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View through a carbon lens

Efficiency and productivity both lead to profitability. Could undertaking a carbon audit make good business sense because it helps focus on these key elements and become more sustainable in the process? CPM finds out more.

By Lucy de la Pasture

The road to net zero has put ‘carbon’ in the spotlight and some entrepreneurial growers are turning their thoughts on how to monetise farming carbon. AHDB’s senior environmental scientist Harley Stoddart believes we should always be mindful that carbon emissions are just one aspect of environmental impact.

“Carbon is pretty critical at the moment, especially around climate change, but often there is quite a lot of conflation between climate change, environmental impact and net zero. There are lots of terms, great buzzwords for politicians to use, but quite often I’m finding there’s actually minimal understanding about what they mean.”

The nomenclature around carbon can be confusing, explains Harley. “Carbon is often used as shorthand for carbon dioxide, which is in turn used as shorthand for carbon dioxide equivalents which also means greenhouse gases.

“Not everything to do with environmental impact is connected to climate change. If we only look at carbon in connection with climate change then there may be unforeseen impacts, such as increases in diffuse pollution or increases in ammonia — it’s a complex area and things need to be taken ‘in the round’,” he says.

Carbon audits

AHDB has recently undertaken to put 52 farms in its Farm Excellence network of Monitor and Strategic Farms through a carbon audit. “It’s a really interesting process,” says Harley. “Once the audit (or carbon footprint) has been carried out, it highlights the areas where improvements could be made and then the farmer and consultant consider the results together to come up with a carbon management plan.”

The big question for growers is whether implementing different management practices to reduce carbon emissions will cost them money or make them money, says Harley. He stresses that carbon management shouldn’t create worry because, fundamentally, most measures to reduce emissions should improve the bottom line of the business.

“I always recommend focusing on profitability, but by accounting for carbon then you’ll be able to demonstrate the environmental improvement that will accompany any increase in profitability. Almost everything that’s recommended to

be good for the environment is good for your pocket as well. Economic sustainability is the driver for environmental sustainability — carbon simply provides a different lens to view the profitability of a farming business.”

Harley believes that one of the major benefits in undertaking a carbon footprinting exercise is to help farmers demonstrate the environmental good that they already do and to challenge the widely held notion that everything farming does is bad for the environment.

“Society is forever asking agriculture to improve but without helping the industry understand where it’s starting from,” he adds. “The industry has been seen to ▶



Any measures to reduce emissions should improve the bottom line of the business, says Harley Stoddart.

▶ be static for the past 20 years but that's not the case. Improvements have been invisible as they've gone unreported at a large scale.

The AHDB role out of carbon footprinting for the network of Monitor and Strategic Farms has been carried out by SAC Consulting and ADAS. The assessments are essentially the gathering of information — to identify and quantify all activities or inputs on farm that come with a carbon footprint. This can be anything from diesel, electricity, feed, and fertiliser and so on.



Fuel use can be difficult to get to grip with during carbon audits, especially where crops require intensive cultivations.

The results from the first wave of auditing will be used to develop a pilot service that will help growers to create a plan to reduce carbon emissions, with a recommendation to conduct annual audits to track the benefits.

Sarah Wynn, managing director at ADAS Climate and Sustainability, explains that the key thing for most arable growers to understand is nitrogen use on the farm, as this makes the biggest contribution to their carbon footprint — often as much as two-thirds.

Embedded emissions

“To get the most out of accounting for carbon on the farm the data on nitrogen fertilisers has to be as accurate as possible, including their usage, nitrogen source and manufacture to properly work out the embedded emissions. The more you know about the fertiliser the better,” she says.

Sarah confirms the relationship between productivity and carbon footprint that Harley alludes to. “The more crop you're producing then the lower the intensity of the carbon footprint (emissions/tonne of output). Though you need to balance this



Sarah Wynn believes that the right time to begin selling carbon out of agriculture is when the net zero goal has been achieved.

though with absolute emissions — if you keep increasing fertiliser use and increasing production, absolute emissions on farm will increase, and you move further from net zero.

But optimising efficiency and reducing waste makes good business sense and many farmers are already doing this, which leaves us with the more challenging things such as nitrogen use efficiency (NUE) to tackle.”

To lay the foundation for carbon footprinting in cereals and oilseeds, AHDB has funded researchers at NIAB and SRUC to conduct a high-level scoping review of the topic area and to inform the

No silver bullet to reduce emissions

Rob Beaumont of AEB Agriculture is one of the four farmers who have teamed up to host the AHDB's Monitor farm in North Herefordshire. Sindons Mill farm in Suckley, Worcestershire is just a stone's throw from the Herefordshire border and within a 15-mile radius of the other three holdings.

Collectively the Monitor Farm hosts farm around 850ha with a mix of enterprises that covers those that are typical in the region. Rob grows winter wheat, winter and spring barley, oats, pulses and maize, with oilseed rape taking a temporary break from the rotation this year — with the farm now paying for OSR grown on a relatively short rotation throughout the noughties and early teens, he believes.

It's been a challenging couple of seasons for arable farmers, but Rob is upbeat about his journey towards a regenerative system of agriculture.

“We've been moving to regen over the past couple of years, but it doesn't just happen overnight. We've recently moved to a Mzuri strip till drill, so we now have a system with less tillage and less soil disturbance,” he says.

Building soil organic matter and carbon is

central to the philosophy of regen practices and the farm has been making use of cover crops for the past 5-6 years, with mixed results. “We've tried a lot of different mixes, including forge crops for local dairy farmers. We're also working with a neighbour who mob-grazes the covers and that's worked well this year.”

