 56,226,000 in 1975, it rose to 65,110,000 in 2015 and is projected to hit 69,444,000 by 2025. Should we therefore be concerned about the dramatic curbs on nitrogen use currently being proposed by the governments of The Netherlands and Canada?

Fungicide programmes were maintained at normal levels because these products more than cover their cost through increased yield. Past experience has shown that if yellow rust or other foliar diseases take hold significant yield potential has already been lost by the time the signs become visible, far outweighing the cost of an effective treatment programme..



Harvesting wheat on the Claydon Farm with the 12m Claas Lexion 600 Terra-Trac.

Good drainage increases yields

Drainage is very important to get the best from our heavy clay soils and in a couple of areas where the old tile system had broken down a significant reduction in yield was apparent. One 12ha area produced 7.78t/ha, compared with over 9.5t/ha in the adjacent field, an overall loss across that small area of around 25 tonnes, so correcting the problem was a priority.

Dry weather allowed local drainage contractor W. R. Suckling & Sons to install new plastic pipes 1m deep across a total of 40ha in various fields. Some was done in the spring, some through rape stubble, and we will mole drain across these areas when conditions allow. Land is far too valuable to have it underperform, and this investment should maximise its potential by increasing yields.

The dry spring and summer, combined with the use of a Claydon TerraBlade inter-row hoe meant that our crops were the cleanest I have ever known, with no spring-germinated blackgrass. I am delighted with the results of the 2022 harvest, high yields underlining the benefits of establishing deep rooting structures which enabled crops to make best use of available moisture. Having recently invested in a new weighbridge we know that the yield information is precise and have posted it on the Claydon website (claydondrill.com).

Those of you who have visited the Claydon factory will know the 16ha field to the right of the access road. The winter wheat there yielded just over 10t/ha, while the average across our whole IACA registered area was 9.54t/ha, with higher-than-average hectolitre weights. Given the lack of rain and 25% reduction in nitrogen use those are both excellent figures.

Hybrid oilseed rape provided a similarly pleasing result. DK Excited, which was drilled at just 2.7kg/ha using a pre-production version of our new Claydon Evolution drill, averaged 3.84t/ha, with one field producing 4.2t/ha. Given that the crop



The new 9m mounted version of the Claydon Straw Harrow is seen here working in '80-acre', a field which has been managed using the Claydon Opti-Till® System for 20 years, after the previous crop of LG Skyscraper winter wheat had been harvested. Following 2.4mm of rain overnight the lack of dust was noticeable, even at 25km/h!



Conditions were perfect for the Claydon Straw Harrow to create a micro-tilth which will encourage rapid germination of weeds and volunteers. These can then be raked out and destroyed with another pass before they become established.



Oilseed rape stubbles were Straw Harrowed in July to create the ideal conditions for weeds and volunteers to germinate once rain arrived.

had to contend with very dry weather, some pigeon damage, and small areas where cabbage stem flea beetle had attacked, these yields are exceptional. With very low establishment costs, a low level of fungicide use, and just 190kgN/ha the margin will be very attractive.

Spring oats put in a surprising performance and are destined for use in a range of gluten-free products such as breakfast cereals and oat milk. We drilled the new Elsoms variety Lion directly into stubble which had been Straw Harrowed using a seed rate of just 100kg/ha and the crop subsequently received a total of 100kgN/ha in two equal splits.

A Claydon TerraBlade inter-row hoe took out any grassweeds growing between the band-sown rows before they had a



Land on the Claydon farm shows none of the deep cracking evident on some nearby farms where conventional cultivations are used, as can be seen in the photograph below. The layer of chopped straw and crop residue on the surface after the Straw Harrow has been used protects the soil and locks in moisture, encouraging weeds and volunteers to germinate. The soil is perfectly prepared, creating a stale seedbed ready for drilling the next crop.

chance to develop and compete with the spring oats, so the crop looked clean throughout. Given the season's challenges I was very pleased that it averaged 6.11t/ha, which was slightly below the 7t/ha from last year's crop of WPB Elyann (KWS) but that had much more favourable growing conditions. We will be drilling Lion again in 2023, as 25% of the farm will be into spring oats, 25% oilseed rape and 50% winter wheat, all first wheats.



Part of the new Claydon clear-span building which will provide additional manufacturing capacity to meet global demand for the company's range of Opti-Till® products.

Current conditions are the polar opposite of those last year, when there was plenty of moisture in the ground during August, but September was quite dry. With the ground currently bone dry we are waiting for significant rainfall to provide some moisture, so everything is currently in a state of limbo. The soil temperature is much higher than at the same time last year, so I am not too concerned that oilseed rape has not been drilled; it is much better to wait and sow into moisture than have the seed sit there doing nothing.

Our own land is showing none of the deep cracking which is evident on some nearby farms where conventional cultivations and establishment protocols are used, nor do we have deep tramlines which will take time and money to put right. In contrast, our fields are level with a layer of fine tilth and crop residues on the surface which will protect and insulate the soil, providing perfect conditions for drilling when we do get some rain.

With Claydon customers saving up to £250/ha on establishment costs by using the Opti-Till® System demand for our products from farmers throughout the world is at record levels, so I am delighted that our new 36m x 36m clear-span building is almost finished. We have managed the build project in-house but, due to difficulties in getting contractors, progress has been slower than anticipated. The concern now is finding enough additional staff to fill the numerous vacancies that we have to offer so if you know of anyone who might be interested in a role please ask them to contact us! When complete the new facility will double our production capacity.

Just before harvest, accredited master thatcher Harry Roberts of Harry Roberts Thatching Services finished replacing the roof at Gaines Hall, our Grade II listed 16th Century farmhouse. After 44 years' service it was rethatched using wheat straw grown by Harry using the heritage wheat variety Maris Widgeon, drilled using a Claydon drill. We are delighted with the results.

SCAN ME



Scan from your mobile
and sign up for a demo

sky-agriculture.co.uk



Distributed by **OPICO**

EasyDrill



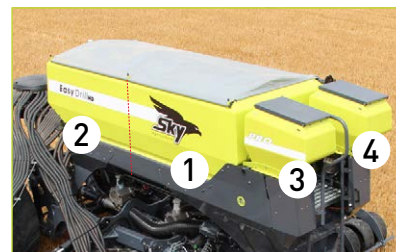
THE FUTURE OF ESTABLISHMENT

Designed for perfect seeding in no-till, min-till & conventional establishment systems making it the most versatile drill on the market.

- Up to 4 separately metered hoppers
- Unique tandem seeding line
- Separate air circuit for grain and fertiliser
- Blockage sensors for both air circuits
- Up to 250kg coulters pressure to ensure correct seed placement in any system
- Fully adjustable press wheel pressure to suit soil / weather conditions
- Low hp requirement (from 35hp/m)
- ISOBUS ready



Versatile



4 hoppers / 2 depths

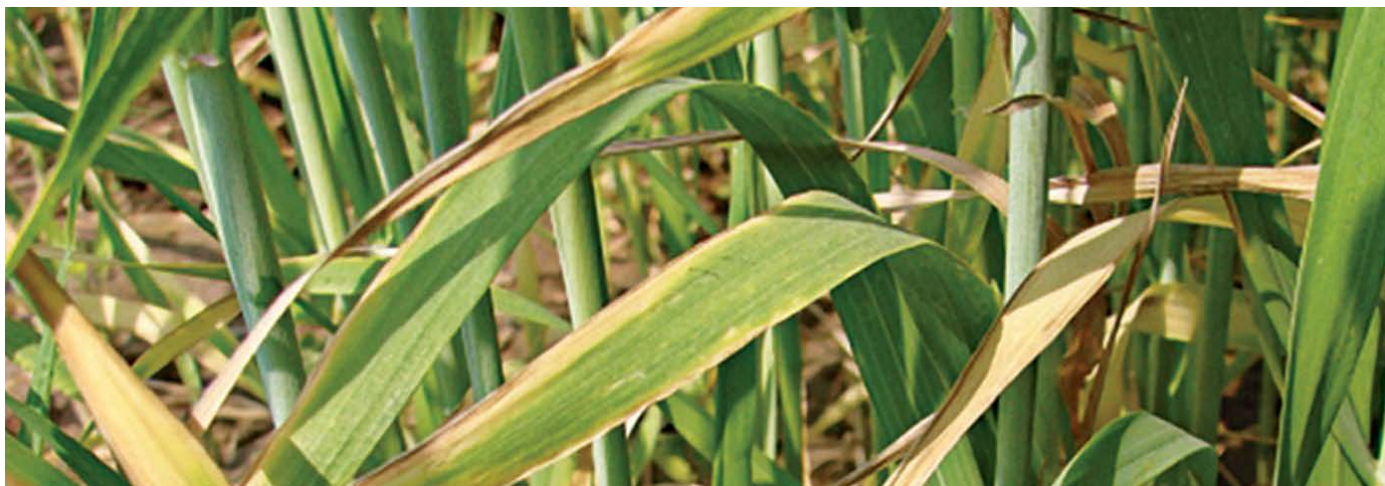


2 separate air circuits



Tandem disc coulters system

No-till • Min-till • Into Cover Crops • Conventional



ROBERT PLUMB DISCUSSES **BIOLOGICAL FARMING**

BIOLOGICAL Farming, with the help of natural soil bacteria and Fungi, is growing rapidly and in the current crazy climate there is more and more interest - after all, we can now use these little bugs to provide Nitrogen, Phosphate and now Potassium. There are also products that will stimulate root growth and help to reduce disease pressure.

Written by Robert Plumb

I have been working on the Biological side of farming for 20+ years; before that, I was a fertiliser blender in mainstream agriculture, so over the years I have seen a few changes, not least the demise of companies like ICI, Fisons, Albright & Wilson and lots of others.

In those early days when fertilisers were made more commonly available, many fertiliser companies took soil samples and simply recommended their products. It was very confusing for farmers as the soil results given used a range of different laboratories many using different extraction methods. This meant the farmer could not easily compare results.

In the early 70's the ADAS (then based at Cambridge), asked for a meeting with these fertiliser companies that included ICI, Fisons (now Norsk Hydro) and about 15 other companies plus advisors; they then worked on an extraction method for a common soil analysis.

Now bear in mind these people were there to sell fertiliser. The idea of replacing what you take off came later and sounds very good but is it really necessary? Little notice was made for the use of manure, and compost was unheard of. At that time fertilisers were

quite cheap and a rule of thumb was a tonne of Nitrogen was about the same price as a tonne of Wheat, ie about £20. In fact, most compounds were at a similar price and Phosphate even qualified for a subsidy, as did all lime materials.

It was a pretty simple system and it certainly sold a lot of fertiliser. But was it really necessary? Many of our long-term friends have not applied any P or K fertilisers - other than a bit of compost, for a very long time (20 years plus) and their soil levels are pretty much the same as when we started, and yields have been OK. They are not trying to grow maximum yields but do they actually make a profit?

Levels of K go from low to high

Potassium (K) is extremely important for crop health and yield and at Soil Fertility Services we like to monitor the plant response with regular plant samples. We found that last season's K levels - in all crops, were extremely low. No surprise from a dry soil. With plants unable to pull it off the clay particles and exchange sites, we are now being told that straw K levels were high! Potassium is important as it helps a plant to regulate water

uptake and the opening and closing of the stomata; it is also critical in producing proteins and most wheat protein levels have been low.

Plants actually need similar amounts of Potassium as they do Nitrogen. This could be up to 200kg. I have never seen one with that level of Potassium at the main stem extension period, but now we may be able to help.

We have developed a K fixing product. Similar to the N Fixing product Bio-N, the beneficial K fixing micro-organisms will release around 50kg of K from your soil's "locked" up reserves, directly into the rhizosphere where your plant system can easily take it up. It may take two applications of 10 litres to provide all your crop's needs, but it will surely help to overcome the problem of Potassium shortages.

We have been measuring 'total Soil K reserves' and find between 6,000 and 10,000 kg/ha in the top 10cm (4") of your soil. Most of this K is in the lattice of the clay particles and is considered 'unavailable', but we can easily find 200 - 300 kg on the surface of the clay fraction that can be made available to your crop with the help of the Bio-K.



2023
harvest season
is now open!

Bon appétit

Now serving healthier soil and profit for 2023.

Start improving your soil's health and increase your profitability
for the 2023 harvest season by joining our soil carbon programme
– now open to all and serving your area!

AgreenaCarbon is accredited internationally to quantify, validate and
verify your greenhouse gas reductions and how much carbon you store
in your soil through climate-friendly farming practices.

You receive a carbon certificate for each tonne of emissions you remove.
You can then decide whether to keep or sell your certificates.



Sign up for free today and you could be earning up to
three certificates per hectare at £20–£40 per certificate.
The more you transition, the more you earn.

Simply scan the QR code to get started!

Agreena

www.agreena.com

GROUNDSWELL 2022

Farmers and growers flocked to the sixth annual Groundswell, the UK's largest regenerative agricultural show in late June this year. It was another sell-out event with 5,500 attendees who travelled to North Hertfordshire for two days of information exchange, inspiration and a bit of liquid refreshment during the worst drought since 1976.

Written by Alex Cherry

With over 140 sessions to attend, Groundswell offered a platform for household names, technical experts, experienced regenerative farmers and leading researchers to explore and debate the issues, opportunities, science and practices around regenerative agriculture. The event has grown from 500 farmers in a barn in 2016 as the "No-Till Show" to the two-day "Regenerative Agriculture Show and Conference" that it is today. Although, one commentator referred to it as a "Festival of Ideas" which perhaps seems more appropriate given the scale and breadth of content.

The eve before Groundswell is always exciting as people begin to arrive from all corners of the UK and beyond, pitching tents and getting the lay of the land. It is a chance to catch up with old friends and make new acquaintances in The Earthworm Arms Bar, where there were some enticing foodie offerings including different Pasture for Life meats cooked over fire. Dr Doolittle took to the decks and blasted out some disco classics which had mixed reviews from the audience, although a loyal cohort in Hawaiian shirts kept the energy going. The camping area soon filled up with around 750 campers with all shapes and sizes of tents and campervans.

On Wednesday morning Jill Clapperton kicked off proceedings in the Big Top tent, followed by Greg Judy advising farmers "How to think like a Grazer". Across the 8 different session venues it was tough deciding what to go and see. Before the midday session a tribute was made to Caroline Drummond MBE, recognising her incredible achievements of 30 years leading LEAF, before her tragic passing in May.

Henry Dimbleby provided a one year update to the National Food Strategy and Dwayne Beck from South Dakota asked "Are We Doing The "Right Things" Or Only Doing The Wrong Things Better?"

Billy Lewis was announced as "Mixed Soil Farmer of the Year" and David Miller as the "Arable Soil Farmer of the Year" in the awards organised by Farm Carbon Toolkit. Tom Martin ran a very honest session entitled "Learn from My Mistakes", a forum which was appreciated by the audience.

The guest speaker that seemed to be on everyone's tongue was George Monbiot who presented a well rehearsed

synopsis of his latest book "Regenesiis". The audience were broadly welcoming of this polarising debate on the future of food. It posed some difficult and highly-referenced points to disrupt the assumption that Regenerative Agriculture is the answer to feeding the planet. As a festival of ideas, it is important to challenge everything. It was noble of George to attend Groundswell, although it would have been even even more impressive had he stayed on for a couple of drinks in the Earthworm Arms to listen to some of the pioneering regenerative livestock farmers he rallies so strongly against..

Professor Lennart Olsson from Lund University in Sweden provided a fascinating update on the progress of the radical "perennial revolution" that the Land Institute and their global network are working on.

After a stimulating and hot day, unsurprisingly the Earthworm Arms bar became the focal point for further in-depth analysis and discussion. The beer was brewed in part by surplus bread from Toast Ale and brewing enthusiasts headed to the tour at Crossover Blendery where the beer is spontaneously fermented and flavoured by the fruit growing in the agroforestry on the farm.

As the sun set, attendees got stuck in to some serious shape throwing on the dancefloor to the groove of funk and soul from DJ Krinks and, in the campsite, history was made as the first Groundswell marriage proposal took place and a happy couple announced their engagement, fittingly on the anniversary of their first embrace at Groundswell 2021. We look forward to the first Groundswell wedding in 2023!

Despite a few sore heads and one speaker declaring memory loss from the antics in the early hours, Thursday's sessions kicked off with stimulating questions proposed: "How is big business adopting regenerative agriculture?" And "Does it make financial sense to go Regen?"

In the Demo Field the line up of manufacturers showcasing their direct drill machines included Weaving, Sky, Dale, Sam Agri, Horsch, Novag, Kverneland, Ryetec, Tuckwells, Amazon, Primewest, Claydon and Horizon. The ground was very dry and the cover crop was bulky with rye

volunteers and weeds. As a case study of an innovation born from a meeting at Groundswell, Small Robot Company and Tuckwell's demonstrated their Treatment Maps Partnership - Tom robot can identify individual weeds in the field and also provide accurate plant counts in a growing crop, whilst also giving an accurate assessment of leaf colour and biomass assessment. This is converted into shape files readable by the sprayer which targets problem areas rather than applying a blanket application to the field.

Defra Secretary of State George Eustice was joined on stage by: Minette Batters, tenant farmer and NFU President; Baroness Natalie Bennett, former leader of the Green Party; Tony Juniper, Chair of Natural England; in a panel chaired by Baroness Rosie Boycott, journalist and publisher. Commenting on the show, Eustice said "It's amazing to see such creative thinking, new ideas being pioneered, new agronomic techniques and indeed, the rediscovery of old ones."

Elsewhere in the programme speakers tackled practical issues such as 'do potatoes have a place in regen systems?', 'Improved Nutrient Management with Zero Carbon Fertilisers' and 'the threat of weeds for regenerative agriculture.'

Hosts John and Paul Cherry led a group to move the mob of beef shorthorns for the last session of the day with Greg Judy providing a refreshing and entertaining commentary on proceedings.

We hope the show is re-energising and stimulates new ideas in this fast changing world we live in. If you missed some of the sessions in person, you can watch nearly all of them on the Groundswell YouTube channel. If you have an idea for a great session for next year applications are accepted via the Groundswell website. We're busy planning already, looking to expand on the offering for small-scale regenerative farmers, new entrants and market gardeners, while not forgetting the retail sector. We are also asking exhibitors to state what they are doing to support Regenerative Practices when they apply for a stand. We hope the show can continue to bring together a forward thinking community whilst regenerative agriculture becomes more widespread within the UK farming industry. Make sure you have the dates in your diary - 28th and 29th June 2023.

**PRACTICAL
FARM
IDEAS**

Subscribe today

use the
QR code



Made it Myself Workshop Projects in Issue #121

- Buckrake:** A transport frame carries what the forage harvest team needs.
- Slurry:** A hydraulic powered tower slurry stirrer based on a telehandler arm
- Logs:** stored in modified potato boxes - stackable, easy unload modification
- Salt gritter:** uses Vicon spreader with ground wheel drive trailer towed by panel van
- Seed drill:** Drawbar extension makes tight turns easy
- Grazing:** Grant aid under Sustainable Farming Incentive. Chain Harrows vs Aerators vs Sward Lifters.

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

FarmWalk: shows a 500 acre arable farm transformed to regenerative

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

No advertising, all editorial. 48 pages. Four issues per year. Published since 1992

www.farmideas.co.uk • info@farmideas.co.uk • www.farmideas.co.uk/subscription.html



Soil+Cover Cropping International



OUTCAST V2 - Wider Slug Protection



- ✔ 24m – 36m options
- ✔ Fits to all sprayers
- ✔ Hydraulic fan
- ✔ GPS speed sensing option
- ✔ Compatible with some cover crops
- ✔ Front rear or side mounting
- ✔ Headland or sectional control

GROUNDSWELL CATCH-UP

Are we doing the "Right Things" or only ...

Watch later Share

Groundswell
22nd & 23rd June 2022

Are we doing the "Right Things" or only doing the Wrong Things Better?

Dwayne Beck

....

The End is Nigh, The End of Nitrogen - ...

