> *"SRS is looking at what's happening below our feet and how we can manage that."*

Unearthing the detail

Soils

Soils are increasingly garnering attention from numerous industries besides agriculture, but the power to improve their resilience still lies in the hands of the farmer. *CPM* attended an Agrii briefing on its new strategy aimed at helping farmers do just this.

By Melanie Jenkins

Farmers may feel they can hardly move without being jostled by the word 'soil' and the many and varied suggestions for its correct management. But with the launch of its new Soil Resilience Strategy (SRS), Agrii hopes to help filter out the substrates, so the waters are crystal clear.

"There are lots of definitions for sustainability and it can be a slightly overused word," says Mark Dewes at the Agrii launch briefing in Cambridgeshire at the end of January. "Its meaning can be devalued from overuse. But from my point of view, sustainability is about minimising the unintended impacts of the essential work we do in producing food.

"But with relation to soil, there can be a very literal meaning to sustainability," he says. "The word human comes from the Latin word humus, meaning soil, and the food produced from that soil sustains human life, so soil is really literally a definition of sustainability.

"It's our job as agronomists and farmers to sustain, regenerate and husband that soil to build the resilience for it to continue to produce the food we require for a long time to come."

Soil health

And though the idea of focusing on improved soil health through reduced cultivations and other means isn't something new, it's something that the industry is taking more seriously now, according to Agrii's Andrew Richards.

One of the company's aims with SRS is to help farmers meet the standards that are likely to be required of them under the incoming government schemes, he explains.

A key driver for scrutinising soil management more closely is the legislation coming through about sustainable action, says Andrew. "The Sustainable Farming Incentive (SFI) has just launched, but there's still lots to think about — whether something is being done the right way or whether it should be done differently — but SFI is focusing the mind."

However, he highlights the lack of detail on ELMs is very frustrating. "What we can be certain about is that it won't fill the void of the single farm payment, and hence ▸

Mark Dewes feels that sustainability is about minimising the unintended impacts of producing food.

The industry is still ten years from fully understanding soil, according to Andrew Richards.

▸ the growing interest in the carbon market and the opportunity for another source of income."

Then, there's the farming rules for water, and particularly the issues around organic manures and spreading them, he adds. "There'll be an increasing set of challenges, such as keeping what's in the field, in the field."

And further to this is the greater move to direct drilling, preventing soil erosion and creating soil resilience. Beyond that is the financial aspect of sustainability, says Andrew, something which has been somewhat negated by the current price of wheat.

"Prices are at levels I never could have imagined, but they may come back down and we're in a time of decreasing single farm payment."

The other aspect to consider is climate change and the intense weather events farmers are having to deal with, he says. "It does seem these intense weather events can wipe out a whole autumn."

And then there's looking at how farmers can use less chemistry. "It's one of the reasons for increased interest in direct drilling, building healthy resilient soil and a potential reduction in blackgrass.

"Then the other big area is in improving nutrient-use efficiency, which has had a big kick-start this year because of the price of nitrogen more than doubling, as well as the UN mandate to reduce N losses by 25% by 2030."

One of the challenges Agrii faces is where farms haven't reinvested in things such as drainage or improving organic matter, highlights Andrew. "There can be a question over where's the starting point, particularly on land that hasn't had investment in ditching, drainage, lime or organic matter in the past 20 years."

But the good news is there's growing interest in farming in more environmentally friendly ways, particularly with the drive towards net zero. However, this poses challenges for agronomists, he says.

"Traditionally, you'd go out, walk a W-shaped pattern across a field, stick soil in a bag and send it off to a lab — looking at a field wasn't that complicated. Whereas now we're introducing this soil health part and looking at the biology as well as the physical and chemical properties of the soil. And we're probably ten years from understanding what's fully going on in the soil."

So currently it's a case of looking at which indicators mean soil biology is functioning well, he says. "It's suddenly very different to just measuring P and K in the soil and there's no standardised approach."

Soil biology

"What we do know is what a healthy soil feels like — it's just how do we measure it? We want decent tilth and depth, and we don't want a surplus of nutrients that will end up causing imbalances or running off. We want to minimise the development of plant pathogens and we know we need drainage, good beneficial organisms and to keep the weed pressure low. Everybody recognises this but the question remains, how do we start to measure it?"

Five years ago, in a project working with the UK Centre for Ecology and Hydrology as part of an ASSIST programme, Agrii looked at what was happening to different populations of bacteria and fungi on land that had been managed in different ways.

The project found where there was reduced tillage and no cover crops, some of the good bacteria increased, and the same with reduced tillage and cover crops. But under a ploughing system, the good bacteria tended to be reduced and the reverse was seen with pest species, explains Andrew.

"What we're looking at is creating a stable environment and a food supply. And as you start to increase OM, the slower developing species — the non-pest ones — had a chance. And over four years of reduced tillage they did gradually increase."