SAC carried out a carbon audit of the farm earlier this year and Rob was struck by the contribution fertiliser use made to his carbon footprint, which accounted for 65% of the total emissions, and fuel came in at 12%. OSR featured in the rotation when the audit was carried out and similarly to much of the UK in 2020, yields suffered after a very difficult growing season and cabbage stem flea beetle damage. The poor OSR performance produced a spike in the carbon emissions at a crop level, highlighting the link between productivity and carbon footprint.

“We have to look at how much nitrogen we're using and learn how to use it more efficiently,” he comments. “This year we've dropped the rates of soil applied nitrogen to 100kg/ha and have topped crops up with amide N later in the season.”



Rob Beaumont says there's not going to be a silver bullet to lower the farm's carbon footprint, but that doing many things a few percent better will make the difference.

Rob has also been looking more holistically at nutrient management and by regular tissue testing this season he found boron levels were often low. By ensuring plants stay nutritionally balanced he's hoping to make better use of applied nitrogen.

“There's not going to be a silver bullet to lower the farm's carbon footprint but if we can do many things just a few percent better, that's what will make the difference,” he concludes.

design and development of the Evidence for Farming Initiative (EFI).

This has confirmed the interventions that will have the most effect to help the combinable crops sector reach net zero. These are optimising nitrogen addition and avoiding applying an excess; growing ground cover in leaching-risk periods, and the use of catch and cover crops (considered together); reducing intensity of cultivation; use of manures and composts; use of biosolids and industrial wastes; use of controlled-release fertiliser/inhibitors and use of biochar.

"It'll come as no surprise that these measures are already widely embraced in the principles which underpin regenerative agriculture practices," highlights Harley.

Sarah picks up on the efficient use of nitrogen, highlighting that a big chunk that's applied isn't ever taken up by the crop so changes to management practices could involve looking at both the nitrogen source, placement and timing of application, so it's as crop appropriate as possible. Improving NUE is an area which will require more research and innovation, she believes.

Harley believes that by seeing some evidence of where farms are in terms of a carbon footprint, it provides a starting point for applying changes to management practices. He adds that the main actions to reduce a carbon footprint can be achieved by developing a nutrient management plan and sticking to it. "Nitrogen is the biggest emitter but if you can get the requirements for the crop right and spend less than that's a win-win."

While nitrogen fertiliser may be the prime source of carbon emissions on most farms, pesticide use can also contribute to positivity where they are used to optimise



Baling straw and reintroduce composts or manures is of more benefit to the soil and helps reduce soil emissions.

yields, being a generally low emissions source but with a big influence on productivity, explains Sarah.

Fuel is the other consideration and is often the most challenging input to get to grips with during a carbon audit, particularly when it's carried out on a per crop basis rather than at an overall farm level. She highlights that fuel use is most important where root crops are grown because of the intensity of cultivations required during planting and harvesting.

Harley says that as well as reducing emissions intensity, there are opportunities to increase carbon capture. "Increasing soil organic matter is never a bad thing and will be not only accompanied by increases in soil organic carbon, but improvements in nutrient holding capacity, porosity, soil workability which are as important.

Mitigating losses

"Min-till and cover crops are brilliant for all those reasons. These measures make a difference but it's small compared with fertilisers. But take all of the benefits together then moving to these practices may help mitigate carbon losses rather than increase sequestration."

Disposal of crop residues is another area where small gains can be made in carbon accounting terms. "If crop residues are returned to the soil, then they will break down and produce further emissions in the process. If you can bale and sell straw off the field and reintroduce composts or manures then it would actually be of more benefit to the soil," he says.

Both Harley and Sarah have reservations about farmers rushing to monetize carbon by trading it as a commodity. Harley believes there are big questions about the permanence of carbon in the soils and an unforeseen event, such as a combine fire or a necessity to plough previously min-tilled land, could potentially release soil stored carbon and leave growers in a contractually difficult situation if they've traded it.

Sarah has concerns that because UK agriculture has to become net zero, some farms will inevitably be carbon negative and others carbon positive, so there may have to be some trading within the industry — but will prices for carbon within the sector be as good as those paid by other sectors?

"At a farm level farmers should not be looking to sell carbon until they are confident that their farm business is net zero. For the agriculture sector to achieve net zero, ideally it should be the first to buy agricultural carbon, before it is sold



Cover cropping is one of the tools growers can make use of to capture nutrients in the soil, reducing soil losses.

elsewhere — but I am not convinced the sector will buy from within itself unless there is a cost to being a carbon emitter.

"If carbon has been sold off then it's no longer available to off-set against a farm's own emissions — you can't use it twice," she says. "Some farms are already close to net zero but most of these have large areas of woodland so its perhaps more by luck than design."

She's also sceptical where farmers are claiming to be net zero because of good soil practices and her view is that there's still a long way to go to robustly demonstrate they're increasing soil carbon year on year. ■



Nitrogen fertiliser use is responsible for up to two thirds of carbon emissions on an arable farm.

Research roundup

From Theory to Field is part of AHDB's delivery of knowledge exchange on grower-funded research projects. CPM would like to thank AHDB for its support and in providing privileged access to staff and others involved in helping put these articles together.

For further information:

AHDB Project No 21140076 'A high-level scoping review Farming, greenhouse gas emissions and carbon storage: cereals and oilseeds' was carried out by NIAB and SRUC during 2020 at a cost of £24,292 to AHDB.