Watch later Share

Groundswell
22nd & 23rd June 2022

The End is Nigh, The End of Nitrogen

Alastair Leake, Tim May, Martin Lines & Dominic Amos

....

Growing and using your own woodchip ...

Watch later Share

Groundswell
22nd & 23rd June 2022

Growing and using your own woodchip for on farm use

Ben Raskin

....

Ian Pigott in Conversation with UK No-T...

Watch later Share

Groundswell
22nd & 23rd June 2022

Ian Pigott in Conversation with UK No-Tillers

Ian Pigott, Ed Horton, Chris Hollingsworth & James Goodley

....

No-till & Regenerative Farming in Finlan...

Watch later Share

Groundswell
22nd & 23rd June 2022

Notill & Regenerative Farming in Finland

Jussi Knaapi

....

Drought Tolerant Swards, Herbal Leys &...

Watch later Share

Groundswell
22nd & 23rd June 2022

Drought Tolerant Swards, Herbal Leys & Approaches to Grazing

Peter Cheek, Gillian Preece, Rob Richmond, David Cross & Jerry Alford

....

AVACAST GR Get Back Control



Machine Key Features:

- ✓ Electronic rate control
- ✓ Trailed, Mounted, Drill or Roll options
- ✓ 200L, 400L & 1200L hoppers
- ✓ High capacity hydraulic fan
- ✓ 0.5m nozzle spacings (no drift)
- ✓ Metering unit designed for Avadex
- ✓ Also apply OSR or slug pellets

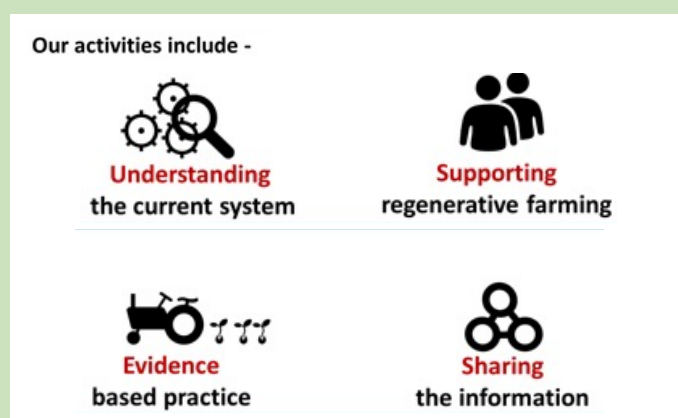
FIXOURFOOD

TRANSFORMING FOOD SYSTEMS IN YORKSHIRE

This year the University of Leeds has launched a project researching regenerative farming systems in Yorkshire. This project is part of the FixOurFood programme led by the University of York, funded by UK Research and Innovation, a government fund to support research to investigate ways to transform the UK food system. As the challenge to address the food system nationally is so large, the FixOurFood project is focusing on Yorkshire as a pilot region to explore regenerative approaches that could be scaled to the UK and beyond. The project focuses on three areas of innovation 1. sustainable and healthy food for children, 2. hybrid business models and 3. regenerative farming systems.

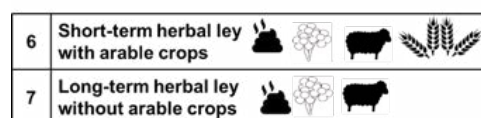
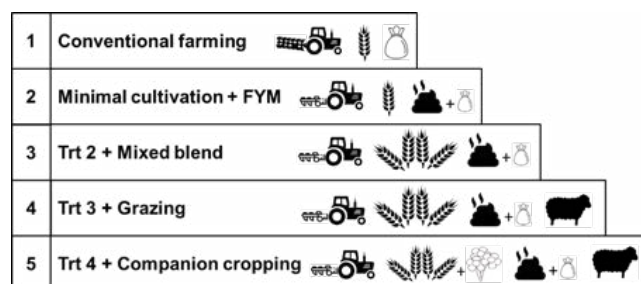
Researchers from the University of Leeds Prof Lisa Collins, Prof Steve Banwart, Prof Pippa Chapman, Dr Gesa Reiss and Dr Ruth Wade, are leading the regenerative farming systems research in Yorkshire. Yorkshire has a large variety of farming systems, containing 13 – 17% of the UK's crop production area and 10 – 14% of the UK's livestock headcount, with a large diversity of soil and land cover in the region and an established network of innovative farmers. This makes Yorkshire a ideal place to investigate and understand the complex dynamics of farming systems. Together with key networks and alliances, the team at the University of Leeds are exploring existing examples of regenerative farming in the region, identifying the limiting environmental, social and economic factors, and discovering practical steps needed to support shifts towards regenerative farming. The research group will then determine what the regional potential is for implementation, and if regenerative agriculture could contribute to combat global warming if scaled up nationally.

Earlier this year, they released a survey to ask farmers what the University can do to support regenerative farming. Four key areas were identified which will be the focus of the project going forwards.

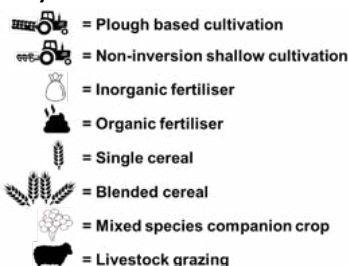


From this survey they also sought to understand the opinions, opportunities, current activities and challenges associated with regenerative agriculture. To date, they have received 166 responses, 147 (89%) said they were farmers and 79% from England. Responses came mostly from those already practicing elements of regenerative agriculture, with the majority of participants stating the main aim of regenerative agriculture was

to 'improve soil quality and fertility' and the main motivation to move towards regenerative practices was to 'improve soil health'. Most participants were using cover crops and direct drilling, and were most interested in reducing agrochemical inputs and increasing diversity in arable rotations. They felt the biggest challenge of moving towards regenerative agriculture was the 'lack of information on good practice', 'lack of evidence' and concerns over 'reductions in yield'.



Key



To support evidence-based practice, the University of Leeds is using its 317ha research farm to trial and test regenerative farming practices. The University of Leeds farm has been developed as a digitally connected smart-farm and terrestrial observatory. The main activity is a field-scale, replicated experiment using a historically conventionally managed field and measure the impacts of different transitions to regenerative agricultural practices on the soil, crop, greenhouse gas emissions and profit. This trial is in collaboration with NIAB whose Northern Regional Centre is based at the University of Leeds

farm. The trial has been designed with advice from researchers and farmers from Yorkshire with seven treatments that range from a ploughed-based conventional farming system, through to significant changes in rotation and the inclusion of grazing livestock.



The experiment began last month but prior to any cultivations, Dr Ruth Wade led a team of researchers to collect baseline measurements of the soils current physical, chemical and biological status. The farm is on fine loamy soils (Aberford Series) and the team collected soil samples at 10cm intervals down to a depth of 50cm. These soil samples are currently being analysed in the lab for measurements such as soil structure, aggregate sizes, water holding capacity, carbon and nitrogen content. Throughout the trial, researchers from the project team will be measuring the impacts of the different transition approaches on soil health, crop growth, agronomy, greenhouse gas emissions, and economics. Soil sensors and automated greenhouse gas measurement chambers will be installed in the experimental plots to collect real-time high frequency measurements. In addition to collecting data, the trial will be used as a regional demonstration platform for farmers to view and discuss different management practices, and the learnings and outcomes will be fed back to the larger FixOurFood programme policy and governance team at City University.

We know from experience that soils must 'earn' the right to be direct drilled, which in practice means resolving any existing soil health issues before switching to a direct drill system. The soil assessments carried out by the researchers indicated that the historic intensive cultivations and high field traffic have caused soil structural issues that needed to be addressed. Therefore,



the treatments transitioning to regenerative agriculture have received a non-inversion, shallow cultivation in the first year to alleviate the soil structural issues, whilst beginning the transition to regenerative management. Drilling will be carried out using a Ryetec MAAG SSP Direct Drill as it is a flexible machine allowing us to drill effectively across the range of cultivation treatments with one drill.



Pig manure was supplied by the University of Leeds National Pig Centre (based at the University of Leeds farm) and was spread on those plots receiving FYM using the Morley Agricultural Foundation small plot manure spreader that allowed the farmyard manure to be applied at a specific rate and only to those plots that required it.

Companion crops and herbal ley seeds were broadcasted and rolled, and the establishment of winter wheat single varieties and winter wheat blends will happen in the autumn.

We will continue to monitor and report on the project, if you would like to know more information or sign up to the newsletter please contact us through the FixOurFood website <https://fixourfood.org/>

There are many farmers in Yorkshire exploring different management practices and we hope that this project is the start of a significant effort to support farmers in the region.

Dr Ruth Wade, University of Leeds

Dr Joseph Martlew, NIAB

SMALL ROBOT CO LAUNCHES ROBOT SERVICES TO 50 FARMS THIS AUTUMN

A major milestone for our small robots: our Tom monitoring robots will be set to work this Autumn. 50 farms will become home to our sustainable robots, delivering our first services for Per Plant Farming: applications by exception.

These autonomous scanning robots will help farmers make informed decisions on how to take action, cutting herbicides and fertilisers. Co-designed with 35 farmer advisors and trial customers, including the Waitrose Leckford Estate, the Sainsbury family Lockerley Estate and the National Trust Wimpole estate, we are excited to see our technology in action commercially this growing season.

This is a big step forward in delivering real value to farmers. Partnering with leading John Deere dealer Tuckwells, we have integrated Tom's treatment maps with existing precision sprayers, saving around 77% of herbicide, and estimated 15% fertiliser savings. This will help farm businesses become both more environmentally and financially sustainable.

Transforming farming at the plant level

We see our bigger picture mission as helping farmers feed the world whilst regenerating the planet. Through the creation of a new farming model 'Per Plant Farming', we are making it possible to give farmers the confidence to only take action when it is required.

Working with farmers to transform the system from the plant level, our

sustainable farming robots Tom, Dick and Harry bring an entirely new way of farming. Using robotics and AI, we autonomously monitor and treat each crop plant. This means problem weeds can be targeted individually, as opposed to the whole field.

This new model enables a highly precise approach to farming, which today is more important than ever before, as farmers face the volatility of the industry. Farmers are under increasing pressure, with input costs on the rise. Research from Harper Adams shows that up to 90% of inputs are wasted. This is not economically or environmentally viable.

Robotics gives huge scope to close the gap: delivering applications by exception. Precision monitoring alone can provide immediate value, optimising existing sprayers for herbicide and fertiliser applications. But we believe that's just the tip of the iceberg in terms of the potential for what per-plant farming can deliver, both in input-cost savings and yield enhancement. Ultimately, input costs and environmental impact will be significantly minimised.

Commercial Service Launch

Our first commercial robots will soon be seen scanning across fields this 2022-2023 growing season. The service will optimise farmer's existing sprayer equipment to reduce costs and inputs. Per Plant Intelligence from our Tom monitoring robot means we treat only the problem areas: nutrient deficiencies, and weeds.

Scanning the field, our Tom robot builds an understanding of where every plant is and what each one needs to achieve optimal performance. The data that is collected is then processed and detected by 'Wilma', our AI Advice Engine. Wilma then creates treatment maps to advise farmers on the most appropriate action to take. This information is used to inform variable rate fertiliser applications and to spot-apply herbicides through nozzle control and sectional control sprays. This gives farmers the confidence to take action only when required or even make 'no spray' decisions.

The 2022 service is fully subscribed, with 2023 orders now underway. 50 farms have signed up to our 'Farming as Service', with groups of up to six



local farmers joining together to form a 'Pod' of 120 ha. They will share a Tom robot, committing a minimum of 20ha each. This means farmers can try out the service on as little as 20ha, without a costly machinery outlay. Each farm will receive 4 scans of their wheat fields during a season. The new service offering will target winter wheat crop count and Per Plant visualisation; weed detection, geolocation and per plant imagery; glyphosate treatment sprayer export; herbicide treatment sprayer export; and fertiliser treatment sprayer export.

The launch follows the successful on-farm trials on three farms during the Autumn 2021 to 2022 growing season to develop the service. These trials included Waitrose Leckford Estate and the Lockerly Estate, owned by the Sainsbury family. The trials covered 118ha, locating 446M wheat plants in which 4.6M weeds were identified.

Precision weed control

The weed surveys conducted over the season by SRC highlighted the fact that a blanket approach to treating weeds is not only costly but often unnecessary. The surveys found that only a few areas were high in density: surprisingly only a few areas had weed density of more than weed/m². We then used this information to create



heat maps, meaning farmers can treat only the problem areas, precisely. Our service enables farmers to assess weed density information for no spray decisions, and to reduce herbicide use by around 77% at a conservative estimate, depending on weed density and distribution.

Optimising crop nutrition

Farmers can also assess crop health and performance, reducing fertiliser costs by around 15%, as well as optimising crop nutrition. These are achieved through a combination of data including accurately gauging green area index and plant populations. The radical change here is that our monitoring service now allows for application by exception, rather than blanket precautionary measure. By also being precise in

targeting weeds, our robots also help farmers protect biodiversity, preserving the natural environment, in particular strengthening soil health, which is essential to encourage optimal crop yield.

Longer term there is considerable potential for far greater savings. With rising fertiliser costs coupled with the industry attention on Net Zero, this has been in the spotlight, and is a strategic focus for our future roadmap. Fertiliser alone is a major contributor to agricultural emissions. This could have a huge contribution to reducing costs and carbon footprint, with no loss of crop productivity.

A robot's eye view

Tom's eight on-board cameras, mounted on a boom, deliver a ground sample distance of 0.39mm per pixel.

TRITON
SEED DRILLS



Looking for the next level in tine drill...You've found it

- Direct Drilling into stubble and Conventional Seeding
- Non inversion - surface tilth remains from year to year for weed control
- All seed types through one coulter, no adjustment required
- Low cost, Low maintenance
- Vertical loosening to 180mm for air, drainage and rooting to increase rhizosphere biology/nutrient availability and tillering
- Patented seed depth bar and slot closure system giving unique seeding ability in all weathers

www.tritonseeddrills.com

[@tritonuk](https://twitter.com/tritonuk) 01223 891888

Abington Farm Park, Great Abington, Cambs CB21 6AX

Among the highest resolution of any crop-scanning technology, this gives Tom the capability to see individual water droplets on leaves and early signs of disease outbreak. SRC's Tom monitoring robot scans the crop to a level of detail that identifies individual plants, gathering data on plant and weed distribution to determine the optimum treatment path. Tom will accurately geolocate and analyse data on every plant in the field. Tom can successfully identify all the wheat plants, determining precise plant counts, as well as broadleaf weeds. With a survey speed of 2.2ha/hr, Tom gathers 15,000 images from its cameras, or 40Gb of per plant intelligence, for every hectare.

Tuckwells partnership

To develop the sprayer integration we partnered with Tuckwells, one of the UK's leading John Deere dealerships, which has a focus on industry-leading design and technology. In trials completed last spring, we created a treatment map for Tuckwells', covering a 14.5ha field in Suffolk, achieving a 97% saving of an early spring herbicide. The trial data was run through JD's Operation Centre and the treatment map for herbicide in wheat supplied to a Mazzoti sprayer with individual nozzle control over its 36m boom.

The trial found that only 3% of the field actually needed to be sprayed (0.42ha), resulting in a herbicide saving of £24.48/ha. If the field had been treated with a JD R962i sprayer with 3m sectional control, it would have sprayed 13% of the field area, saving £21.96/ha. Another advantage for farmers is knowing how much will need to be applied before filling up



the sprayer – what is put in the tank is what you use, nothing will be wasted.

"We've been looking for the next innovation in precision application of herbicides and robotics seems to be the way forward," says George Whelan, Tuckwell's Group Technologies Manager, who coordinates their new technologies.

"Weed identification is the key and the AI element is the most exciting part. We can use the data from Wilma to create an application map and deliver real in-field solutions."

Co-designed with Farmers

These results highlight the extensive potential for robotics within farming today. This will have a huge impact for farmers, reducing input costs, this in turn both increasing and optimising yields, whilst protecting the natural

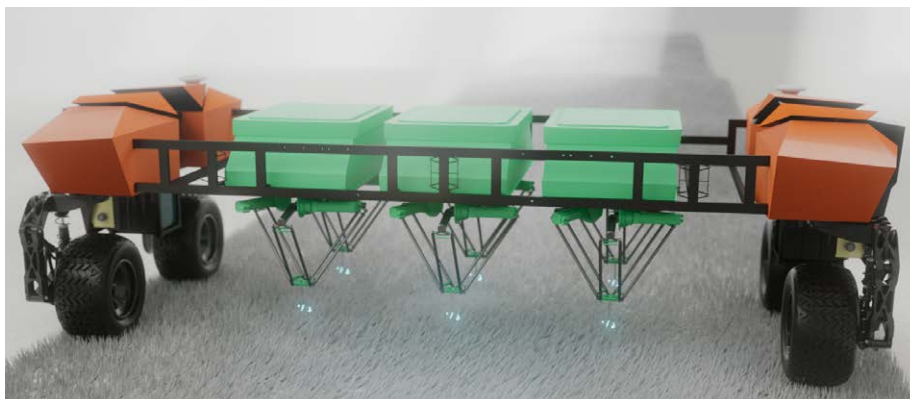
environment.

Our service is designed by farmers for farmers to create a farming system without compromise. Working with farmers to inform the developments of our technology has been invaluable. These close partnerships of more than 5 years with our farmer advisors has enabled us to accurately pin-point the challenges and pain points to tackle providing a wealth of information. The foundations of our service are based on the farmer; technology should not take control, but rather work in partnership with farmers.

Accelerating regenerative

We believe these systematic changes in farming today are crucial in progressing towards regenerative farming practices. Stewardship for our soil health and the natural environment today is essential to ensure future generations can produce high quality crops both profitably and sustainably. Now is the time for us to work together to create a more ecologically harmonious farming model. For farmers - rightly - to be rewarded for their efforts. Farmers are integral to the environmental solution.

We're excited to see our technology get to work on farms this season, but this is only the beginning. The potential is endless. Technological innovation will be a keystone in the Fourth Agricultural Revolution, and we're honoured that our small robots are part of this revolutionary change. Helping build the food system of tomorrow.





Leave something to be proud of. That's the Mzuri philosophy

Our passion is helping farmers and landowners leave behind a landscape and industry to be proud of. Whether that be through greater financial security of the family business or ensuring a stable ecological environment that is fit to feed the future – we offer crop establishment solutions that make a real difference.

Call us today for a no obligation
chat about the future of farming.



tel: **01905 841123** web: **www.mzuri.eu**

Mzuri Limited, Springfield Farm, Peopleton, Worcestershire, WR10 2BF

mzuri

FUTURE PROOF FARMING

FARMER FOCUS

CLIVE BAILYE



Power Corrupts

There are two occasions in my farming year that remind me of the anticipation and trepidation felt as a child when my exam results or end of term school report were received. The first is of course harvest, yields being the score card for the team effort of all involved in every part of the growing process. As the loads roll in and pass over the weighbridge filling barns we reflect upon what we got right and what we got wrong in the seemingly never-ending, life long quest for growing perfection that only a farmer can ever understand. It is this that drives, innovates and motivates never ending improvement for the next year.

The reality however is we are all, mostly, out of control of the yield outcome. That "goldilocks" year of not too wet, not too dry, not too hot or not too cold rarely, if ever, comes and there is always something that could have been done better or at different timing with the benefit of hindsight.

This year I suspect many will be reflecting upon agronomic decisions such as how different synthetic fertiliser rates and strategies have impacted yield (or not) or variety and input timing choice but in truth, what will have determined all our yields more than any other factor will be the soil we have and the weather we got.

The second set of results is the end of our financial year which runs with the calendar to the 1st of January and this is the really important set of results that reflect our management of the business and its ability to adapt to whatever season we are dealt, financial performance is something we have almost complete control over, our input /output buying and selling decisions, our labour and machinery spends and our agronomic strategy can all be adapted as inevitably weather and trading situations change.

