



“Carbon is a currency that we need to understand.”

Farming for the future

Technical Carbon farming

As growers continue making progress towards Net Zero, AHDB highlighted some of the key issues and opportunities during its recent 'Carbon Week'. CPM finds out more.

By Charlotte Cunningham

Sustainable farming has been getting a lot of airtime lately, and while what farmers 'should' be doing is pretty well covered, how to do it is sometimes less well explained.

That said, there's been a surge in widespread collaboration across the industry to come together and ensure we're working collectively in order to meet the NFU's Net Zero by 2040 target.

Most recently, AHDB held an online 'Carbon Week' bringing together key voices from across the industry to enable this wider knowledge transfer.

CPM joined the webinars and picked out some of the 'best bits' to provide growers with a better understanding of some of the ways in which they can make changes on farm to promote

a more sustainable future.

Starting right at the top, carbon accounting — sometimes called carbon footprinting — has become a core tool for those looking to calculate their key sources of emissions on farm. However, with many different methods of doing so, it begs the question: are they a help or a hindrance?

“You can't manage what you can't measure,” says Sarah Wynn, managing director of ADAS' climate and sustainability team. “That's where an assessment tool is really important.”

Emissions assessment

Sarah says an emissions assessment should be thought of as a decision-support tool and can be hugely beneficial. “These tools help growers identify key sources of emissions, develop a baseline and look at the scale and impact of opportunity. The findings can then be used to develop a plan to reduce the carbon footprint of the farm and create a model to move forwards that takes into consideration how changes will impact emissions.”

For arable producers, Sarah says a footprint should be based on one year of production and should consider emissions from nitrogen applications and livestock manures (if appropriate), as well as

embedded emissions from energy production and combustion.

As mentioned, there are a number of tools available to carry out such an analysis, so how do growers decide on which to use? “Different tools do different things, and it's important when selecting a calculator that you choose a formula — or software — that will accurately help you ▶



Sarah Wynn says carbon calculators can be a useful guidance tool for those looking to reduce their carbon footprint.



To improve efficiency, it's essential to focus on both your crop and your soil, says Christina Baxter.

► answer the questions you have regarding your carbon status," she explains. "Think about whether you want to do an assessment for the farm as a whole, or if you want to calculate the status of a specific product — for example, perhaps you want to know the carbon impact of a tonne of grain — because that can influence what tool you choose.

"Farm Carbon Calculator and Agrecalc can do whole farm assessments, for example, whereas the Cool Farm Tool is designed for product assessments."

Though calculators can be an incredibly beneficial guidance aid, it's important to recognise that no one tool gives exactly the correct answer, stresses Sarah. "They're all built on assumptions. Most have a standard approach behind them, but can make a different assumption, for example, on how much embedded carbon is in feed or fertiliser.

"This doesn't mean that one is better than another — but it's just about knowing which ones are going to be most beneficial for your requirements."

Like any technology, carbon calculators do have their downfalls, and Sarah says one of the main issues they have is providing details on mitigation. "Thinking about different manure applications, for example, these calculators aren't often able to show the different emissions associated with each practice as they require a huge amount of data to do so."

Sarah stresses that while calculators are a means to an end, they're not an end in themselves. "For climate impact to be seen, you have to take action on farm,

reduce your emissions as much as possible, enhance carbon sequestration where you can, and move towards Net Zero."

So just how much action is being taken on farm at the moment?

Essex grower, David Lord, has been thinking about his carbon impact for a number of years and spoke about practical ways of achieving Net Zero on farm during AHDB's 'Carbon Week'.

Better understanding

David says that gaining a better understanding of his soils has been the most influential guide to the changes he could feasibly implement on farm. "We have mixed soils here, but mainly heavy clay, and use a mixture of conservation agricultural practices, including cover cropping, direct drilling and making use of a big diverse rotation.

"Understanding that the soil is an ecosystem is key to mitigating some of the key challenges — particularly in terms of reducing fertiliser usage which we've found to be hugely important for reducing our carbon footprint.

"Carbon is a currency that we need to understand."

With agriculture's unique position to be a 'carbon sink', as well the opportunity to reduce its emissions, David has been looking at ways he can both sequester carbon and reduce carbon emissions on his farm.

"In terms of sequestration, cover crops are the big thing for us. It's really hard to put a value on them in terms of return on investment, but they're essential for us and we wouldn't be able to go down the direct drilling/no-till route without them — something that's also helping us sequester more carbon, though we'll still use cultivations where we need them."

Looking at drainage has also been important for David. "This is something that often gets overlooked, particularly on heavier soils, but the better the soil drains, the healthier it will be — which then has positive effects on nutrient levels and fertiliser usage."

Rethinking rotations are also part of the future plans — particularly including legumes to reduce the need for N fertilisers — as well as considering the role livestock could play on arable farms, he explains. "A grazed pasture is the ultimate goal if we think about improving carbon levels. If arable growers can find a way of incorporating livestock onto farm, then this is only going to be a good thing in terms

of reducing overall emissions."

Turning focus to reducing emissions, David carried out some carbon audits last year which showed that his wheat and beans were in a negative carbon balance — though it's important to point out that organisations like ADAS has raised concerns over the accuracy of such calculators. "The audit showed our land management has been integral in helping to negate our carbon impact, however, it also highlighted that soils/fertiliser usage is our main area to target."

"We use liquid nitrogen and we're able to put a carbon source with it and that's helped reduce N use by 20-30% over the past couple of years, just by helping N bind into soil and not leach as much.

"But improving soil health benefits nutrient holding capacity which is going to be fundamental in reducing fertiliser usage. Government policy is threatening fertiliser usage so the time is right now to focus on N use efficiency by using the tools available — there's going to be a commercial drive for it now."