In 2019, the project took 386 field samples from across southern England and looked at measuring soil health using the carbon:clay ratio — also known as the Dexter ratio, he explains. "The suggestion is that if soil is below a 13:1 ratio, soil is degraded, when it's 8:1, it's a good to excellent soil."

Using this measure, a lot of the samples appear to be in better condition than indicated by the standard soil survey data Rothamsted had used, which had suggested that most arable soils were degraded. With the clay carbon measure, the suggestion was that a lot of samples were in good condition, he explains. "Encouragingly, the test said 30% of soils were in the 'good' category."

So could this be used as the basis for an indicator of soil health and what should be measured beyond this?

Compaction, infiltration, organic matter and biology are all other aspects that merit further discussion, he details. "And we do come back to pH as the principal driver of biology."

So how is Agrii looking to support farmers to transition towards more sustainable systems?

"We quite often say we know more about what's happening 100K miles above our heads than we understand what's happening right below our feet," says Amy Watkins, Agrii sustainability manager. "What we're doing with SRS is looking at what's happening below our feet and how we can manage that to reduce compacted soils and the financial risks to businesses."

Being rolled out to farmers in March this year, SRS is Agrii's new research and development-based soil service, she explains. "We've tried to keep it as flexible as possible for our growers. We hope to offer any service to match a farmer's business objectives; whether it's around improving soil carbon

Mycorrhizae extend out, create networks of hyphae which increases mining capabilities of plant roots.

sequestration, improving soil organic matter levels, or generally trying to understand the health of their soils, or perhaps why one area of a field or the farm is underperforming compared with other areas.

"It's a very practical and scientific approach that's trying to harmonise the two and we'll provide some practical implementation from that," says Amy.

SRS consists of a number of key components: soil biology, water management, soil structure, chemistry and nutrition, and carbon.

"Water management is included as we'll look at how the soil deals with intense rainfall and also the drier periods in the summer months," she explains.

Different packages

The SRS offering is broken down into a couple of essential packages. "There are two lab assessments as basic starting points, and these can be bolstered by a number of other assessments."

For those looking at soil health generally, the soil health assessment baseline option includes a broad-spectrum extra analysis, and also a Solvita test. "We've included Solvita to purely look at biology," explains Amy. "This looks at how much respiration is happening in the soil."

The second base option is the carbon assessment. "This is of particular interest with the evolution of carbon markets and because SFI is also looking at soil carbon. We've looked at standardised approaches to measuring soil carbon, and how we can help farmers prepare for new income streams through SFI, but we're also looking at carbon markets, if that's the route farmers are interested in going down.

"We've spent a lot of time looking into this," says Amy. "It's involved looking at what other organisations in the industry have been doing and which scientific approaches have been taken, as well as finding a standardised approach to assessing carbon."

One element that Agrii explores in its assessments is the different forms of carbon in the soil. It will involve looking at how carbon varies throughout the soil profile and the various pools of carbon — active, inorganic and organic — and how these vary, she comments.

Forms of carbon

"Active carbon is included to track the short-term changes in soil organic matter. This should help farmers determine if ▸

Soil assessments don't just look at worm numbers, but also evidence of their activity.

The most important piece of kit on the farm is a spade – it's a very underutilised resource, says Amy Watkins.

Infiltration tests can identify how water travels through the soil, identifying any compaction and pans.

▸ what they're doing is having the desired impact on their soils. Active carbon is also important because it acts as a source of food for biology."

The inorganic carbon can act as an antagonist to some nutrients — so we're really looking to manage it from an agronomic point of view, says Amy.

"The organic carbon is the one that gets everyone excited and it's what we look at in the clay carbon ratio, but it's particularly important when looking at soil carbon sequestration and how much is stored in the soil."

Though there are numerous different approaches to testing soil carbon, Agrii is following the FAO standardisation. This includes a sampling pattern in a W-shape across the field, having a minimum of five samples, but ideally between 15-20 cores, explains Amy.

"Depth is the biggest question we seem to get. The standards set going down to 30cm in a stratified approach of two depths. But if you're specifically interested in carbon credit schemes, look into what they require."

Ideally farmers should sample in every field, but at least start with sampling for each different management strategy, she adds.

So how can SRS help farmers? The aim is to provide farmers with a strategy and action plan for their soils based on any assessments undertaken.

"The action plan isn't just handed out; it's developed between agronomist and farmer to determine what's possible in each situation. It'll provide a practical summary of what can be done to improve soil health on a short, medium and long-term basis.

"SRS is a tool for evaluation, to communicate year-on-year how a farmer is improving their soil resilience and signpost what more they can be doing." ■

The Agrii team has developed programmes to help determine soil condition using tools such as penetrometer tests.