I do say "almost" complete control however as there is nearly always something unexpected and an element of luck that could never be planned for or expected by even the most perfect of management business plan, that unexpected major mechanical failure or that out of the blue ill health or personal issue.



Yes that is me and a plough!



Getting bigger, power replaced the need for the plough

Whilst financial contingency for that unexpected breakdown can be budgeted for to some extent it's the latter personal and staffing issues that can be a lot harder to plan for and disruptive to workload, time cannot be easily bought, or can it?

For an arable farm to be profitable these days requires absolute focus on minimising fixed costs. Highly skilled operators are both one of the harder to find and more increasingly expensive resources for many farms. Larger machinery has provided great opportunity to reduce the need for so many to be involved in establishment, care and harvesting of crops and although larger, higher output machines are of course more expensive their cost is somewhat mitigated by the needs for far fewer of them to complete workloads in a timely fashion.

Regardless of a farms establishment strategy the trend to larger machinery has been common over the last couple of decades. At the start of my farming career our "big" tractor was a Ford 8240, which I think was just about 100hp. That tractor comfortably ploughed and established all our crops with a power harrow combination drill on around 250 arable acres we farmed at the time, I can't recall ever thinking we needed more power but did aspire to a 8340 or even a mighty TW model one day just "because" my neighbours had one. Vanity and ego can be an expensive aspiration for a young farmer as I would learn.

As acres farmed grew, labour became harder to find and justify, the tractors got bigger to pull increasingly wide cultivation and drilling equipment. Eventually power no longer seemed the limiting factor and traction did. The more powerful tractors had got a lot heavier the 270 hp John Deere 8410 we had "grown into" being more than twice the weight of that 90 hp Ford 7810 and despite big advances in tyre technology and large sizes somewhat reducing the damage to soils that weight can do tracks were the inevitable next step, first 8520T's and ultimately the pinnacle of BIG tractors at the time the mighty Challenger 875, all 25t and over 600hp of it!

Pulling the (very on trend at the time) Simba solo followed by a Vaderstad rapid cultivator drill it offered massive outputs vs that old 90hp plough / combi drill system, one man was comfortably establishing probably ten times the area that the



The ultimate big power at the time, the only way up from here was down

Ford 8240 was capable of. It came at a cost however and despite that x10 capacity of work I have a suspicion it may have had a cost in both capital and running costs that was more than x10 the 100hp system! Many large arable farms still run similar systems today, many will claim it's "cheaper" to do so quoting all sorts of nonsense about economies of scale and paying high rents or entering contract farming arrangements to justify the machinery. It rarely is however, and I will be honest, the main reason I had a 610hp tractor back in 2007 was really because I wanted a 610hp tractor..... I probably just made the rest and the numbers "fit". I don't think I'm the first or will be the last young and ambitious farmers to apply such warped logic to my thinking.

So, what problem does big solve? the answer is labour, "big" does buy time. The ten 90hp tractors needed to cover the same workload we had at the time would have required 10 skilled operators, skilled labour is hard to find on a seasonal basis and on a purely combinable cropped farm the labour requirement is for relatively small periods of the year. Fewer full-time staff equals less costs and less problems, easier management, fewer of the most unpredictable of variables, people.

However as is so often the case, as you solve one problem you create others. Power corrupts, it allows you to do things you probably shouldn't like to cultivate too deep or in conditions that you shouldn't. It changes mindset about what we need, writing this article I really find it hard to believe that just 20years ago a 100hp tractor was all we ever needed, it seems that once your goal post has been moved its hard to remember what was possible.

Power adds weight, lots of weight! combined with that ability to force work when conditions are not right that power can quickly add up to a lot of damage to soils, this damage needs cultivation to fix it and so the vicious circles begins where cultivation creates the need for cultivation, power requirement increases and costs spiral. This "hamster wheel" of tillage farming is very difficult to break and faced with solving that many are simply unable to accept that it is even possible to do so. For every no-till farmer I have ever met evangelical about the change to his soils and bottom line I come across a similar number of farmers, equally as convinced they have no choice but to cultivate, their soils are somehow "different", their farm is somehow "different", they are somehow "different". They may well be right, farming in the UK is anything but consistent and every farm is indeed different, there is no rule book on crop establishment and my advice to any farmer is do what works

and what you are comfortable with, only change if you either want or need to.

A good exercise for any farmer is to look back at what power levels they were using and felt they needed 20yrs ago on their soils and ask themselves if they could manage with that today? If for any other reason than increased workload the answer is not then something is wrong, your soil and your farm is not moving forward, and the situation is probably not sustainable, just maybe that is highlighting the need for change even if that change may not always be a comfortable one, maybe the need to change is greater than you realise?

Moving to direct drilling of course offers an alternative way to cut the labour fixed cost but this time in a very different way to the high horsepower route. By removing the entire operation of cultivation the hours required in the seat are massively reduced. This allowed us to get away from the painful costs of the big tractors and return to what has always felt to me like a much more sensible size and cost of versatile machines.

We began with a second-hand 4m direct drill and had a 240hp tractor pull it which was too big for that drill, the tractor size being based around where the best deals were and a power requirement to pull large grain trailers at harvest and facilitate move away from costly self-propelled sprayers to trailed alternative rather than dictated by high draft cultivators and drills.



A new kind of smarter big, efficient big not just big ego

The 4m drill successfully proved the no-tillage concept to us and was quite quickly replaced by a 6m version of the same brand that felt better paired to the tractor. Direct drills are much lower draft requirement than their min-till or cultivation counterparts. Wider row spacings means today we power a 12m direct drill with the same 240hp tractor, that gives work rates of up to 300ac a day possible if fields are large enough and logistics can keep up. It is a truly huge capacity way beyond that of any establishment system we ever had before, far more than we need in fact affording us the luxury choosing our timing, improving the agronomic prospects of the crop hopefully and importantly reducing our risk of failure due to factors beyond our control like weather. This time "Big" has bought us time whilst genuinely reducing fixed costs and not just moving those cost from the labour column to the machinery column in those important budgets and year end accounts. This time "Big" makes business sense and is no longer ego.

NUTRIENT USE EFFICIENCY STUDY

Multi-year soil health study measuring differences in nutrient availability

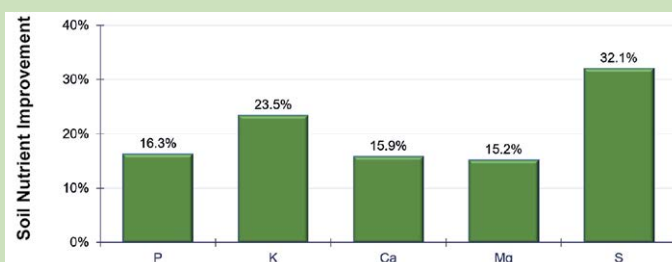
Over the past several years, agricultural industries have been focused on the Nitrogen(N) portion for improving soil and plant efficiency. However, we cannot forget the importance of the remaining primary, secondary, and micronutrients. This research report highlights how L-CBF not only capitalizes on N use efficiency but also unlocks the remaining primary, secondary and micronutrient abilities as well.

A Two-Year Study [2020 & 2021] measuring Soil Health, Overall Nutrient Use Efficiency, and Nitrogen Use Efficiency [QLF Agronomy. (2022). Soil health and nitrogen use efficiency study. RT6530, p.1] was accomplished at an independent research station near Martinsville, Illinois. QLF Agronomy Research compared a blend of 10% Liquid Carbon-Based Fertilizer L-CBF BOOST™ 4-0-3-2 S and 90% Urea Ammonium Nitrate [UAN 28%], as opposed to a full rate of UAN 28%.

Six-inch depth soil samples were acquired in a grid pattern before pre-emerged [broadcast] and side-dress [Y-Drop @ V4-5] fertilizer applications were utilized. Samples were retaken two weeks after the broadcast and side-dress applications [e.g., post fertilizer applications], thus were evaluated to the first set of soil samples exercising Haney's Soil Health Test Procedure.

Plant growth and development depends on their ability to sequester all mineral nutrients from the soil. Plants often encounter considerable challenges in attaining an adequate quantity of these mineral nutrients to meet the requirements of cellular progressions due to their relative immobility. Nutrient deficiency can also lead to reduced overall soil biodiversity since plants serve as the manufacturers that support most food webs. The four charts below validate how ten percent L-CBF BOOST™ inclusion with UAN 28% improved nutrient availability for plant growth and development while providing the soil microbes with biodiversity. Each graph exhibits that all mineral nutrient listed, beyond N, has surpassed nutrient efficiency over the control treatment, thus proving that L-CBF products have the necessary tools to compete effectively in today's high-demand agricultural sector.

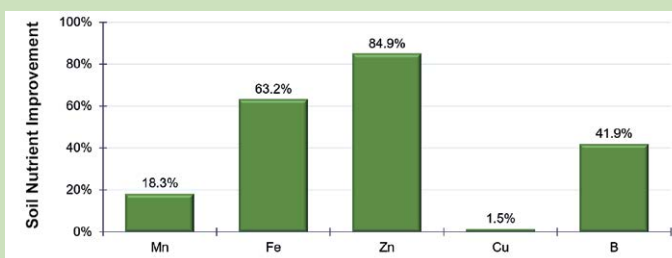
Results



Graph 1

Ten Percent L-CBF BOOST™ Inclusion With UAN 28%.

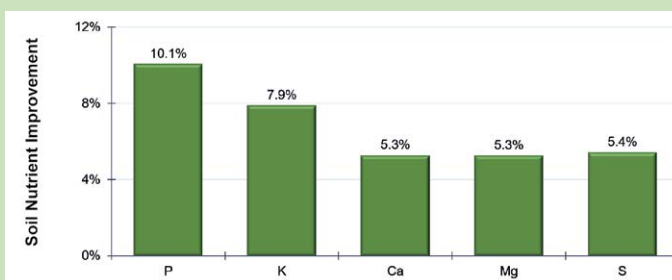
Pre-Emerge [PPI] Application of 36+4 GPA Compared to 40 GPA of UAN 28%. Two Year Post Mean [2020-2021], Martinsville, Illinois.



Graph 2

Ten Percent L-CBF BOOST™ Inclusion With UAN 28%.

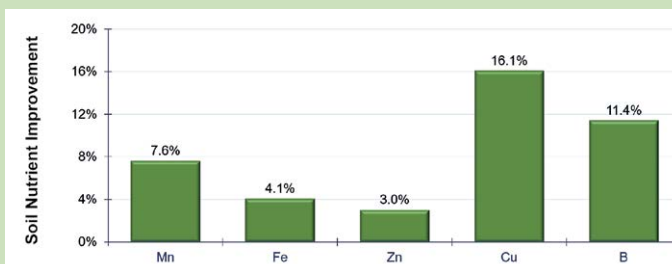
Pre-Emerge [PPI] Application of 36+4 GPA Compared to 40 GPA of UAN 28%. Two Year Post Mean [2020-2021], Martinsville, Illinois.



Graph 3

Ten Percent L-CBF BOOST™ Inclusion With UAN 28%.

Side-Dress [Y-Drop] Applications of 36+4 GPA Compared to 40 GPA of UAN 28%. Two Year Post Mean [2020-2021], Martinsville, Illinois.



Graph 4

Ten Percent L-CBF BOOST™ Inclusion With UAN 28%.

Side-Dress [Y-Drop] Applications of 36+4 GPA Compared to 40 GPA of UAN 28%. Two Year Post Mean [2020-2021], Martinsville, Illinois.

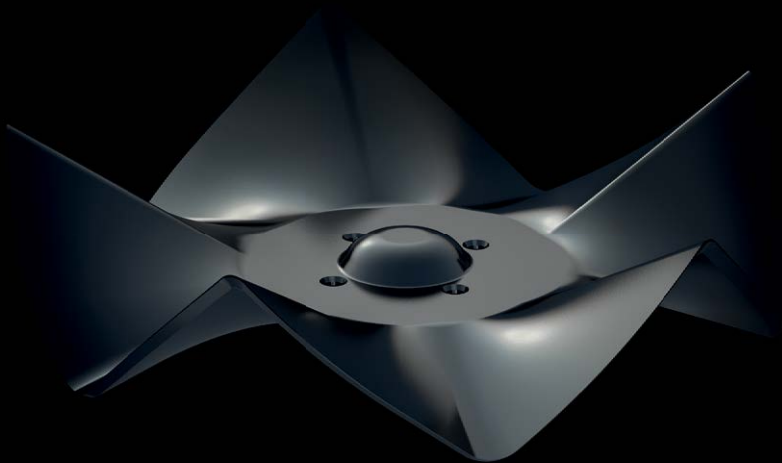


MACHINE OF
THE YEAR 2018

CrossCutter by Väderstad

Ultra-shallow tillage

Ultra-shallow tillage by Väderstad CrossCutter Disc provides full cut at only 2-3cm working depth. The unique cutting profile crushes, chops and mulches in one single pass. It is excellent in oilseed rape stubble, cover crops and grain stubble.



Learn how ultra-shallow tillage by Väderstad CrossCutter Disc will help give a perfect start to your next crop at vaderstad.com

— **VÄDERSTAD** —

DOES NO-TILL MEAN LESS **NITROUS OXIDE** IN THE ATMOSPHERE?

Reducing tillage could result in less production of a potent greenhouse gas, according to a study out of Penn State University.

Nitrous oxide, also known as "laughing gas," is the most important greenhouse gas after methane and carbon dioxide and the biggest human-related threat to the ozone layer. But is talked about less.

Nitrous oxide emissions from human activities have ballooned 30 percent over the past four decades. Although carbon dioxide has been responsible for about 10 times as much warming as nitrous oxide. But nitrous oxide is more potent: 1kg of the gas warms the atmosphere some 300 times more than 1kg of carbon does over a 100-year period. With Nitrous Oxide staying in the atmosphere for around a century after release. In arable farming N₂O is emitted naturally as part of the nitrification process it is a by product of the application of nitrogen fertilisers.

The paper that researched this is called "Tillage intensity and plant rhizosphere selection shape bacterial-archaeal assemblage diversity and nitrogen cycling genes" and was published in the journal "Soil and Tillage Research." You can read the whole paper by following the QR Code.

Abstract

We evaluated bulk and rhizosphere soils from two crop years (corn and soybean) of a three-year rotation of corn-soybean-small grain + cover crop. Soil samples were collected at three growth stages from corn and soybean plants and across three tillage practices that had been applied every year for 40 years. Tillage practices represented three levels of disturbance intensity ranging from no-till, to intermediate to high (plough) intensities. Bacterial assemblage diversity differed in soils having contrasting tillage histories and from bulk or rhizosphere soil (compartments), crop year, and

growth stage. Compared to ploughed and disc soils, no-till soils had lower abundances of denitrification genes, higher abundances of genes for dissimilatory nitrate reduction to ammonium (DNRA), and higher abundances of family-level taxa associated with archaeal nitrification and anammox. Soybean rhizospheres exerted stronger selection on bacterial-archaeal composition and diversity relative to corn rhizospheres. Abundances of N genes were grouped by factors related to weather, as well as management and soil compartment, which could impact activity related to denitrification and DNRA. Low intensity tillage may provide an option to reduce potential 'hot spots' or 'hot moments' for N losses in agricultural soils, although weather and crop type are also important factors that can influence how tillage affects microbial assemblages and microbial N use.

Notes from the Paper

Researchers ultimately found DNA evidence that members of families of bacteria capable of turning N into ammonium were more common in bulk no-tilled soil than in soils for minimum or high tillage. What is more, no-till soils contained fewer genes for bacteria known to create N₂O from nitrogen.

Conclusion

Results of this study suggest that minimizing disturbances to agricultural soils may provide an opportunity for reducing N₂O emissions.



AVACAST TWIN AIR - Black Grass Control



- ✓ 24m – 36m Avadex application
- ✓ Fits most sprayers
- ✓ Half width shut off
- ✓ Hi capacity Hydraulic Fan
- ✓ Dual metering units
- ✓ Also applies Cover crops & Slug Pellets
- ✓ Multiple outlets to give highly accurate coverage
- ✓ 450l Hopper
- ✓ NSTS compliant

**What if you could
simply create the
perfect seed bed?**



At Dale Drills we're as passionate about your soil as you are. As farmers we know just how vital good soil structure is to the health of your crop - locking in vital nutrients to create optimum conditions for sowing and growing.

Capable of drilling in direct, min-till and conventional seedbeds our versatile range

of lightweight seed drills have been made with exactly that in mind - promoting low impact cultivation that encourages minimal disturbance. Renowned for excellent contour following, accurate seed placement and a low power requirement, why not see how our drills can help your business fulfil its full potential?

daledrills.com info@daledrills.com 01652 653 326

DALE DRILLS

THE FUTURE OF EFFICIENT CROP ESTABLISHMENT

TRANSITION EXPERIENCES GIVE GROUNDSWELL GUIDANCE

Transitioning to more regenerative regimes hasn't been entirely plain sailing for three growers with very different soils and situations who shared their experiences at a packed Agrii Green Horizons seminar at this year's Groundswell.

All three no-till novices have found their journey over the past 6-8 years very positive and are increasingly profiting from moving less soil, protecting its surface, keeping roots in the ground and diversifying their cropping.

While their goals are very similar, the way the growers have gone about achieving them reflect clear differences in the balance each has to strike between long-term sustainability gain and short-term profitability need.

On his mostly light 160ha at Hawkmill Farm just to the east of Cambridge, David White's principal stakeholders are his family. This and his determination to 'wean himself off the comfort blanket of cultivation as soon as possible' led him to switch from full to no-till in a single, bold step in 2015.



David White

Since then, he has been experimenting at scale with a whole host of regenerative opportunities, including a vast range of cover cropping mixes and management methods; early drilling and a variety of OSR companion crops to combat cabbage stem flea beetle; and, most recently, bi-cropped beans and oats – both winter and spring.

At Revesby Estate near Horncastle in Lincolnshire, farms manager Peter Cartwright has been moving more steadily but very deliberately towards

no-till across the Wiggins-Davies family's 1100 cropped hectares since 2014.

Getting the basics working correctly, keeping things simple at the start and building on carefully trialled experience with a firm goal in mind has been his recipe for success to meet the business' need for parallel improvements in profitability and sustainability.

Farming around 1000ha under a variety of agreements across a vast range of soil types, George Fraser of Shaftesbury-based farming and contracting business, A&R Fraser has had to be even more cautious in his regenerative transition.

Six years ago, he and his family started developing their well-established business to be the no-till contract farmer and contractor of choice in the North Dorset/south Wiltshire area. With short-term performance at least as important as long-term improvement to their customers, they have done this by perfecting their approach on their own land before extending it more widely in the most appropriate ways.

"In stepping up our soil biology to reduce our reliance on inputs our shoulders have had to be broad enough to take a good amount of criticism for farming ugly," said David White. "We have made our fair share of mistakes along the way. Not least by failing to follow the biological rules and trying to do the same thing twice – like growing wheat after wheat.

"We have been surprised at how quickly soil biology can start working much better when you look after it and encourage it to proliferate. Working with nature rather than trying to force the soil with big, heavy machines has seen our soil structure and health come on by leaps and bounds.

"Amongst other things, both shallow



working and deep burrowing earthworm numbers have built-up really rapidly. Keeping the land green the year round with catch and cover crops has been very useful in capturing nutrition. And drilling directly into them with the least possible soil disturbance has also helped capture carbon.

"We are finding many ways to farm both more sustainably and profitably. The bi-crop of spring oats and spring beans we tried last year, for instance, performed handsomely with no in-crop herbicides, fungicides or fertiliser at all. The two species complemented each other extremely well, generating a much higher margin than the traditional bean crop we grew alongside it.

"Higher seed rates and the right soil structure mean we are increasingly able to employ crop competition in place of herbicides to deal with weeds," David added. "We need much less tractor horsepower these days, and work our tractors for around a quarter the time we used to. This means they last longer and we at least halve our diesel usage.

"Our soils are far more resilient to both drought and heavy rainfall too. At the same time, the amount and diversity of wildlife we have on the farm these days is a joy to see."