As David says, there's certainly a growing interest, from both the agriculture sector and wider industry, around reducing fertiliser usage and for arable farmers this looks to be the most impactful method of reducing carbon emissions.

That said, fertiliser, particularly nitrogen, is a hugely important part of crop production, so is there a way growers can maximise fertiliser efficiency and reduce their carbon footprint, without hindering overall production and profitability?

Dr Christina Baxter, crop research consultant at ADAS, discussed the contribution of N fertilisers to agriculture's carbon footprint during 'Carbon Week' — specifically looking at calculating emissions and reducing usage.

She says nitrogen use efficiency plays an important role in reducing the emissions associated with N fertiliser use. "To improve efficiency, it's essential to focus on both your crop and your soil. The advice from me is to be cautious of your predicted yield and consider the season you're in and the potential limitations of that season. As well as this, it's crucial to know how much nutrient is being provided by the soil, and any improvement in soil structure — particularly aeration — will increase NUE.

"From a practical point of view, avoid application in waterlogged soils and consider the use of inhibitors where possible."

ADAS has been involved in Defra-funded studies looking at the efficacy of nitrogen inhibitors in reducing N₂O emissions.

Dicyandiamide was trailed in arable and grassland scenarios, and one of the take homes from this work was that there's considerable variation in N₂O reduction efficiencies — ranging from +19% to -100%, which can come as a result of a number of factors including temperature, clay content and soil organic matter levels, explains Christina.

"But on average, DCD was more effective in reducing emissions in arable situations than grassland — with an average reduction of 81% compared with 58%."

And while they've proven to make a difference in reducing N₂O emissions, Christina says it's important to note that inhibitors have no proven agronomic benefit. "They haven't been seen to improve yield, total N offtake or NUE, so when considering how we roll out these inhibitors on a wide scale to reduce emissions, there's likely to be a requirement for an incentive." For those thinking that they ought to be looking at being more efficient with fertiliser usage, nutrient management is going to play a huge role in this to ensure crops don't suffer as a result, says ADAS' Dr Anne Bhogal.

According to Anne, nutrient planning should be a step-by-step process as follows:

1. Understand what the crop needs
2. Look at what's already in the soil
3. If using manures, account for manure nutrient supply

Eco-friendly fuel

Also a big contributor to climate change is CO₂ emissions, however E10 fuel — an eco-friendly blend of petrol and ethanol — is set to be available by Sept 2021, with the announcement heralded as 'good news' for farmers.

Following a consultation with drivers and industry, the introduction of E10 fuel, which is a mixture of petrol and ethanol made from materials including low-grade grains, sugars, and waste wood, will boost the government's ambitions to reach Net Zero by 2050.

Its introduction on UK roads could cut transport CO₂ emissions by 750,000 tonnes/year — the equivalent of taking 350,000 cars off the road, or all the cars in North Yorks.

Responding to the government announcement, NFU crops board chairman

4. Then, and only then, consider how much you need to top up with bagged fertiliser.
5. Finally, ensure spreading is accurate, even and timely to minimise losses and maximise efficiency.

"It's really important to use a fertiliser recommendation system and adjust for expected yield where appropriate," explains Anne. "The amount required will depend on crop type and variety, sowing date and soil type, but the aim should be to optimise and enhance crop productivity to maximise carbon capture, while minimising inputs."

Soil N supply

Once growers know what their crops need, they can then think about what's available in the soil, she adds. "This is all about determining what nutrients you can get for 'free'. For nitrogen, it's important to know your soil N supply and there's standard values with RB209 that can be used, but you can also measure this yourself ahead of working out fertiliser requirements.

"This can be particularly useful in a season where you might have high N residues — for example, if you regularly use large volumes of organic materials or a high N residue crop."

Anne warns it's not just N that should be considered, and if other nutrients aren't in adequate supply, that N cannot be used effectively and efficiently. "I recommend sampling soil every three to five years to calculate the P, K and Mg levels. Also think about pH levels and take action to

Matt Culley said: "The NFU has long been calling for the government to authorise E10 fuel and it's great to hear that it will start to be available at UK forecourts from Sept.

"Not only will this mandate provide a boost for the UK wheat and sugar sectors, it will play an important and immediate role in delivering the government's green agenda, especially as it may be some years before we are able to make a countrywide shift to fully electric vehicles.

"E10 is a great example of how investment in farming and the rural economy can benefit the whole country. British growers have the ability to deliver more renewable fuel for the nation, alongside continuing to produce the country's larger staples, and we should do all we can to maximise that potential to help drive green growth across the economy."



It's really important to use a fertiliser recommendation system and adjust for expected yield where appropriate, says Anne Bhogal.

correct any suboptimal values."

Looking at alternative solutions, organic manures can provide a valuable source of nutrients and allow growers to rely less on synthetic sources, although knowing the nutrient content is key. "RB209 provides 'typical' figures, but manures are inherently variable, so a lab analysis will provide a better understanding."

But it's not just about knowing the nutrient content as a whole. The crop-available nutrient content is what's going to have the biggest influence on reducing bagged fertiliser usage, explains Anne. "For nitrogen, it's important to understand what's in the manure in terms of readily available N content, then consider how much might be released by mineralisation during the season as well as estimating what losses you're likely to get from leaching, volatilisation and denitrification. Then you'll be left with the N content that's actually available for crop uptake."

The final part of the process is application, and this is equally as important for minimising losses and promoting efficient fertiliser usage. "For manures, quantify application rates and know your spreader load, discharge rate, bout width and tractor speed. For slurry and liquid manure, consider using band-spreaders as they can give even application across known bout widths, and minimise ammonia loss.

"Finally, precision fertiliser application, such as variable rate spreaders can also help improve fertiliser use efficiency, reduce fertiliser use and consequently the carbon emissions associated with their production and use." ■