Since moving from minimum tillage with rotational ploughing to almost entirely no-till cropping over the past

eight years, Peter Cartwright has also seen huge improvements in the workability, resilience and health of soils with up to 40% clay and 40% silt at Revesby Farms.

Over this time, he has almost halved diesel usage and substantially reduced labour needs while increasing average wheat yields by 1t/ha; not to mention getting to grips with horrendous blackgrass problems.

"Our transition was actually prompted by the need to deal with levels of blackgrass that made some of our land almost uncroppable," he explained. "Following the Stow Longa recipe, we introduced up to three consecutive years of spring cropping, concentrated on moving as little soil as possible at drilling and employed the most competitive wheat varieties at high seed rates drilled as late as possible in the autumn.

"The rotational change led us to trial a range of cover cropping options and we now grow around 450ha of winter covers a year. We first ventured into direct drilling with a tined Horsch Sprinter, to which we have just added an Avatar drill now our soils are in good enough condition. We trialled the prototype Avatar back in 2016 and knew this would be ideal for our needs once we were in a position to make the most of its disc coulter system."

Two different types of direct drill these days gives the Revesby team the flexibility they need to deal with different soil conditions, trash levels and the weather. Over 90% of their crops are now drilled without cultivation, and the capacity to drill all their winter wheat in 5-6 days reduces both their weather risk and need to travel when the conditions aren't right.

Alongside moving the least possible soil under the most favourable ground conditions, moving to their own version of Controlled Traffic Farming has made a big difference to the physical as well as biological health of their soils.

"Everything is coming together so well now that I think we should be able to push our wheat yields up another 1t/ha over the coming four years," suggested Peter Cartwright.

"With hindsight, we should have been braver and cut down our cultivations

sooner. And we certainly shouldn't have invested in the Horsch Cruiser cultivator we have hardly needed to use since the day it arrived because our soil condition improved so much..

"Getting the basics of both drainage and black-grass management right before moving too wholeheartedly into no-till have been essential to our success. As have been attention to detail, working towards a clear goal, and careful trialling under our own conditions in a scientific way as an Agrii Technology Centre."

Improving drainage and soil structure to enable the most successful direct drilling have been as important in the Fraser family's transition from traditional plough and min till cropping to the regenerative regime they now employ on more than 80% of their farmed land.

They are also being able to successfully extend this experience to their contracting operations to provide the resource and experience needed to help more West Country growers benefit from soil-first management.

"We have found digging soil pits everywhere to assess soil condition and carefully targeted low disturbance subsoiling and mole-ploughing to sort out any inadequacies a crucial first step," George Fraser stressed. "With our agronomist, we also plan everything on the basis of full soil testing, repeated every four years to monitor changes.

"We really benefit from being large enough to run several different types – including a Weaving GD, Amazone Cayena and Weaving Sabre Tine – so

we can match the kit we use closely to soil needs and condition. The substantial slurry, muck and digestate service that is part of our family business has been great fit with our organic matter-building focus too.

"Contract farming means we can't afford to be evangelical about our system. So, where ground needs subsoiling it gets it; where trash causes slug problems we stubble rake; and everything we put into our cover crops is there for a particular economic as well as environmental reason.

"Like David and Peter, we have seen great improvements in the health, vitality and workability of our soils in a relatively short time without compromising crop performance," he reported.

"Wider rotations are giving us more flexibility to adapt to conditions as well as greater biodiversity. Cover crops are helping condition soils and build organic matter while providing late-season wildlife food and shelter. And better plant health through healthier soils and more balanced nutrition is taking the pressure off sprays programmes at just the time we need it with the loss of so much chemistry.

"Moving to no-till is far from a panacea and it's all too easy to make mistakes; especially where them likes of brome as well as blackgrass are problematic. But we have no doubt that integrating the most appropriate regenerative techniques into our business with attention to detail and the best-informed advice has to be the way ahead."



ENVIRONMENTAL IMPACT OF **57,000 MULTI-INGREDIENT PROCESSED FOODS** REVEALED

This paper suggests a new way of assessing the environmental impacts of supermarket food. Plant-based foods have the lowest environmental impacts. More nutritious foods are often more sustainable

By University of Oxford News Team

The paper compares the environmental impacts of meat and meat alternative products, such as plant-based sausages or burgers, and finds many meat alternatives had a fifth to less than a tenth of the environmental impact of meat-based equivalents.

This is the first time a transparent and reproducible method has been developed to assess the environmental impacts of multi-ingredient products. It provides a first step towards enabling consumers, retailers, and policymakers to make informed decisions on the environmental impacts of food and drink products.

Lead author, Dr Michael Clark says, 'By estimating the environmental impact of food and drink products in a standardised way, we have taken a significant first step towards providing information that could enable informed decision-making. We still need to find how best effectively to communicate this information, in order to shift behaviour towards more sustainable outcomes, but assessing the impact of products is an important step forward.'

"By estimating the environmental impact of food and drink products...we have taken a significant first step towards providing information that could enable informed decision-making"



Dr Michael Clarke

A study by the Food Standards Agency* shows more than half of UK consumers want to make more sustainable decisions on the environmental impacts of foods and, at the same time,

food corporations are setting ambitious net zero greenhouse gas targets. But there is a lack of detailed environmental impact information on food and drink products – which would allow consumers and corporations to make more sustainable choices.

The study, led by researchers in Oxford's Livestock, Environment and People (LEAP) programme and Oxford Population Health used publicly available information to derive estimates of the environmental impact of 57,000 food products, which make up the majority of foods and drinks for sale in UK supermarkets.

They looked at greenhouse gas emissions, land use, water stress, and eutrophication potential – when bodies of water become enriched with nutrients, often causing harmful algal blooms and ultimately killing other life. For the purposes of analysis, visualisation and communication, the team combined these four scores into a single estimated composite environmental impact score per 100g of product.

Professor Peter Scarborough, Oxford Professor of Population Health, says, 'This work is very exciting. For the first time, we have a transparent and comparable method for assessing the environmental footprint of multi-ingredient processed foods. These types of foods make up most of the supermarket shopping we do, but until now there was no way of directly comparing their impact on the environment.'

'This work could support tools that help consumers make more environmentally sustainable food purchasing decisions. More importantly, it could prompt retailers and food manufacturers to reduce the environmental impact of the food supply thereby making it easier for all of us to have healthier, more sustainable diets.'

"This work is very exciting. For the first time, we have a transparent and comparable method for assessing the environmental footprint of multi-ingredient processed foods... most of the supermarket shopping we do"

Professor Peter Scarborough

The researchers quantify the differences in environmental impact between multi-ingredient products and find those made of fruits, vegetables, sugar, and flour, such as soups, salads,

bread and many breakfast cereals, have low impact scores, and those made of meat, fish and cheese, are at the high end of the scale. Jerky, biltong, and other dried beef products, which typically have more than 100g of fresh meat per 100g of final product, often have the highest environmental impact.

When looking at specific types of food products, such as meat and their alternatives, lasagne, cookies and biscuits, and pesto sauces, the researchers found large variation within these types of foods. For these food types, lower-impact products often had one half to one tenth the environmental impact of higher-impact products. This type of information, if communicated to consumers and retailers, may help shift behaviours towards more sustainable foods without requiring large changes in dietary behaviour, such as swapping beef for beans.

When comparing the environmental impact score to their nutritional value, as defined by the Nutri-score method, products that were more sustainable tended to be more nutritious, including meat and meat alternatives. There are exceptions to this trend, such as sugary beverages, which have a low environmental impact but also score poorly for nutritional quality.

Jennie Macdiarmid, Professor of Sustainable Nutrition and Health at the the Rowett Institute, University of Aberdeen, says, 'An important aspect of the study was linking the

environmental impacts of composite foods with the nutritional quality, showing some of the synergies and trade-offs between different parameters. Using this new method manufacturers can reduce the environmental impact, while ensuring a high nutritional quality of products.'

"Using this new method manufacturers can reduce the environmental impact, while ensuring a high nutritional quality of products"

Professor Jennie Macdiarmid

The amount of every ingredient in a multi-ingredient food or drink product is usually known only to the manufacturer, but in the UK they are legally obliged to provide percentage values for certain ingredients, and ingredients are listed on packaging in order of size. Dr Clark and colleagues used known percentages and order of ingredients to infer unknown values, cross-referencing products and ingredients through use of a large dataset of products. Individual ingredients were mapped to environmental databases, and the percentages of all ingredients within each product were used to estimate the impact of each whole product.

The analysis makes use of foodDB – a Big Data research platform at Oxford, which collects and processes data daily on all food and drink products available in 12 online supermarkets in the UK and Ireland, and a comprehensive review of 570



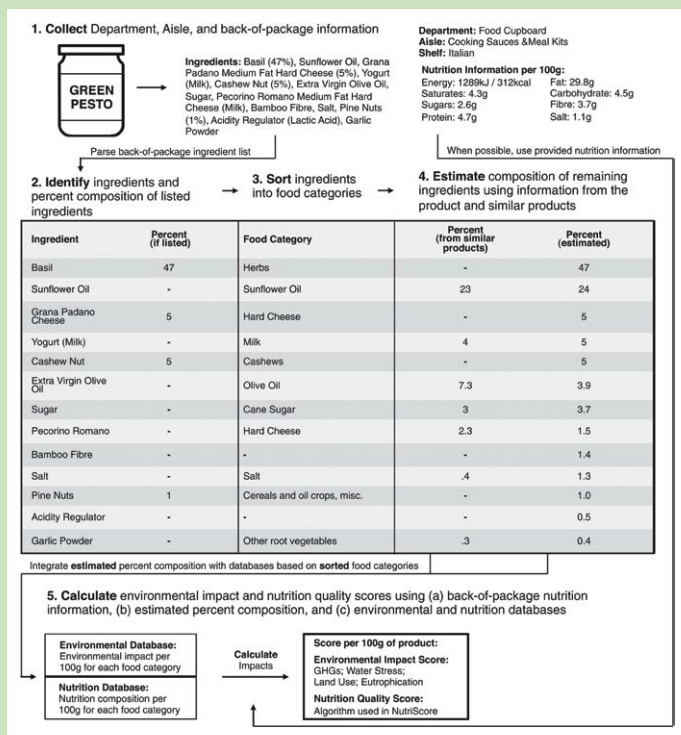
The advertisement for Acres Insurance features a large, dark Fendt tractor with orange accents, pulling a tillage implement in a field. The sky is filled with heavy, grey clouds, creating a dramatic backdrop. The Acres Insurance logo, consisting of a stylized green leaf and the text 'Acres INSURANCE', is positioned in the upper center. Below the logo, the text 'WE WILL HELP COVER YOUR SEED' is written in large, white, bold capital letters. Underneath this, 'CALL FOR GOOD HONEST ADVICE' is written in smaller white capital letters. At the bottom, a dark red banner contains the contact information: 'HELLO@ACRESINSURANCE.CO.UK', 'TEL: 01536 607070', and 'WWW.ACRESINSURANCE.CO.UK'.

Acres
INSURANCE

WE WILL HELP COVER YOUR SEED

CALL FOR GOOD HONEST ADVICE

HELLO@ACRESINSURANCE.CO.UK TEL: 01536 607070 WWW.ACRESINSURANCE.CO.UK



studies of the environmental impact of food production, including data from 38,000 farms in 119 countries.

A limitation of the analysis is that information on ingredient sourcing, such as country of origin or agricultural production method, is lacking from ingredient lists and this would help increase accuracy of the environmental impact estimates. Additionally, as portion sizes vary for different products, there remain uncertainties in the total environmental impacts of products.

“Our method fills an information gap on the environmental impacts of multi-ingredient foods”

Dr Richie Harrington

Dr Richie Harrington, head of foodDB, says, ‘Our method fills an information gap on the environmental impacts of multi-ingredient foods. The algorithms we developed can estimate the percentage contribution of each individual ingredient within a product and match those ingredients to existing environmental impact databases. Applying this methodology to generate impact scores for large numbers of products, we illustrated how this can be used to derive quantifiable insight on the sustainability of those products, and their relationship to their nutritional quality.’

One Industry Response to Eco-labelling



Phil Bicknell from CIEL

Here's Phil Bicknell, Head of Business Development at CIEL, and his take on eco-labelling...

Recent work to estimate the composition of 10,000s of food and drink products has been in the news this week. As the coverage has flagged, the analysis has its limit and references lack of information on country of origin or agricultural production method. I'll admit that I've only skimmed the headlines and the full paper is top of my reading list. However, that point about the work's limitations feels something of an understatement to me.

Anyone who has looked in detail at the emissions and broader sustainability issues associated with livestock production systems will know the significant variation between countries, between product types, and between systems. The reality is that beef produced in the UK has half the GHG impact of the global average, for example. The bottom line is that broad assumptions and estimates don't necessarily move us further forward when we are dealing with very technical and very complex issues.

On the surface, the work has generated some eye-raising results. How can sugar-coated cereals and fizzy drinks be better for us than nutrient-rich, locally produced meat? We

know meat, eggs and dairy are naturally highly nutritious sources of protein, which many of the foods with higher ratings in this report are not. There seems to be a gap when looking at the issue of nutrient quality, using one single figure to describe very different foods. It strikes me that meat or dairy products can provide more of the nutrients needed in a healthy diet than many of the foods listed.

Another gap is the continually evolving nature of agricultural production. I have no doubt that a greater focus is being given to the important role livestock play in efficient, circular food systems across UK agriculture. Whether it's the re-introduction of livestock to arable cropping systems or the re-assessment of the value of nutrients in farm waste, the livestock industry is not standing still. And all of the above is before we get into the challenges of assessing biodiversity.

I understand that companies are keen to shout about their environmental credentials, but I can't help feeling that work like this has the potential to add to the confusion for shoppers. More importantly, it has the potential to do a disservice to some positive steps being taken in the UK by the food industry and by farmers.

Let us know your thoughts on The Farming Forum...

Scan the QR code to read the full study





JOHN DEERE

NOTHING RUNS LIKE A DEERE

FARM SMART, PROFIT MORE

**PARTNER WITH US TO BOOST YOUR YIELD
WITH SITE-SPECIFIC SPRAYING**



Take control of your yields with smart farming technology from John Deere and access the full potential of your fields. Send applications map wirelessly to the field from John Deere Operations Center™ for a seamless and precise spraying execution. In the field with John Deere Individual Nozzle Control, you'll achieve best coverage and reduce overlaps to a minimum, to lower your input costs and boost your yield potential while maintaining effortless regulation compliance.



**GET JOHN DEERE
OPERATIONS CENTER™
NOW, FOR FREE**



Apple



Google Play

FARMER FOCUS

PHIL ROWBOTTOM



The build up to harvest is always mixed with a bit of trepidation and excitement, this year was no exception, Harvest 2022 was our first harvest following direct drilling with the Opico Sky Easy Drill.

After the hard work and cost of growing a crop, there's always a bit of uncertainty of how successful it will be, irrespective of just how well you think the crops have looked throughout the growing season.

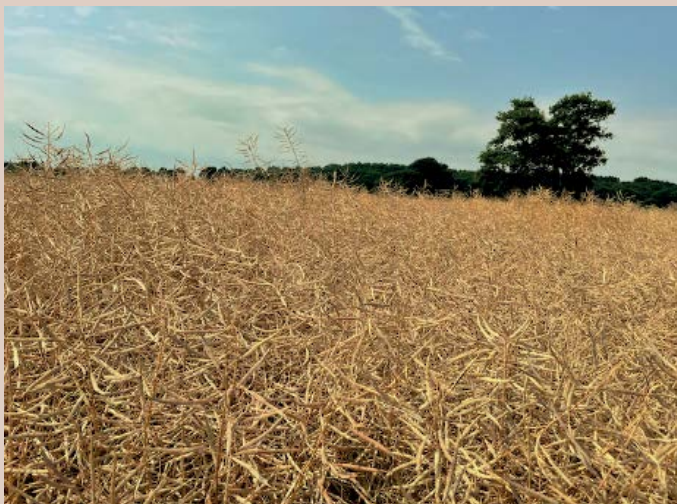
Despite the record high temperatures and dry spring, I have to say the Oil Seed Rape and wheats have looked well all year.

Harvest was looking to be the earliest ever experienced, just as we prepared to start on the 21st of July, it rained and did so for a further 8 days!

We've not run a combine here for around 30 years, I've used a contractor ever since, for just over 300 acres it's not cost effective.

Our light sandy soils have never broken records, but this years OSR has been the highest yielding rape crop we've ever managed, given the conditions this season and low establishment and inputs I'm over the moon with 1.7t/acre.

It's difficult to conclude how or why, all I can suggest is that it had a good start into a moist seed bed last year, had little or no evidence of flea beetle and has looked like a good crop all year.



We pretty much rolled straight into the wheat, progress was slightly hampered by a minor fire on the combine, fortunately no major damage, but parts availability slowed the repair down.

Wheat yields were effected by the excessive heat, with Skyfall yielding 3.5 t/acre and Skyscraper producing 3.4.

Although a delayed start from planned, harvest seemed to be over in a very short space of time, dare I say very easy, probably some of the best harvesting conditions we've ever



experienced, our small cooperative grain store facility was soon filled with some ease this year.

Thoughts very quickly turned to cover crop establishment and trying the 7.5M Mizuri Rezult stubble rake, it's been a bit of an experiment this year, running costs are extremely low and at 12-15kph you can cover the ground very quickly.



Initial impressions of the rake have been encouraging, we chop all the straw on the farm, it helps with organic matter build up and with the cost of fertiliser it's worth more to me than baling and selling it off, only slight issue is the combines chopper and chaff spreader don't spread the full header width, leaving a gap between the mats of straw.

Running the rake at a slight angle to the tramlines, seems to have moved the straw enough to even this out, it also



seems to have encouraged a 'chit' by slightly scratching the soil surface and mixing the straw, grains and soil. The OSR stubble was very dry and brittle this year, the rake also seemed to break it up to some degree.

Compared to other parts of the country we'd had around 25-30 mm of rain, the chopped straw helped to retain some of that valuable moisture. 40 ha drilled before 2nd wheats. I even drilled some of it in the rain, something you couldn't do onto ploughing or heavily cultivated ground.

Cover crop mix and sowing rates

Radish	3kg/ha
Common vetch	14kg/ha
Phacelia	2.25kg/ha
Clover	3kg/ha
Linseed	8.75kg/ha
Buckwheat	12kg/ha

2023 Anatasia oil seed rape drilling @ 4.5kg/ha and slug pellets at 4.5 kg/ha was completed on the 31st of August, into pretty ideal conditions. The plan will be similar to last year, as low input as we can get away with, mindful of increasing costs.

The biggest saving to date is fuel, between 4.5 - 5.5 l/ha on the drill depending on the field, somewhere in the region



Cover crops

of two thirds less fuel use from our old system.

The plan is to have drilled 1st wheats by the 1st of October weather permitting, into cover crops.

Single pass establishment with the Sky Drill has changed



the way we farm, not only in the input costs, but in time, our old plough based system, was a slow, costly process, it works with our system and other business interests, it's also beginning to gain some interest locally and the acreage I'm contract drilling will increase this autumn.

Direct Drilling not only reduces the time spent drilling, it allows for choosing the optimal timing for going drilling. Harvest 2022 has been one of the easiest in memory, the weather has had an impact in that, the drill is also a major factor, if this is what the future looks like, then so far, I'm convinced.



**Looking
after
your
No. 1
asset**



Primewest Limited
Agricultural Contractors & No-Tillage Specialists
www.primewest.co.uk



STRAW MANAGEMENT FOR SUCCESSFUL DIRECT DRILLING

Martin Lole of Springfield Farm and Mzuri, reflects on drilling into stubble and his recipe for successful straw management.

As farming systems become more productive, arable enterprises are faced with increasing levels of straw to manage post-harvest.

For many this provides a valuable secondary income source when baled, but for others, whether through environmental objectives or simply not having the demand for it, straw management forms part of the preparation for next year's crop.

Some growers may see leaving straw in the field as a luxury or perhaps a nuisance depending on their system, but when managed well, there are a number of advantages with wide ranging benefits from soil health to better establishment.

Advantages of drilling into stubble:

- Provides nutrition for soil microorganisms, supporting healthy populations
- Increases soil organic matter
- Reduces risk of wind and water erosion by protecting with a straw thatch the upmost field surface from harsh weather
- Supports good soil structure and promotes better machinery travel
- In dry seasons, stubble can help to preserve moisture by retaining it in the

soil

Talking predominantly about direct establishment systems, drilling into stubble can be a very effective and efficient way to establish a range of crops, but success in doing so can depend on several key management factors which are important to consider before heading in with the drill.



The Pro-Til with its wide row spacing and high clearance through the machine gives it the advantage in dense straw situations

1. Assess your straw

"You've had a bumper harvest and with that comes a bumper crop of straw. You recognise the benefits of leaving the straw on the surface but what next?"

The most important factor relating to successful direct drilling into straw is ensuring an even spread and a chopped to a consistent length. By far the easiest and most cost-effective way to achieve this is to start with the combine.



Pro-Til on Select Mode at 66cm row spacing has the distinct advantage of going straight into straw for better OSR and cover crop establishment

Watching to see if straw is chopped and distributed evenly will highlight whether the combine is operating as it should, or whether further preparation is required prior to drilling.

Uneven straw distribution will cause problems with variable germination and can cause drills to block if not managed correctly, something which can cause unnecessary downtime and frustration.

This leads onto considering what type of drill will be used and what the operator wants to achieve by drilling into stubble. For farmers wanting to drill into a lot of surface residue, strip tillage has the advantage with wide row spacing and sufficient clearance for trash flow, something which the Pro-Til range has been specifically designed for. For those growers who still want to drill



A great example of Pro-Til drilled OSR between stubble rows to produce a nursery environment for the new crop

into stubble but want a hybrid system that gives a more conventional row spacing, covering large areas quickly, good straw management is particularly important. The iPass sits in this category, offering conventional row spacings into stubble, min till or cultivated land whilst maintaining high forward speed and accurate seeding which makes the iPass range a versatile solution for a range of drilling situations.

2. Manage uneven straw

"Your combine wasn't what it was and refuses to chop and spread straw consistently, what now?"

For effective drilling, chopped straw should be short in length and evenly spread across the field. This not only provides a smooth canvas for direct drills to operate in, but it also starts the process of decomposition and returning those nutrients back into the soil.

There are a number of methods of pre-drilling field preparation that can be used to manage uneven straw levels including raking with a stubble rake such



The Rezult rake is a useful tool for stubble management to spread uneven chopped straw and to encourage weeds to chit for a stale seedbed

as the Mzuri Rezult. Fitted with discs and five banks of stiff tines, a pass of this surface cultivator can help to chop surface straw, spread it evenly across the field and also generate a small level of tilth mixing it with the straw to aid decomposition.



The iPass drilling spring beans into an oat cover crop that had been sprayed off the month before

For growers who want to maximise the incorporation of chopped straw with the top layer of soil, there are various surface cultivators for example the Vaderstad carrier which will produce more tilth than a stubble rake, but will leave a very even finish of mixed soil and straw – accelerating straw decomposition which can be an ideal canvas to drill into with a direct drill, particularly if there is a large amount of surface straw to deal with.

Not only does lightly incorporating the straw prepare the field for drilling, but it can also act as an important step in minimising slug and weed pressures for the next crop. The Mzuri Rezult rake can be used in the heat of the day post combining of OSR stubbles to disrupt slug habitats and expose slug eggs to the midday sun reducing slug pressure for the following crop. Raking can also encourage volunteers and weed seeds to chit by mixing them with a slight tilth which creates a stale seedbed that can either be harrowed again for cultural control or receive chemistry both providing a blank canvas ahead of drilling.

3. Success with straw

"You've taken the time to assess your straw and carried out light surface cultivation in fields that need it, giving the direct drill operator the perfect recipe for success."

When managed effectively, working with surface straw can yield great benefits over traditional establishment methods. Not only does it provide a

weatherproof finish which helps mitigate erosion and run off in high rainfall, it can also provide a sheltered microclimate for young seedlings when drilled between stubble rows.

Stubble acts as a mulch to preserve soil moisture and prevent it drying out in dry seasons, reducing stress to the crop and protecting long term soil structure. All of which benefits crop growth throughout the season and ensures a stable, consistent environment to direct drill into.

Some direct drills may require more stubble preparation than others depending on what the operator is trying to achieve.



Martin Lole of Mzuri & Springfield Farm

The Takeaway Message

Not all stubble is created equal. Low volume stubbles such as Rape, Beans and wheat straw that has been baled are all very straightforward for the majority of single pass drills. However, larger volumes of straw on the surface can cause challenges particularly for drills with close row spacings or low frames with little clearance. When combined with heavy soils, these scenarios can prove even more challenging and effect the success of the establishment. There are however a few important steps that we can take to balance the benefits of drilling into stubble with the need for effective seeding. Straw raking or light discing is always going to be a helpful tool when dealing with high volumes of surface straw, as is also avoiding drilling into heavy soils when wet. It is also important to consider the drill being used and its clearance, stagger and row spacing. But perhaps the most important thing to take away, is the importance of starting straw management with the combine. It is essential to ensure a short stubble length and if not baled a well chopped spread of straw to give the best canvas ahead of drilling.

NITROGEN UPTAKE AND RELEASE IN COVER CROPS

By Andrea Basche, Assistant Professor in Cropping Systems, Source: University of Nebraska Extension

With growing interest in cover crops, it is important to understand how cover crops might impact soil fertility for the following cash crop. Nitrogen (N) provided by cover crop biomass may be used in the short-term by the following crop, and in the long-term through improving soil N content and reducing fertilizer input costs. The availability of soil nitrogen is a function of residual soil N (or nitrogen present in the soil) and N mineralized (released by the organic pools in the soil) from previous crop residues. However, environmental and management factors greatly influence cover crop decomposition dynamics, making it a challenge to consistently and accurately predict the amount of N that will become available, or when it will become available, to a subsequent crop.

We compiled field studies from Nebraska and other corn-producing states that evaluated the range of biomass production of cover crops, the amount of N in their biomass, and their C:N ratio (Table 1). While these studies do not provide exact estimates of when N is available to subsequent crops, they can give us some information to help inform nutrient changes following cover crops.

Nitrogen Uptake by Legume Versus Grass Cover Crops

Cover crops acquire N through the uptake of nitrate and ammonium from the soil. When cover crops decompose, N is recycled back to the soil. Leguminous cover crops, owing to their symbiosis with rhizobia, can acquire N from the air (biological N fixation). When this N is released during decomposition, it is a net gain of N, so legumes are typically thought of as an N source or supplier. However, not all N in legume biomass is fixed N, as legume may take up considerable amounts of N from the soil (Redfearn, 2016).

The N in clover and vetch varieties commonly used in annual cropping systems can vary widely (Tonitto &

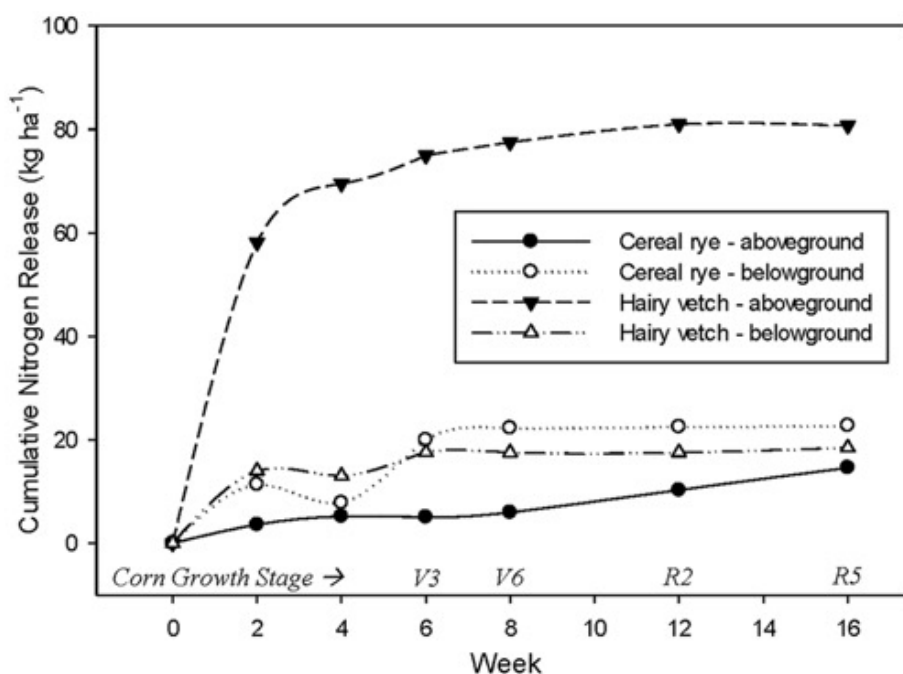


Figure 1. Estimated cumulative nitrogen release of cereal rye and hairy vetch residue over 16 wk of decomposition with corn growth stages. (Sievers and Cook, 2018)



Drinkwater, 2006). Among the studies included in Table 1, Nebraska hairy vetch biomass production was in the lower range with 364 to 724 lb/ac, which contained 12 to 29 lb N/ac. Red clover was more productive with 78 lb N/ac. In the Eastern United States, cover crops, especially hairy vetch, had more biomass and N, probably due to milder and wetter climates.

Winter cereals are commonly used in the Midwest as cover crops because of

their winter hardiness and high early-spring biomass production. They are also very effective in taking up mineral N and are 'scavengers' for nutrients that have moved to the lower part of the root zone, rescuing nutrients that may otherwise be lost (Bergtold et al., 2017). In Nebraska, rye produced between 1,312 and 2,072 lb/ac of biomass, which contained between 34 and 54 lb N/ac (Table 1).

When Does the Nitrogen From Cover Crop Residue Become Available?

Cover crop N release should be synchronized with N demand of the succeeding crop. The N accumulated in the cover crop biomass will be available to crop absorption after mineralization, which depends on soil moisture and temperature, soil type, and the carbon to nitrogen ratio (C:N ratio) of the biomass (Gil and Fick, 2001). The C:N ratio is the amount of carbon in cover crop biomass divided by the amount of N. It is often

used to predict how fast soil microbes will breakdown residue and release residue N back to the soil. Microbes use the carbon in residues for energy and the N for protein (think growth). A C:N ratio of 24:1 is considered “ideal” as it has the balance of carbon to N that soil microbes need. Residues with greater C:N ratios will decompose slower because there is not enough N for microbial growth. To decompose residue with high C:N ratios, microbes take up N from the soil, thus immobilizing or “tying up” N. Residues with C:N ratios lower than 24:1 decompose quickly, and because there is more N than microbes need, N will be available for the next crop (USDA, 2011).

Legumes residues typically have lower C:N ratio (Table 1) and decompose more rapidly than grasses, providing readily available N to the subsequent crop. However, if the subsequent crop cannot take up the N, there is potential for loss. Cereal rye residues often have

high C:N ratios and may immobilize soil N. Because of that starter fertilizer is typically recommended to overcome immobilization, with a rate between 30–50 pounds of actual N per acre (Midwest Cover Crop Council, 2019).

An experiment in 2015 in Carbondale, IL, assessed the time it took for N from a legume (in this case, hairy vetch) and grass cover crop (cereal rye) to be released. Hairy vetch rapidly decomposed and released about 70 lb N/ac within the first 4 weeks after corn planting (Fig. 1). Cereal rye residues released less than 10 lb N/ac during that same period, and overall released much less N (Sievers & Cook, 2018).

Some strategies, such as the incorporation of the residues, can result in faster N release. The use of mixes of grasses and legumes can also modify the C:N ratio and speed up decomposition.

The Bottom Line: Consider Your Species, Biomass, and

Environmental Conditions

Biomass production, N uptake, and C:N ratio vary widely across the United States, with Nebraska on the lower end of productivity. The N in cover crop biomass will be released within a few weeks after termination, however, decomposition varies with soil moisture, soil temperature and C:N ratios. Therefore, not all biomass N will be available for the subsequent crop. A better understanding of cover crop N release and cash crop N uptake can help to optimize crop synchrony and the choice of species to grow.

Some cover crop species have the potential to produce a high amount of biomass, providing great soil protection and reduce nitrate leaching, but they may not be suitable as an N source for a subsequent crop. Mixing cover crop species can overcome shortfalls of individual species and should be explored in more detail.

Cover crop species	Cover crop biomass lb/ac	N in biomass lb N/ac	C:N ratio of biomass	Location	Study reference
Legumes					
Hairy vetch	690	29	-	Nebraska	Power, 1991
Red clover	2500	78	-	Nebraska	Koehler-Cole et al. 2020
Hairy vetch	364	13	11	Nebraska	Koehler-Cole (unpublished) vetch broadcast in corn, before soybean
Hairy vetch	724	28	10	Nebraska	Koehler-Cole (unpublished) vetch broadcast in soybean, before corn
Hairy vetch	2658 - 5076	93 - 160	11	Maryland	Clark et. al.,2007
Hairy vetch	2685 -4915	89 -161	-	Michigan	Hayden et al., 2014 (Thapa et. al.2018)
Field pea	1452	49	-	New York	Schipanski, M. E. and L.E. Drinkwater. 2011.
Red clover	2109	67	-	New York	Schipanski, M. E. and L.E. Drinkwater. 2011.
Red clover	1972	72	-	Michigan	Gentry et. al. 2013
Red clover	1847	83	-	Michigan	Gentry et. al. 2013
Alfalfa	7794	45- 89	-	Kansas	Gil & H. Fick, 2001
Red clover	3827	27-67	-	Kansas	Gil & H. Fick, 2001
Red clover	1338 - 2052	51 - 67	13-Nov	Minnesota	Perrone et. al.,2020
Grasses					
Rye	1312	34	17	Nebraska	Koehler-Cole et al., unpublished Rye broadcast in corn, before soybean
Rye	2073	54	17	Nebraska	Koehler-Cole et al., unpublished, rye broadcast in soybean, before corn
Winter rye	669	23	-	Minnesota	Weyers et.al.2019
Rye	4193 -6691	36-78	30 - 40	Minnesota	Perrone et. al.,2020
Rye	2114	31	28	Maryland	Clark et. al.,2007
Rye	4166	33	57	Maryland	Clark et. al.,2007
Rye	2703- 3693	36	-	Michigan	Hayden et al.,2014 (Thapa et. al.2018)
Rye	154	7	-	Minnesota	Wilson et.al. 2019
Wheat	1401	21	29	Illinois	Weidhuner et.al.2019
Brassicas					
Winter camelina	352	15	-	Minnesota	Weyers et.al.2019
Radish	1081	35	-	Minnesota	Weyers et.al.2019

Table 1. List of cover crop species and their biomass production (in lb/ac), nitrogen in the biomass (in lb N/ac), and C:N ratio in studies from different locations across the United States. The studies highlighted in green were carried out in Nebraska.

FARMER FOCUS

ANDREW JACKSON



Many farmers have been surprised at their yields this year, the starting point must have been a kind autumn and winter, but it appears that sunlight in June contributes more to yield than we thought and rainfall to the beginning of harvest (6 months), was 207mm, could be of less importance. Like the Monty Python Four Yorkshire men sketch some might say that 'I was lucky' to have 207mm, nevertheless combined with the hot sunny weather, the soils had become dry and hard.

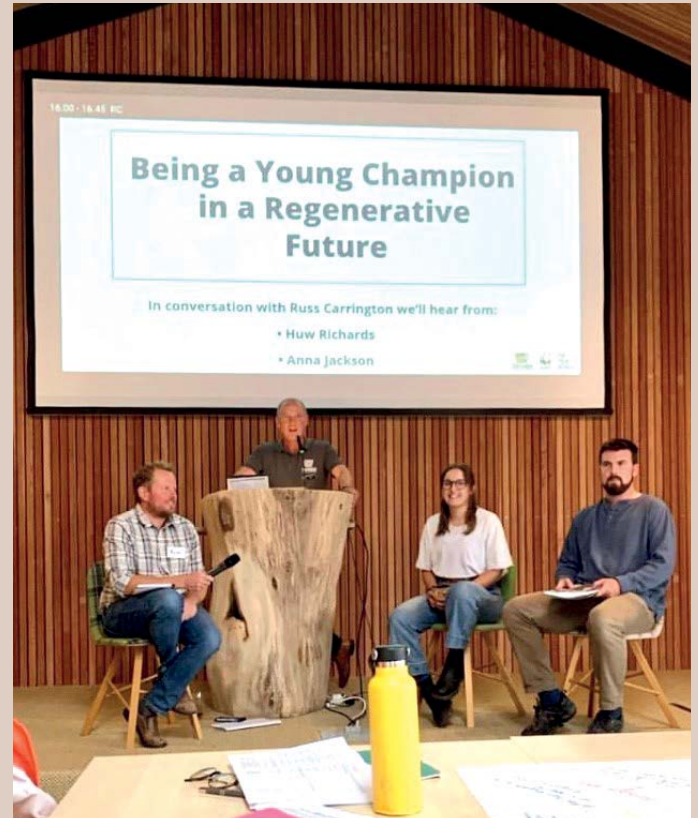


We have a small flock of sheep and after watching a YouTube presentation by Christine Jones on Quorum Sensing (essentially highlighting the benefits of herbal leys), it has been our ambition to rejuvenate our permanent pasture into a mixed species herbal ley. Some of you better farmers may not have had problems with the establishment, however we tried direct drilling into our grass, but the grass was too competitive, then we tried spraying off the grass, but the decaying grass emits an acidity which hinders new seed germination. Currently we have sprayed off the grass in summer and sown the part field down to stubble turnips and kale, with the intention of sowing our herbal ley in the spring. I am aware that the Australians have a type of rotavator complete with a seeder and this could also be an option to try in the future.

Once again, we have reduced our nitrogen rates to 160 Kg/N/Ha and this has provided acceptable yields. We have also trialled the application of foliar Nitrogen, the trial yields could have been better. The conclusion in my path to understanding the potential of foliar nitrogen will be to apply two normal nitrogen applications in March to winter sown crops, which will be followed up by subsequent foliar nitrogen applications which may contain Sap analysis product amendments.



In April, we experienced blockages within the liquid fertiliser application system, which is fitted



to our Horizon drill, this was totally my fault due to my preference to apply some lumpy biological product. Aware that Tim Parton had peristaltic pumps fitted to his John Deere drill, I called Tim and asked for the details of who developed and installed the peristaltic pump, it turned out to be Trevor Tappen who had a stand at Groundswell. After clarifying the correct number of noughts from Trevor's quotation and sitting down for five minutes, I decided to bite the bullet and have the pump fitted to my drill. I have used the system this autumn to apply nitrogen and fish hydrolysate when sowing OSR and Grass seed, so far so good.

Last autumn I decided to drill my OSR with an all-legume companion crop, the chosen species were, Crimson clover, Rivendale white clover (ground hugging), Berseem clover and Black Medic (a prostrate trefoil). In the middle of May all the legumes and the OSR were in flower, the field looked a picture. The rape yield was respectable, but I am not sure how much nitrogen the legumes brought to the party, maybe the residual nitrogen will show up in the following crop.

Two winter wheat fields were sown with seed dressed with Johnson Su seed dressing, one of the fields was within the foliar trial but the other received the 160 Kg/N/Ha and yielded a respectable 10t/Ha Unfortunately, combine yield maps failed to detect any benefit from my Johnson Su, this has not deterred me, and I will continue with these trials. We also made some static compost from chopped grass stalks (left behind a stripper header where grass seed was



harvested), chopped straw, volcanic rock dust and some bokashi mix. This was a compost based on the work of the German scientist Walter Witte with very few comparables in this country. The PLFA results showed that the compost, which we left on a pad for nearly a year was high in bacteria, fungi, and protozoa, with a good bacteria to fungi ratio, the only low reading was the PFLA diversity. The product has now been spread on a field coming second wheat at 25 tonnes per Ha. We will not know the contribution of the static compost until next harvest.

We have been advised to have the SSM gold standard soil test, which although more expensive has provided some useful feedback. The highlight for us is the raising of the soil organic matter levels within the last 10 years, ten fields have shown and average percentage increase of 1.81, this does not sound a lot, but coming from a low base the results indicate a 97% increase leaving all but one very sandy field nicely above 3% organic matter and heading in the right direction.

After twelve years of being a cereal seed grower, which has been a blessing in disguise regarding keeping black grass populations low. I have concluded that the seed premiums offered do not currently reflect the huge swings in commodity prices especially when I sell at the lowest price point in the year, I have tried to navigate this with futures trading but some years you can be up and others down. Therefore, even though I am a bit late to the party, I have ordered eleven varieties of wheat with the view of growing a blend and retaining the home saved seed for futures years, I may regret this move when I am completing the royalties declaration.

My daughter Anna who only took up farming two years ago after a career in photography has been approached by Colin Ramsay and Claire Mackenzie to participate in the film Six Inches of Soil. Consequently, Colin and his sound assistant have visited us periodically throughout the season and there was also some filming at Groundswell together with the other participants who feature in the film. Groundswell was once again blessed with good weather and the event seems to move on from strength to strength, I was keen to maximise



on the bar in the evening so together with a new expensive ground mat and sleeping bag, we camped once again. My lasting memory of the evening was leaving two farmers propping up the corner post of the marquee or was it propping them up?

Looking to the future, the Six

Inches of Soil crew have arranged for Anna and I to visit John Pawsey, a farmer who I admire and Direct Driller columnist whose articles are better than Jeremy Clarkson's. Speaking of Jeremy, I believe that his program Clarkson's Farm was universally enjoyed, even by the people who had not enjoyed his bombastic approach as seen in Top Gear. My youngest daughter works with a friend of Jeremy's, and I hatched a plan to ask this young man to give Jeremy a copy of Dirt to Soil by Gabe Brown. The book was duly sourced and packaged and the handover took place on the day of a shoot. The book was accompanied by an email from me, and my vague hope was that the third series of Clarkson's farm would touch on Regenerative Agriculture. I have heard nothing to date.

Recently Anna attended an event called FarmEd, which was aimed at the under thirties. Not all attendees were young farmers and the blend of young people, 50% of whom were women, from other professions, made for an enjoyable and informative event. Talking of events don't forget to book up for the BASE UK conference at Nottingham in February 2023, this will be the tenth AGM and hopefully it will be a bit special.



NEW DEVELOPMENTS IN ROBOTISATION

HORSCH has been pursuing topics like automation and robotisation for quite some time. Michael Horsch tells us how the idea for the Gantry was born, how it develops further and where the journey will lead to.



The idea of the Gantry is almost forty years old. Michael Horsch has been following the development already since the beginning of the 80s.

How did HORSCH come up with the idea of the Gantry?

We have been dealing with the aspects of automation and the construction of robots for farming for quite a long time. The trigger for the Gantry was a problem that mainly came from South America. For approx. five to six years, we have been selling our 18 metre Maestros over there, especially in Brazil, to large soya and maize farmers. These farms have understood how a reasonable cultivation strategy works on their sites, they seed directly and successfully manage catch crops. Thus, there are more humus and nutrients in the soil, and it can keep more water. Catch crops have become the key for progress in Brazil – especially the right catch crop mixtures, sown properly and at the right time. Thus, direct seeding works without tillage and loosening in the long term. Only on sandy soils do you have to loosen the soil additionally – a pass you can use in turn to place a fertiliser depot in deeper layers.

However, the problem of most of the farmers over there is that they do not get enough employees for the cultivation of their large fields. This is why they prefer to have one or two larger machines than several small ones.

The requirement are machines with 24 m or even larger working widths. But from an engineering point of view there is a magical limit – 18 m. It still folds easily, the machine weight is relatively low and it is very stable. From 24 m, the machines become very heavy, and the weight is where you need it least – namely in the middle. To be able to cope with the powers during the folding process, this is where much stability and thus weight is required.

We focused on this problem and discussed what would make sense to prevent the machine from becoming too large

and too heavy but still heavy enough for direct seeding and especially with a good distribution of the weight over the whole working width. This is why we came up with the idea of the Gantry. However, we did not invent it.

Where does the idea for the Gantry originally come from?

The idea for the Gantry already is about 40 years old. Since the beginning of the 80s, I have been following this development in England, e.g. at the National College of Agricultural Engineering in Silsoe. Today, besides us, some companies deal with this idea – with quite interesting applications – and also with the aspect of automation.

Many manufacturers, universities and start-ups often focus on small, all-electrically driven robots. They mainly think of a use in clusters. There already are companies that commercialise it. We took a look at Farmdroid and we noticed that the people working there are very pragmatic young people who have an agricultural background. They tackle the subject with a very practical approach what, in my opinion, makes the whole thing feasible rather quickly. If you try to work theoretically and to realise things on small test fields, you will proceed much slower.

To begin with, we focused on large working width, fully automated sowing processes etc.

Especially large 12 and 18 m seed drills which fold towards the front and have compact transport widths and large hoppers can be automated quite well. Of course, we have to continue to make tests and to develop ideas.

In past years during which we carried out test runs with the robots, one of our first findings was that there are only little possible savings with regard to staff. The tasks only change when you do no longer sit in the cabin, but you have to check that the machine does what it is supposed to do and you permanently optimise the adjustments for an optimum work result – and all this often by simply running after the machine.

What will it be like in the future?

We are proceeding quite fast, but there still is a lot of software work to do, e.g. with regard to track planning or surroundings detection. And there is a lot of know-how. But we are only proceeding this fast due to our test efforts in the field, especially on our own test farm AgroVation.

We already tackled the subject of Controlled Traffic Farming

about twelve years ago. We wanted to see if you can get more efficiency out of the machines and if it has an effect on soils structure and thus on the yields if you make all passes on one fixed track and no longer drive over the rest. We learnt that this also was the first step towards robotics, that we have to plan the tracks and digitalise the fields.

From an agronomic point of view, however, Controlled Traffic did not achieve what we hoped for. At the harvest, it makes most sense to move the high loads on fixed tracks. Especially during the maize harvest, it often is wet and the wheat that is grown after the maize suffers. In this case, CTF is very advantageous. Now and then we noticed a few effects on heavy soils. If it was wet and in case of fixed tracks, there were small effects in the population development and in the yields in a one-digit percentile range.



HORSCH, too, focuses on the concept of the Gantry and develops it further within the scope of automation and robotisation.

What was also obvious: if tillage is exclusively been carried out with CTF, the soils inevitably become uneven. In Australia, where farmers have been working with direct seeding and CTF for years, the farmers made the same experiences. If you drive on the track in the same direction every year, the result are longitudinal and cross corrugations. And this affects tillage and sowing quality as well as the operational speed for example when spraying. We also partly noticed that it is quite difficult to follow the soil with a combine if there is lodged grain. And in addition: If you drive in a fixed track, the track – no matter where it is – becomes a “dirt track”. Everyone knows what becomes of a dirt track after several years. There are potholes, it is uneven and especially if it is wet, it is very difficult to drive on.

What does the HORSCH Gantry solution look like? How did it develop further?

Our motivation was: We do not want to build another heavy machine that compacts the soil. We choose the Gantry way – with two wheels at the front, two at the rear and the frame is positioned between the wheels. In our case, the front axle is wider – it is based on a 12 m track. The rear axle is based on a 4 m track. The reason is that in this case it isn't one single track that is always driven over twice. For if it is wet and you drive over the same track twice, even between the rows, you might cause quite a mess resulting in intense compactions.

Last year around Christmas during Covid my brother and I again discussed this subject and suddenly we had the

Customised ag-weather in one single app



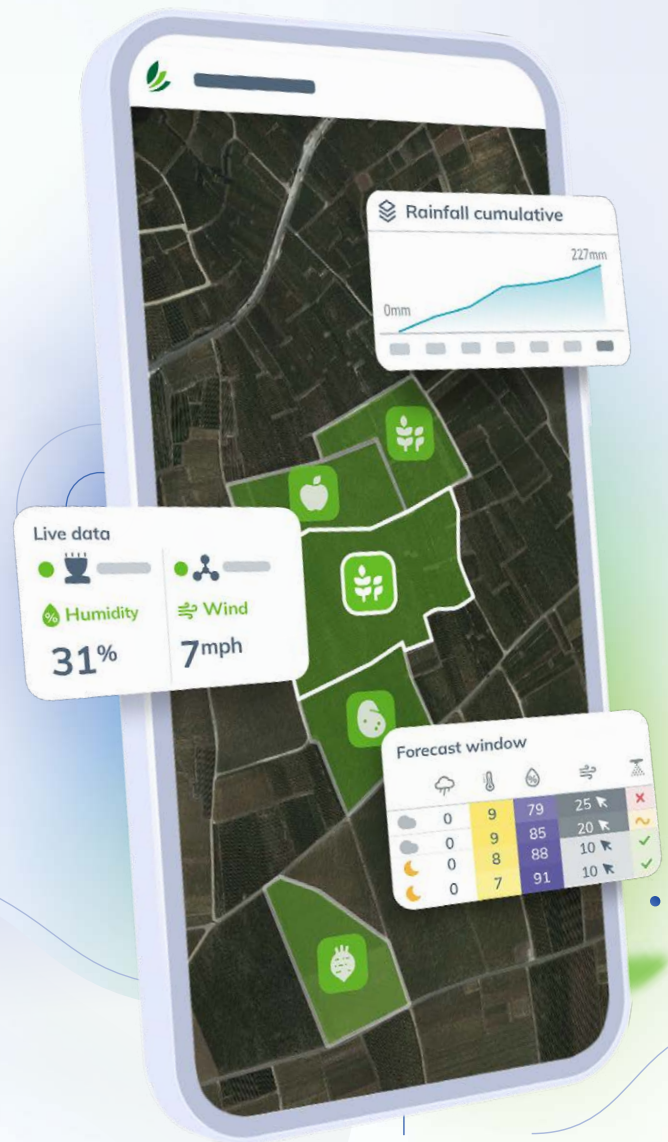
Weather
monitoring



Disease and pest
prevention



Irrigation
management



In field weather data

- Organise your interventions: ultra-local forecast.
- Visualise the risk indicators: weather forecast by crop.
- Make the best decisions: follow the conditions in real time.



Scan this QR code and test
the Sencrop app today!*

Any questions? ☎ +44 7723 580941

*free trial

idea not to build a 24 m maize seed drill which with too small wheels and too much weight in the middle section would only be a bad compromise but to design the machine as a robot. This is how the Gantry idea was born – in a slightly modified form with the frame in the middle etc. At the beginning of January, we brought one of our engineers into the project to complete the design and to build the machine.

What is the current state of affairs? Are there still any problems?

We are currently in the test stage. At the end of May, the Gantry was sent to Brazil to carry out tests on large fields. In Germany, the options for these tests are few – the Gantry is too wide and has no homologation for road service.

What we are still working on is the software issue. It is quite easy to solve from a technical point of view. As always, the main work is carried out by the software. But there still is a long way to go until the sensor system makes the machine react fast enough, until everything does what it is supposed to do.

What is again and again proven during the field tests is that you can achieve a significantly higher efficiency and work quality if you do without a cabin. The cabin sometimes is diverted from its intended use to take a little rest.

But the advantage also is that you gain a lot of installation space. Accessibility is improved considerably. You can access everything – even from below. The design of the frame, especially of the main frame, is simple, elegant and first and

foremost particularly stable. This way, you can also build wider machines. With our concept, we could go to 30 or even 36 m. Due to the large hoppers, we generate a wider coverage, and we can place them where most of the weight is required.

Of course, you will eventually reach a limit of what four wheels can carry. 40 to 50 t on the wheels will be critical, especially with regard to the turning process if the seed frame is lifted or in wet conditions. The whole machine almost weighs 30 t, plus 10 to 15 t of seed – the weight quickly adds up. But still the concept is more manageable than a design with separate parts. When sowing directly, the weight has to be distributed evenly to where the row bodies are positioned, even right outside. The wider the machine is, the more difficult it is to put this into practice.

Which sectors can be automated with such ideas?

With regard to automation, in my opinion it is important to tackle the topics that can most easily be put into practice, that have to do with sowing, plant protection, fertilisation and mechanical weed control. Tillage does not have top priority. It is not so complicated and is more or less carried out alongside. To automate harvest processes, however, is extremely complicated. We are far from having a harvest machine drive on the field without a driver – no matter if it is a combine, a potato or a sugar beet harvester. In this sector, there are way too many influencing factors. Everyone who has ever threshed for example lodged grain with a combine knows what a challenge it is.

Soil First Farming

bringing your soil back to life



**Soils becoming harder to manage...?
Grass weeds an increasing problem...?
Why not call in some specialist advice!**

Steve Townsend

07989 402112



James Warne

07969 233163

Call us today or visit the website to find out more – www.soilfirstfarming.co.uk

‘your soil right is the basis for your profits’



November 23-24, 2022 East of England Showground

Register FREE at www.croptecshow.com

2022 Seminar programme announced!

Bringing together the industry's top experts, policymakers and most successful farmers, this year's seminar programme will give you the chance to invest in your knowledge and get practical insight into cost cutting and cultivating business resilience.

Maximising natural capital revenue opportunities: A hard look at ways to monetise environmental deliverables on-farm



From carbon to water, experts will take a hard look at the various drivers influencing the supply chain of these environmental deliverables to identify financial gain.

Coping with change: Costs, environmental regulation & cultivating resilience

From analysing the impacts of international trade to exploring the implications of environmental policy, experts will gather to tackle some of the most pressing questions around cost management facing the arable sector.



Trusting data: How tech adoption could be key to controlling fertiliser costs



Experts will deep dive into the economics of tech adoption to highlight its role in controlling fertiliser costs.

Strategies for disease control in a changing climate: where next?

From IPM to analysing the role of plant breeding in the crop protection armoury, this session will explore strategies to help farmers deal with the disease burden and look to the future to ask: where next for disease control?



Sponsored by



INNOVATION • KNOWLEDGE • PROFIT

AGROECOLOGY CONFERENCE BUILDS SUSTAINABLE FARMING

On 8th November Hutchinsons is hosting its inaugural Agroecology conference, giving farmers the chance to discover how to make the most of regenerative farming practices to benefit the environment and the bottom line.

Agroecology: Making the Transition will address many of the core regenerative agriculture principles, which head of Agroecology, Ed Brown, believes form the basis of good agronomy in a rapidly changing industry.

Rising costs, changes to farm support, and increasingly extreme weather events, have hastened the need to build more resilient production systems that harness natural processes and reduce the need for artificial inputs.

"The days of 'high input, high output at all costs' agriculture are numbered. The focus is much more about taking an holistic approach to farming and agronomy."

Hutchinsons is helping farmers do this with the launch of its new Agroecology service, and November's conference will be packed with practical advice about sustainable farming practices.

"Whether you're a farmer that has already moved to a more resilient farming model, or are just starting out, the conference should have something for everyone."

Speakers include Knight Frank's Tom Heathcote, who is passionate about regenerative farming, and has helped a number of businesses transition to more sustainable farming systems, making him ideally placed to offer advice on business structuring and finance.

Soil health is widely recognised as a cornerstone of sustainable farming systems, so Hutchinsons's Ian Robertson will explain the importance of understanding your soil before making any significant structural or operational changes.

Internationally-renowned independent researcher and regen consultant, Joel Williams, will also be present to offer a technical insight into his latest research.



Two farmer speakers, at different stages of their agroecology journeys, will be there too. Ben Taylor-Davies, aka "regen Ben", will share his experiences from years of adopting regenerative practices on the farm at Ross-on-Wye, while Harry Heath, who hosts the Helix Agroecology farm, will explain how he has tackled soil health issues on the Shropshire pig and arable farm.

"For us, we've gone through that early phase where we recognised our soils weren't in the best of health, with significant slumping and erosion," says Mr Heath. "We were massively over-cultivating, and with subsoiling in particular, we found the more we did, the more we had to do, to artificially create structure."

"But we are now well down the implementation phase, having converted to direct drilling five years ago."

Cover and catch crops, grazed off by sheep or pigs, are integral to the rotation, improving natural structure through a

diversity of root structures, while also feeding soil biology.

"Soil health and microbiology are always at the forefront of our decision making process," Mr Heath adds. "The symbiosis that exists between the microbiology and the plant is vital and making sure we maximise that is integral to agroecology."

"But the key is to be openminded. To get off the conventional treadmill, you have to think differently, recognise it's not all about the crop and continually question everything you do."

Conference details

The Hutchinsons Agroecology conference will take place on 8th November at The Belfry, Sutton Coldfield, West Midlands. To book your place and find more information, please go to hlhld.co.uk/event.



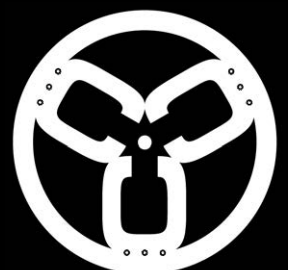
TECHNOLOGY

HORIZON



**The most technologically
advanced row unit
on the market**

GEORGE SLY - MANAGING DIRECTOR



FARMBENCH RESULTS: PAST, PRESENT AND FUTURE



Mark Topliff, AHDB Lead Analyst – Farm Economics, uses Farmbench data to illustrate how crops performed in 2021, and provide costings estimates for 2022 and a forecast for 2023.

The analysis

Conventional combinable crop enterprise performance results (11,584) were analysed in Farmbench (ahdb.org.uk/Farmbench) for the 2017 to 2021 harvest years.

Results are presented across three performance groups: top 25%, middle 50% and bottom 25% – based on full economic net margin.

Crop	Top 25%	Middle 50%	Bottom 25%
Barley - spring	7.0	6.3	5.4
Barley - winter	8.5	7.6	6.7
Beans - spring	4.5	3.7	2.8
Beans - winter	4.3	3.6	2.8
Linseed - mixed	2.3	1.6	1.1
Oats - spring	6.7	5.5	4.8
Oats - winter	7.4	7.0	6.0
Oilseed rape - winter	4.7	3.4	2.7
Peas - feed, mixed	4.3	3.1	2.9
Wheat - spring	6.7	5.8	4.9
Wheat - winter	9.9	8.9	8.0

Table 1. Five-year (2017–21) average yield (tonnes/ha)

Yields

Across the crops, there was significant yield variation in the enterprises and over the years – in response to weather and disease pressures. However, 2021 yields were close to the previous four-year averages. The top 25% consistently averaged higher yields (Table 1).

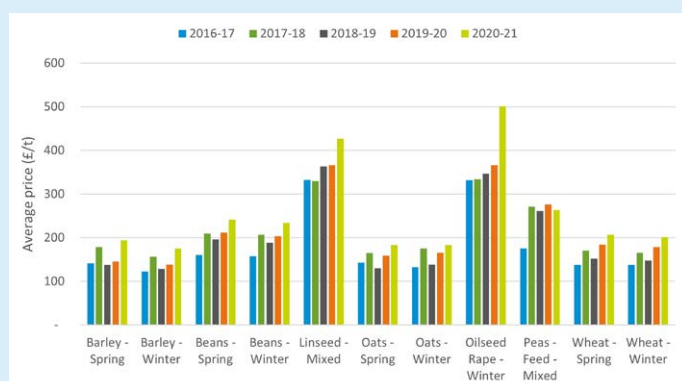


Figure 1. Five-year (2017–21) Farmbench reported crop prices (£/tonne)

Prices and income

There has been an upward trend in reported prices received for most crops since the 2019 harvest year (Figure 1).

Income data reveals the combined impact of yields and

prices, with data (2017–21) shown for winter wheat, spring barley and winter oilseed rape (Figure 2).

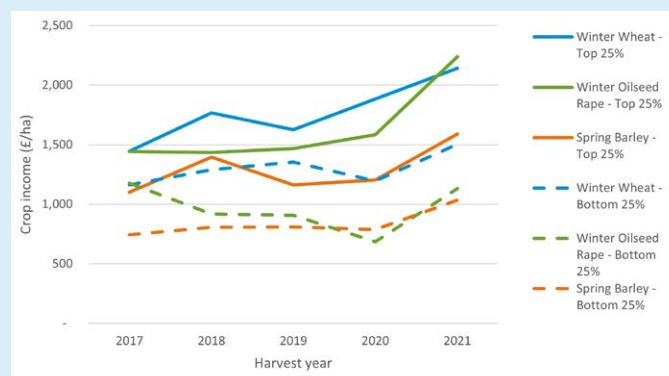


Figure 2. Five-year (2017–21) crop income (grain and straw sales) for winter wheat, oilseed rape and spring barley (£/ha).

For the top 25% performers, income increased by around £500 to £800 per hectare (crop dependent), largely due to higher prices.

Conversely, income changes in the bottom 25% were much smaller, by around -£40 to £340, due to relatively low yields and higher costs.

Although a relatively small proportion of the cereal crop income, the top 25% typically received double the income from straw than the bottom 25%.

Five-year average spring and winter barley straw sales were 8% to 9% of the crop income in the top quartile. But, half this proportion in the bottom 25%.

Variable costs

Variable costs include seeds, fertiliser, crop protection, agronomy services and sundry variable items.

On average, the lowest variable costs (2017–21) were associated with beans, linseed and oats. The highest were associated with winter barley, oilseed rape and wheat. Variable costs are estimated to increase in 2022 and again in 2023 (Table 2).

Even if a modest reduction (10%) in usage is assumed, fertiliser costs could still be more than three and half times higher in 2023 than in 2021. This could double the variable costs in heavy-input crops.

Gross margins

Winter wheat always produced the highest gross margin (2017–21), followed by winter oilseed rape or winter oats (Figure 3).

The middle-performing group's gross margins were usually 40% lower than the top performers. The bottom quartile had

Crop	2017	2018	2019	2020	2021	Five-year average	2022 estimate ¹	2023 forecast ²
Beans - winter	229	222	225	214	236	225	266	341
Beans - spring	249	224	299	241	263	255	293	372
Linseed - mixed	235	242	260	279	266	256	322	487
Oats - spring	262	254	267	266	271	264	368	595
Peas -feed, mixed	307	239	315	292	279	286	321	474
Oats - winter	298	298	333	323	311	313	428	699
Barley - spring	312	306	345	314	341	324	460	740
Wheat - spring	307	342	333	359	360	340	184	775
Barley - winter	404	409	461	411	406	418	541	859
Oilseed rape- winter	446	442	487	461	432	453	593	961
Wheat - winter	475	498	527	482	482	493	646	1,034

Table 2. Variable costs (£/ha) by crop for Farmbench middle 50%

around 45% lower gross margins compared to the middle group.

Overheads

Total overheads include a value for unpaid labour, the rental value of owned land, depreciation, and finance charges.

Wheat and winter oats had the highest total per-hectare overheads, with a 2% increase over the five years. Most crops saw an 11% to 15% rise over the period.

Generally, overheads account for two-thirds of the total cost of production. They are key drivers of profitability,

alongside yields.

When total overheads are calculated as a percentage of total income (a function of yield), there is a strong association with net margin (Figure 4).

As overheads as a percentage of income reduce, net margin increases.

For most crops, the top 25% group has total overheads that are less than 60% of the crop income – for wheat, barley, and oilseed rape this falls to under 40%.

Energy and machinery costs have been the key influences

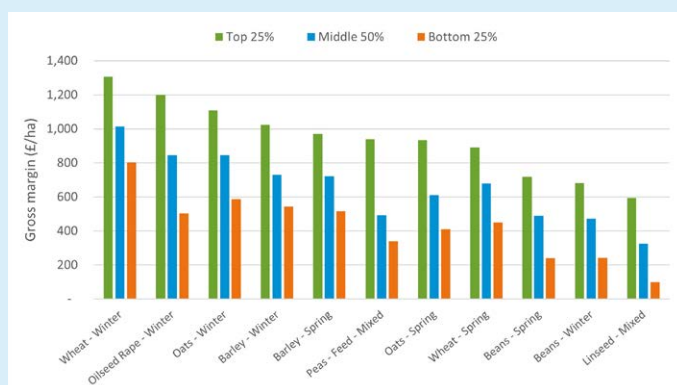


Figure 3. Five-year (2017-21) average gross margins (£/ha) by crop and performance group

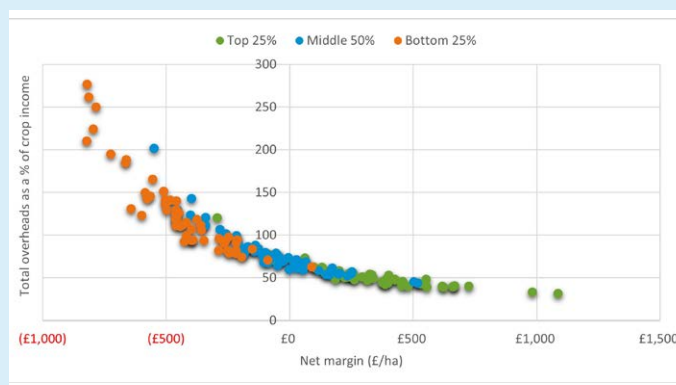


Figure 4. Total overheads as a % of crop income versus net margin (£/ha) by performance group for all crops (2017-21)

Crop	2017	2018	2019	2020	2021	Five-year average	2022 estimate ¹	2023 forecast ²
Beans - winter	651	649	624	608	636	633	682	824
Peas - feed, mixed	641	556	657	710	636	640	706	853
Oats - spring	632	669	632	682	706	664	761	923
Beans - spring	632	674	692	726	707	686	760	909
Barley - spring	639	695	718	737	722	702	786	955
Linseed - mixed	763	608	751	704	720	709	774	934
Barley - winter	658	744	743	755	755	731	891	1,006
Oilseed rape - winter	683	728	713	762	773	732	837	1,010
Wheat - spring	696	687	709	815	775	737	835	1,007
Oats - winter	729	792	738	794	742	759	808	972
Wheat - winter	756	789	781	805	774	781	838	1,015

Table 3. Overhead costs by crop for Farmbench middle 50% (£/ha)

Crop	2017	2018	2019	2020	2021	Five-year average	2022 estimate ¹	2023 forecast ²
Oats - spring	913	903	891	874	907	897	1,050	1,419
Beans - winter	868	917	943	951	958	927	1,052	1,296
Linseed - mixed	867	916	952	1,005	973	942	1,082	1,396
Oats - winter	930	967	965	1,005	1,017	977	1,189	1,622
Beans - spring	907	968	1,042	996	1,018	986	1,184	1,378
Peas -feed, mixed	1,070	847	1,066	996	999	995	1,095	1,358
Barley - winter	1,045	965	1,118	1,121	1,042	1,058	1,247	1,712
Wheat - spring	990	1,070	1,046	1,121	1,133	1,072	1,321	1,785
Barley - spring	1,041	1,098	1,083	1,108	1,083	1,083	1,268	1,712
Oilseed rape - winter	1,142	1,129	1,196	1,286	1,207	1,190	1,428	1,968
Wheat - winter	1,231	1,287	1,308	1,287	1,256	1,274	1,484	2,049

Table 4. Full economic cost of production by crop for Farmbench middle 50% (£/ha)

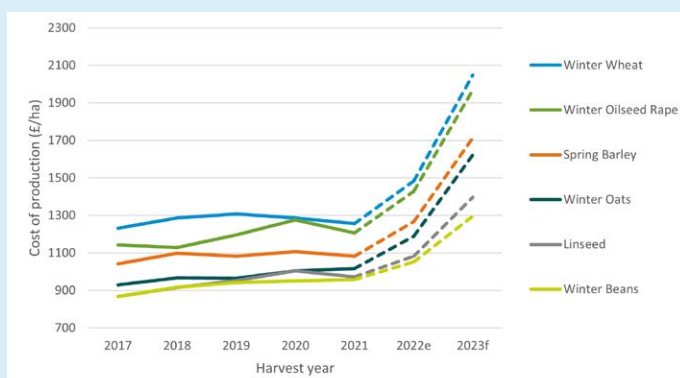


Figure 5. Full economic cost of production for Farmbench middle 50% (£/ha)

Net margins

In all performance groups, winter wheat, oilseed rape and oats returned the best average net margins (2017–21).

In line with crop income trends, full economic net margins also improved in 2021. Unsurprisingly, the top 25% had the greatest increases. For example, a rise of nearly £300/ha with winter wheat.

In 2021, all crops for the top quartile and most crops for the middle 50% returned a positive net margin. Apart from winter wheat, no positive net margins were observed in the bottom 25%. In fact, the five-year average showed no positive net margins for that group (Figure 6).

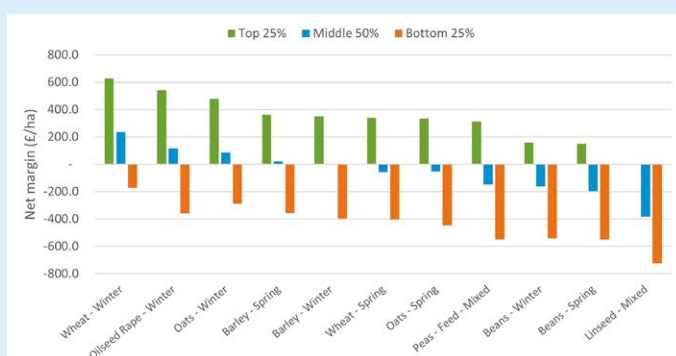


Figure 6. Five-year (2017–21) average net margins (£/ha) by crop and performance group

When yield is considered, the order changes slightly. In the top quartile, oilseed rape has the highest net margin (Table 5). On average, linseed delivered the worst results for each performance group.

Except for barley, winter crops outperformed their spring equivalents – by £4–£15/tonne in the top quartile, and £1–£38/tonne in the middle 50%.

Crop	Top 25%	Middle 50%	Bottom 25%
Barley - spring	52	3	-66
Barley - winter	41	-0	-60
Beans - spring	29	-60	-211
Beans - winter	33	-61	-236
Linseed - mixed	-16	-284	-713
Oats - spring	50	-11	-97
Oats - winter	65	13	-48
Oilseed rape - winter	131	37	-148
Peas -feed, mixed	71	-54	-189
Wheat - spring	52	-11	-85
Wheat - winter	64	27	-22

Table 5. Five-year (2017–21) average full economic net margin (£/t) by performance group

High cost impact

Table 6 shows an analysis of the middle 50% group to indicate the potential margin impact of higher costs on wheat, barley and oilseed rape. It uses forward crop prices and average yields to estimate income in these crops, with 2022 and 2023 cost of production estimates deducted.

For winter wheat, margins could increase around 66% in 2022, if forward prices are realised. Spring barley is not

expected to have such a big increase and oilseed rape is estimated to be lower than in 2021, due to higher costs.

However, based on current futures prices, the impact of the higher costs will bring all margins down dramatically in 2023. Possibly into negative territory for spring barley and oilseed rape.

Forward crop prices ³ £/t	2021 (based on prices reported)	2022 (based on Nov-22)	2023 (based on Nov-23)
Feed wheat	196	257	241
Feed barley	190	232	216
Oilseed rape	499	511	510
Yields t/ha	2021	Five-year average	
Winter wheat	8.8	8.9	
Spring barley	6.5	6.3	
Oilseed rape	3.4	3.4	
Total cost of production £/ha	2021	2022e	2023f
Winter wheat	1,256	1,484	2,049
Spring barley	1,083	1,268	1,712
Oilseed rape	1,207	1,428	1,968
Total cost of production £/ha	2021	2022e	2023f
Winter wheat	519	865	150
Spring barley	251	273	-300
Oilseed rape	503	309	-234

Table 6. Full economic net margin analysis (2021–23) for three combinable crops for the Farmbench middle 50% group

on farm-input costs will impact heavily on net margins in 2023.

Holding on to 2022 profits will prove difficult, with generally higher working capital required to purchase inputs for harvest 2023 crops and, in England, the reduction in Basic Payments.

Grain prices are likely to stay volatile into the 2022/23 marketing year, with marketing strategies having an even greater influence on margins in 2022 and 2023.

Options to optimise income and mitigate cost increases can be explored in Farmbench – from crop rotation changes, to locking into futures prices, to evaluating potential inputs and equipment investments. If not already considered, environmental schemes should also be investigated on whether they can fit into the farming system and provide a useful steady income.

Notes

¹Based on year-on-year change in Defra Agricultural Price Index average of 15%.

²Based on forecast aginflation average of 32% and assumed reduced usage of inorganic fertiliser.

³Futures prices as at 19/8/22. Deductions accounted for in total costs

⁴Including straw income for wheat and barley

2022 estimates based on changes in Defra agricultural price indices applied to the 2021 results. Some reduction in fertiliser usage is assumed.

2023 forecast figures based on a full crop year at current inputs inflation rates. Some reduction in fertiliser usage is assumed.

Net margin is crop income minus all costs, which includes all non-cash costs to the business – depreciation (machinery and buildings), unpaid labour and the rental value of owned land. Subsidies are excluded.

Full economic costs include a value for unpaid labour, the rental value of owned land, depreciation and finance charges.

All tables are ranked by five-year average data.

Conclusion

Until recently, the general upward price trend has largely kept ahead of gradual cost rises. Now inflationary pressures



Feed your soil now



SEA2SOIL

ORGANIC SOIL IMPROVER



Reap rewards in Spring

Fungi

Sea2Soil is a rich energy source for beneficial fungi, which perform important functions in the soil, such as nutrient cycling, disease suppression, water dynamics and carbon sequestration.

Boost Spring Growth



Fungi



Bacteria

Organic Matter

Increased Primary Consumer Activity

Bacteria

Sea2Soil provides key nutrients, increasing populations of healthy soil bacteria which play an important role in improving soil structure and fertility.

Feed Soil Biology Now



Groundswell

As Seen At Groundswell 2022



Scan Me



ORGANIC SOIL IMPROVER

Read more: sea2soil.co.uk/directdriller

GREEN COVER: SOIL HEALTH RESOURCE GUIDE – 8TH EDITION



valuable expertise and insight for the benefit of all. To some, this guide may be a reinforcement for what they already know; to others, it may be the first step in their journey towards healthier soils. This is by no means an exhaustive soil health resource; rather, it is intended to be a concise summary of soil health concepts, and a gateway to further learning.

Table of Contents	
The Purpose of This Guide and Previous Articles.....	3
The Importance of Context.....	4
Keep the Soil Covered.....	6
Minimize Soil Disturbance.....	7
Maximizing Biodiversity.....	8
Living Roots as Often as Possible.....	9
Livestock Integration.....	10
The Problem.....	12
Introduction to Regenerative Agriculture.....	13
The Secret of Farmer Happiness: Regenerative Agriculture.....	14
Regenerating Human Health with Soil Health.....	16
How Healthy Plants Create Healthy Soil.....	18
What Your Food Ate.....	20
Economics of Soil Health on 100 Farms.....	22
"Get you feel pretty stupid now!".....	23
Roots Build Soil Health.....	24
Nitrogen: The Double-Edged Sword.....	26
What Can I Plant to Make Nitrogen for Next Year's Crop?.....	28
Case Study: 200 ac Corn With No Nitrogen.....	30
What About P and K?.....	31
An Agricultural Testament by Sir Albert Howard.....	32
One Man's Trash Was My Treasure.....	34
Growing Forage in a Drought.....	35
Cattle as the Cash Crop.....	36
Making Cattle Profitable: Year-Round Grazing.....	38
Everyone Complains About the Weather.....	40
The Plant-Microbial Communication Network.....	43
What Is in a Seed? And Why Is It Important?.....	46
What the Heck Is HypeGrow?.....	48
Back to the Roots.....	50
Regenerative Wildlife Management.....	52
Soil Health in Orchards and Vineyards.....	54
FFA Essays - "Why Soil Health Is Important to Me and My Community".....	57
Milpa and First Acre Program.....	58
SmartMix®.....	59
Cover Crop Mixes.....	60
Legumes.....	62
Brassicas.....	64
Broadleaves.....	70
Perennials.....	72
Our Team.....	74
Nebraska Facility.....	78
Kansas Facility.....	80
A Note From Our CEO.....	82
Contact Information.....	83
Back Cover.....	

Think of this guide as seeds that can sprout and grow into deeper understanding if you will but plant them. We strive to have significant new content every year. While that is a good thing, it also means that many excellent articles from previous editions, some of which are catalogued at right, are not printed in this eighth edition.

Fortunately, we have all of them available on our website. We encourage you to diversify your education and read these

articles also. Let the learning continue by going to: www.greencoverseed.com/SHRG/

We invite you to do your due diligence and further explore any or all of the topics that we will touch on in this resource guide or on our website. We welcome your comments and feedback on this guide, and we are happy to provide additional copies upon request.

Keith and Brian Berns, Green Cover founders

The Purpose of This Guide

At Green Cover, our mission is to help people regenerate God's creation for future generations. As producers who make our living from the abundant resources with which God has blessed us, we should be the most adamant and passionate conservationists. Not only do our current and future livelihoods depend on healthy functioning soils and ecosystems, but God has charged us with caring for His creation. Adam, the first farmer, was directed by his Creator to care for and protect the soil. At Green Cover, we believe that we still have this responsibility, and we are called to take the additional step of rebuilding and regenerating our soils. We are committed to educating people about soil health and providing them with as many tools and resources as we can. This Soil Health Resource Guide is dedicated to that end.

We recognize our own limited knowledge and experience, so we have invited some of the best minds in the regenerative agriculture movement to share their

Download the useful guide for free by scanning the QR Code.



NEW PROFESSIONAL REGISTER FOR ENVIRONMENTAL ADVISERS

Managing the farmed landscape to both produce food and deliver for the environment is becoming increasingly important – from a legislation point of view, in terms of meeting government targets for biodiversity, water quality, woodland planting and net zero; from a business point of view with being able to ensure maximum environmental potential from the farm; but also for you and the local community with the joy of seeing a new species flourishing, organic matter levels increasing and your margins buzzing with pollinators.

Every farmer and land manager has a huge amount of knowledge to draw from, in order to manage and enhance the farmed landscape and achieve their own, local and national ambitions. However, do you also work with advisers to learn more, to use their expertise and experience to put together options or manage habitats and to enjoy sharing in the successes from the introduction of new practices?



Working with advisers who have technical environmental knowledge and understanding, along with an appreciation of farm business economics and how to effectively manage integration of practices with production is becoming increasingly integral across the UK.

For this reason, BASIS have worked

with stakeholders and organisations from across the sector to develop a new Environmental Advisers Register. This Register provides professional recognition of the role these advisers play, in working with farm businesses to achieve environmental outcomes.

The Register has been designed for the breadth of individuals delivering environmental advice with a farm business - from biodiversity, air, climate, energy and productivity knowledge, to effective management of plant health, livestock, nutrients, soil, water, woodland and the historic environment.

Advisers joining the Register will need to demonstrate their knowledge and understanding of environmental land management by either completing a qualification to entry, currently the BETA Conservation Management course, or by applying for acquired rights, based on the significant experience they have gained whilst working in the industry.

In addition, there will be the requirement to combine this with ongoing continuous professional development each year, which ensures all members of the Register have the up-to-date knowledge and skills to deliver advice which meets the needs of farmers and land managers.



Members of the Register will also be able to appear in a public, online directory, which farmers, land managers and advisers can use to find expertise on a particular subject in their local area – perhaps to put together a new agri-environment scheme application, carry out a survey or create a new management plan.

The aspiration of this Register is that it will create an industry standard for integrated advice delivery, raise standards across the industry and support farmers and land managers to enable sustainable productive and profitable, farming businesses, whilst delivering against national environmental ambitions.

For more information, please visit: www.basis-reg.co.uk/environmental-advisers.

FARMER FOCUS ED REYNOLDS



Harvest 2022 arrived fast and was completed without a pause. The wheats yielded 8.8t/ha, with only applied 155kg/ha bagged N applied, which was 16% less than 14yr average. 85% of this was direct drilled and we are seeing soil structure continue to improve. The oilseed rape yielded 3.3t/ha, with the highest yielding field consisting of a 3-way companion crop until January. The gross margin of this crop is hard to match with other break crops, so we have opted to roll the dice again and plant more for 2023. As I write on 20th September, the rapeseed with companion crop is experiencing much less CSFB attack, perhaps showing a benefit of diversity in a cash crop system.

This summer will be remembered on our farm for being hot and dry. We were fortunate to receive 24mm of rain on 25th August, after a period of nearly 10 weeks without rain. The dry weather threw a spanner in the works for cover crop / catch crop establishment. Indeed, we only drilled half the catch crops we intended. Because our system is linear: annual cash crop followed by cover crop sequentially, once harvest was complete, the soils were without a living root, bare and exposed to the sun. These were 'baked out' causing harm to the soil life that we are trying to encourage. This made me aware of the flaws in our system, where we need to look at overlapping plant cover and more living mulches.

Soil Testing

As a result of so much recent conversation around carbon in agricultural soils, with the backdrop of climate change and the opportunity to enter carbon certificate programs, we wanted to start testing our soil (Farmer Focus article - Apr 2022). The results of our original tests were quite shocking. Soil scientists look at Soil Organic Carbon (SOC) as a proportion of total clay content in the soil, so the higher the clay content, potentially the higher capacity to store stable carbon. One group of studies suggests a very good ratio for arable soil might be 1:8 carbon to clay, where as a degraded soil is 1:13 (Prout et al, 2020). The results from our first 24ha field showed a 1:16 SOC:clay content – in other words highly degraded.

This leads to the question of how it degraded to this point? To our best knowledge, this high clay content field has been in



arable production since 1940's, when American crawler tractors began to be imported as part of the increase in domestic production during WWII. It would probably have had animal manure rotationally applied until 1960's, when livestock left this farm. Since then, it has been in arable production, using intensive cultivation and

artificial fertiliser. You can see a lighter soil colour on the sloping parts of the field in the recent satellite imagery, indicating lower organic matter and implying soil erosion. I agree it is an assumption, but a safe one to say that the SOC level pre-1940 would have been significantly higher.

Given the soil test information, this leads to a bigger question – is my job as a farmer to grow crops safely and profitably for the world market, or is there a moral imperative to stop degradation of my soil, and even try to improve it? To quote from the summary of the periodical article: 'Many arable soils in England and Wales evidently have a substantial SOC deficit, suggesting a significant opportunity to increase SOC storage to both improve soil conditions and sequester carbon' (Prout et al, 2020). Interestingly, the field we tested is not one of our 'worst'. It has been in no-till / very shallow till for 5 years and is functioning well under this new regime. We hope to use this and other regenerative practices to try and improve its carbon content – no danger of reaching carbon saturation point anytime soon. We have logged the sampling points and will revisit them in 10 years time.

Could you explain this in more detail?

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



Novag



Next Generation
Farming

Cross out the past and let the worms work for you

Some direct drills from around the world may have been a good idea when they were invented. But times have changed – so keep up with the future.

With a Novag drill you're not only investing in the world's most innovative no-tillage drill, but you'll also receive healthy soils that will make the next generation's farming a success.

Cut your costs and working hours and let the worms, fungi and bacteria do the job for you. Enjoy increasing carbon sequestration, water storage and nutritional quality – all while increasing yields and revenues! It even helps you to restore thriving ecosystems. This may sound like a fairytale, but it works.

Novag SAS \ TEL +33 5 49 24 65 43 \ www.novagsas.com



NITROGEN STABILISERS (PART 1): INHIBITORS

Joel Williams, *Integrated Soils*

Reductions in nitrogen fertiliser use and associated greenhouse gas (GHG) emissions is of course high on the agenda in recent times – you’d have to be living under a rock to have missed this memo! In many countries around the world, we are seeing legislation from governments striving to limit the release of GHGs in order to meet emissions and sustainability targets. The use of low efficiency nitrogen fertilisers is of course one of the major sources, contributing both ammonia (NH₃+) and nitrous oxide (N₂O). Production systems that are dependent on external N inputs are highly vulnerable to the impacts of this impetus and farmers who have been experimenting and trialling lower N strategies will be well poised to weather the upcoming changes.

There is no silver bullet to addressing the nitrogen dilemma, a multi-pronged approach that integrates many tools into the toolbox is required. One such strategy involves the use of stabilised nitrogen fertilisers – often called enhanced efficiency fertilisers – which make use of chemical inhibitors to slow N transformations in the soil and prevent losses. Urease inhibitors (UI) slow ammonia production while nitrification inhibitors (NI) slow nitrate formation (which can ultimately be converted to N₂O during anaerobic conditions). These inhibitors are very targeted and they have been proven highly effective in reducing production of these two GHGs¹. However, there has been some concern raised about their potential side effects on soil biology – this is something I have been asked numerous times over the years. There are two recent studies that have investigated this question and I thought it was worth sharing their findings. The bottom line was that both studies found no effect of UI and only a mild and temporary effect of NI but let’s expand with a touch more detail...

Firstly, a short-term study² in Canada applied urea-ammonium nitrate (UAN) with and without both urease and nitrification inhibitors and followed

up monitoring the effects on the soil microbiome for 16 days. The addition of the inhibitors to UAN had only minor effects on the abundance or activity of target and non-target N-cycling microbial groups which was temporarily observed around day 9 after fertiliser application, but no longer evident by the end of the study period. Along with these minor and transient impacts, a significant ~68% reduction in N₂O emissions was achieved².

Secondly, a more recent and longer-term paper³ from Ireland studied the effects of UI and NI on soil microbial communities and biological function in a grassland soil over a 5 year period. After 5 years of repeated applications, there was no impact of either inhibitor on non-target microbes while function and abundance of N cycling communities were for the most part, unaffected by fertilisation or the use of inhibitors; although, the NI did reduce the abundance of a bacteria which produce N₂O. Although the inhibitors had a fairly negligible effect, this study found the fertiliser itself did have an impact on the fungal community structure but no impact on bacterial community structure³.

So it appears nitrogen inhibitors are not only effective at stabilising nitrogen inputs in the soil, they also have a minor effect on the soil microbiome, making them a potential valuable tool as part of an integrated nitrogen management approach. That said however, there are some reports of urease inhibitors having negative effects on plant growth by entering the plant and suppressing the urease enzyme internally. From a plant nutrition perspective, the urease enzyme catalyses the breakdown of urea, liberating the embedded N to be utilised by the plant to ultimately synthesise amino acids and proteins. Consequently, using a UI which can block the activity of this key enzyme internally can lead to a build up of urea and additionally prevent adequate protein synthesis (of course important for plant health and quality).

A study from as early as 1989 highlighted that plant uptake of UI increased both leaf-tip necrosis and urea concentrations to toxic levels in both wheat and sorghum⁴. Another study with maize demonstrated that UI can heavily interfere with urea nutrition, limiting uptake as well as the following assimilation pathway⁵. Lastly, a very recent study from earlier this year applied foliar urea with a UI onto pineapples – a reduction in urease activity was observed which corresponded in high levels of urea and diminished levels of ammonium, amino acids and protein in the pineapple leaves⁶. Combined, these studies all indicate that UI are taken up by plants, can influence N uptake and disrupt N metabolism and hence protein synthesis. That said, keep in mind that plants do make use of a range of N sources beyond just urea so utilisation of ammonium, nitrate, amino acids, proteins and bacterial endophytes can still function and support plant growth; however, the broader goal of optimising plant growth and production should aim to support all sources and pathways of N nutrition.

In part 2 of this article, we will explore the potential of some of the alternatives to chemical inhibitors, namely C-based inputs.

References:

1. *Urease and Nitrification Inhibitors—As Mitigation Tools for Greenhouse Gas Emissions in Sustainable Dairy Systems: A Review.* (2020). doi.org/10.3390/SU12156018
2. *Short-term response of soil N-cycling genes and transcripts to fertilization with nitrification and urease inhibitors, and relationship with field-scale N₂O emissions.* (2020). doi.org/10.1016/J.SOILBIO.2019.107703
3. *Assessing the long-term impact of urease and nitrification inhibitor use on microbial community composition, diversity and function in grassland soil.* (2022). doi.org/10.1016/J.SOILBIO.2022.108709
4. *Potential phytotoxicity associated with the use of soil urease inhibitors.* (1989). doi.org/10.1073/PNAS.86.4.1110
5. *The urease inhibitor NBPT negatively affects DUR3-mediated uptake and assimilation of urea in maize roots.* (2015). doi.org/10.1073/pnas.86.4.1110
6. *Transient application of foliar urea with N-(n-Butyl) thiophosphoric triamide on N metabolism of pineapple under controlled condition.* (2022). doi.org/10.1016/J.SCIEN.2021.110822



Farming for a **SUSTAINABLE** future

Like it or not, farming has to change.

We can help future-proof your farm by growing a diverse range of crops together with comprehensive advice on environmental and sustainable business opportunities.

We've captured our wealth of experience and know-how in our Green Horizons Insight Reports. Simply ask your Agrii agronomist for copies or follow the link below to order copies directly.

Whatever your sustainable farming, nature recovery or regenerative farming goals are, Agrii can guide you to a profitable and successful future.

**FIND OUT MORE AT
[WWW.AGRII.CO.UK/
SUSTAINABILITY](http://WWW.AGRII.CO.UK/SUSTAINABILITY)**



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.

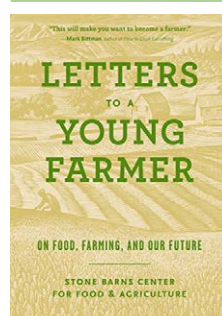


The Fate of Food: What We'll Eat in a Bigger, Hotter, Smarter World

We need to produce more food. With water and food shortages already being felt in some parts of the world,

this might sound like an insurmountable challenge, but all is far from lost. You may not have heard about it, but the sustainable food revolution is already under way.

Amanda Little unveils startling innovations from the front lines around the world: farmscrapers, cloned cattle, meatless burgers, edible insects, super-bananas and microchipped cows. She meets the most creative and controversial minds changing the face of modern food production, and tackles fears over genetic modification with hard facts. *The Fate of Food* is a fascinating look at the threats and opportunities that lie ahead as we struggle to feed ever more people in a changing world.



Letters to a Young Farmer: On Food, Farming, and Our Future

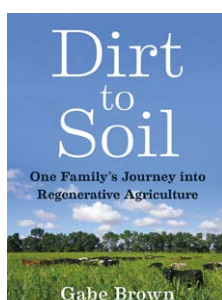
An agricultural revolution is sweeping the land. Appreciation for high-quality food,

often locally grown, an awareness of the fragility of our farmlands, and a new generation of young people interested in farming, animals, and respect for the earth have come together to create a new agrarian community. To this group of farmers, chefs, activists, and visionaries, *Letters to a Young Farmer*

is addressed. Three dozen esteemed leaders of the changes that made this revolution possible speak to the highs and lows of farming life in vivid and personal letters specially written for this collaboration.

Barbara Kingsolver speaks to the tribe of farmers—some born to it, many self-selected—with love, admiration, and regret. Dan Barber traces the rediscovery of lost grains and foodways. Michael Pollan bridges the chasm between agriculture and nature. Bill McKibben connects the early human quest for beer to the modern challenge of farming in a rapidly changing climate.

We have listed a few more books you might find interesting, challenge the way you currently think and help you farm better.



Dirt to Soil: One Family's Journey into Regenerative Agriculture

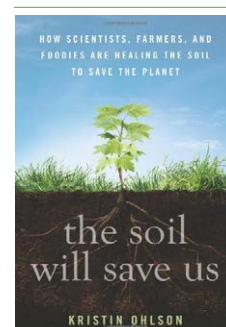
Gabe Brown didn't set out to change the world when he first started working alongside his father-in-law on the family farm in North Dakota. But as a series of weather-related crop disasters put Brown and his wife, Shelly, in desperate financial straits, they started making bold changes to their farm. Brown—in an effort to simply survive—began experimenting with new practices he'd learned about from reading and talking with innovative researchers and ranchers. As he and his family struggled to keep the farm viable, they found themselves on an amazing journey into a new type of farming: regenerative agriculture.

Brown dropped the use of most of the herbicides, insecticides, and synthetic fertilizers that are a standard part of conventional agriculture. He switched to no-till planting, started planting diverse cover crops mixes, and changed his grazing practices. In so doing Brown transformed a degraded farm ecosystem

into one full of life—starting with the soil and working his way up, one plant and one animal at a time.

In *Dirt to Soil* Gabe Brown tells the story of that amazing journey and offers a wealth of innovative solutions to our most pressing and complex contemporary agricultural challenge—restoring the soil. The Brown's Ranch model, developed over twenty years of experimentation and refinement, focuses on regenerating resources by continuously enhancing the living biology in the soil. Using regenerative agricultural principles, Brown's Ranch has grown several inches of new topsoil in only twenty years! The 5,000-acre ranch profitably produces a wide variety of cash crops and cover crops as well as grass-finished beef and lamb, pastured laying hens, broilers, and pastured pork, all marketed directly to consumers.

The key is how we think, Brown says. In the industrial agricultural model, all thoughts are focused on killing things. But that mindset was also killing diversity, soil, and profit, Brown realized. Now he channels his creative thinking toward how he can get more life on the land—more plants, animals, and beneficial insects. "The greatest roadblock to solving a problem," Brown says, "is the human mind."



The Soil Will Save Us: How Scientists, Farmers, and Foodies Are Healing the Soil to Save the Planet

Journalist and bestselling author

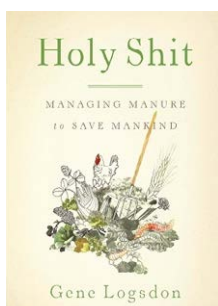
Kristin Ohlson makes an elegantly argued, passionate case for "our great green hope"—a way in which we can not only heal the land but also turn atmospheric carbon into beneficial soil carbon—and potentially reverse global warming.

Thousands of years of poor farming

and ranching practices—and, especially, modern industrial agriculture—have led to the loss of up to 80 percent of carbon from the world's soils. That carbon is now floating in the atmosphere, and even if we stopped using fossil fuels today, it would continue warming the planet.

As the granddaughter of farmers and the daughter of avid gardeners, Ohlson has long had an appreciation for the soil. A chance conversation with a local chef led her to the crossroads of science, farming, food, and environmentalism and the discovery of the only significant way to remove carbon dioxide from the air—an ecological approach that tends not only to plants and animals but also to the vast population of underground microorganisms that fix carbon in the soil. Ohlson introduces the visionaries—scientists, farmers, ranchers, and landscapers—who are figuring out in the lab and on the ground how to build healthy soil, which solves myriad problems: drought, erosion, air and water pollution, and food quality, as well as climate change. Her discoveries and vivid

storytelling will revolutionize the way we think about our food, our landscapes, our plants, and our relationship to Earth.



Holy Shit: Managing Manure to Save Mankind

In his insightful new book, *Holy Shit: Managing Manure to Save Mankind*, contrary farmer Gene

Logsdon provides the inside story of manure – our greatest, yet most misunderstood, natural resource. He begins by lamenting a modern society that not only throws away both animal and human manure – worth billions of dollars in fertilizer value – but that spends a staggering amount of money to do so. This wastefulness makes even less sense as the supply of mined or chemically synthesized fertilizers dwindles and their cost skyrockets. In fact, he argues, if we do not learn

how to turn our manures into fertilizer to keep food production in line with increasing population, our civilization, like so many that went before it, will inevitably decline. With his trademark humor, his years of experience writing about both farming and waste management, and his uncanny eye for the small but important details, Logsdon artfully describes how to manage farm manure, pet manure and human manure to make fertiliser and humus. He covers the field, so to speak, discussing topics like: How to select the right pitchfork for the job and use it correctly How to operate a small manure spreader How to build a barn manure pack with farm animal manure How to compost cat and dog waste How to recycle toilet water for irrigation purposes, and How to get rid ourselves of our irrational paranoia about faeces and urine. Gene Logsdon does not mince words. This fresh, fascinating and entertaining look at an earthy, but absolutely crucial subject, is a small gem and is destined to become a classic of our agricultural literature.

Unrivalled seed to soil contact

 **GÜTLER® Magnum 1240**
The all-year implement for large-scale farming and contracting



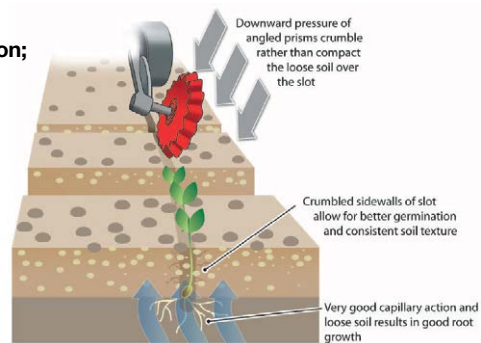
WOX
AGRI SERVICES

To find out more call **01670 789 020**
or visit **www.woxagriservices.co.uk**



Take a closer look at the Prisma® roller system with a cultural twist on;

- Blackgrass chitting with volunteer cereal control
- Straw spreading and incorporation
- Trailed units from 6.4m - 12.4m
- A wide range of paddle, tined units and options to fit seeders for cover crop seeding and small seeds
- For non-inversion and plough-based systems.



 [woxagriservices](https://www.facebook.com/woxagriservices)
 [woxagri](https://twitter.com/woxagri)
 [woxagri](https://www.youtube.com/woxagri)

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

Patrons

Clive Bailye	Richard Thomas	James Bretherton	Julian Gold
Justas Vasiliauskas	David White	Tim Ashley	Adam Driver
Trevor Bennett	Robert Beaumont	Douglas Christie	Russell Calder
Tracy Gleeson	Andy Meecham	Gavin Lane	Glyn Rogers
Richard Reams	Colin McGregor	Andrew Bott	Becky Willson
Nigel Joice	Simon Cowell	Gary Yeomans	Kevin Roberts
Hugh Marcus	Louis Stephenson	James Dorse	David Aglen
Richard Rawlings	Stephen Tate	Mike Porter	Sam Middleton
David Grainge	John Pawsey	Harry James	David Lord
Michael Fray	Charles Whitbread	David Fuller-Shapcott	Stephen Edwards
Duncan Wilson	Nick Herring	John Cantrill	Emma Dennis
Mark Middleton	James Chamings	Blazej Delnicki	Robert Johnston
Ben Taylor-Davies	Richard Bruce-White	Ed Spencer	Tim Palmer



New For
2022

VIRKAR

New For
2022

Dynamic Double Disc



Introducing the New Dynamic DD Double disc. The addition of a Turbo Disc running directly in line with the seeding disc, ensures that even in the highest of crop residue the seeding channel is cleaned leading to perfect seed to soil contact and germination. The pressure of the turbo disc can be adjusted to take into account different soil conditions as well as being lifted out of work when not required. The coulter design benefits from 35cm of coulter travel with on the move pressure control.



VIRKAR

*Redesigning The Way We Go Seeding !
Innovation Knows No Boundaries !*

Visit us at Groundswell Stand DN5



Meet Sandy

The Smart Natural Capital Navigator

Sandy can boost business resilience with smart, independently accredited, easy-to-use software for measuring, managing and monetising farm carbon and natural capital.

To request a demo visit www.trinityagtech.com

Trusted by leading farms of all sizes including:



"To have baseline data that you know has sufficient rigor gives you the confidence to explore options you otherwise couldn't. Once you do, the continued revelation of amending management practice makes you realise just what's possible."

Craig Livingstone, Lockerley Estate