

Worming the way up the agenda

“The struggle has been finding growers willing to talk to researchers about their worm sampling-related challenges.”

DR JACKIE STROUD

While earthworms have become a key indicator when it comes to soil health, according to researchers, there's still work to be done to increase monitoring on-farm. *CPM* speaks to agricultural soil scientist Dr Jackie Stroud, for her take on the matter.

By Janine Adamson

The humble earthworm – widely recognised as a biological indicator of soil health thanks to their ability to improve soil structure, aeration and drainage, and recycle nutrients.

And while on the whole, growers have come a long way in improving their understanding of the plentiful benefits of this earth-dwelling invertebrate, it appears more could be done when it comes to monitoring earthworm abundance.

According to agricultural soil scientist at Warwick Crop Centre, Dr Jackie Stroud, questions should be raised regarding what's holding growers back from undertaking this relatively simple on-farm task, to understand the pain-points and therefore find viable solutions.

“Growers appear to still be interested in the role of earthworms in the soil ecosystem, but whether this influences on-farm decision-making beyond that depends on who it is you're talking to, and this includes their willingness to undertake regular sampling.

“As part of being able to address this, as researchers, we want to know what's behind this reticence – so what frustrates

farmers regarding earthworm sampling.”

Jackie adds that her curiosity was initially triggered when considering how the scientific community could better support growers with compliance for assurance schemes such as the Global Farm Metric, or the Sustainable Farming Incentive (SFI).

“For example, providing soil health assessments can often include digging for earthworms, but does that make the task feel like a tick-box exercise rather than being something meaningful for the individual grower, thus motivation to do it is reduced?”

Having undertaken initial discussions with growers to pose that question, she says it seems while some aspects of sampling and monitoring don't appear to hinder – such as the manual labour aspect of digging – other factors, including identification, do.

“In this instance, the next step would be to make that identification process simpler and more user-friendly,” suggests Jackie.

However, she acknowledges that so far, only a limited number of farmers have come forward to speak

to her team at Warwick, and there's a long way to go if they're to truly overcome any perceived barriers.

“Rather than identifying the solutions, the struggle has actually been finding growers who are willing to talk to researchers about their worm sampling-related challenges. The hardest to reach are those farmers who are the 'going to' or 'meaning to' do it, but never get around to it. It's their feedback which could help us to understand the unspoken barriers,” she explains.

The reason why Jackie wants more growers to be proactive with earthworm



Intelligence gathering

Dr Jackie Stroud wants to know what frustrates farmers regarding earthworm sampling.



Bird decline

More frequent earthworm sampling could help to shine a light on the correlation between earthworm populations and the decline in certain bird species, such as the song thrush.

monitoring is because reports state populations continue to decline, despite an overall shift to more regenerative practices and better knowledge regarding the benefits of improved soils.

Not only is this bad news for the health of agricultural soils, but it's having a potential knock-on effect higher up in the food chain, she points out. "Research indicates a reduction in earthworm numbers could be partly responsible for the decline of certain at-risk bird species, because their food source has dwindled.

"But we don't fully understand what's going on here, which is one of the reasons why monitoring earthworms on-farm is an important activity," stresses Jackie.

Referring back to grower concerns regarding earthworm identification, she says rather than individual species, it's best to concentrate on understanding the three main ecological categories. "These are epigeic, endogeic and anecic, and are classified based on their behaviour and roles within the ecosystem.

"One of these – endogeic earthworms – live within the soil profile and are therefore not particularly affected by tillage. In contrast, anecic and epigeic earthworms feed on plant litter and reproduce on the soil surface and are therefore affected by cultivations."

Looking at these groups in further detail: endogeic earthworms are mostly shallow-burrowing and pale in colour; anecic are large, deep-burrowing with pigmented skin; and epigeic are small, found in leaf litter, and are also pigmented.

In terms of ecosystem services, it's the deep-burrowing anecic group which make permanent vertical burrows in the soil, and a tell-tale sign for these types of earthworm is a 'midden', she adds.

"An earthworm midden is a tennis

ball-sized 'plug' made from plant material and earthworm casts, created at a burrow entrance. They're quite specific and more commonly found in regenerative or conservation agriculture type systems, so an effective indicator of overall soil biodiversity levels."

Jackie would also like growers to consider sampling a few strategic times during the year, particularly during the summer, which could help to shine a light on the correlation between earthworm populations and the decline in certain bird species.

"Growers tend to sample when earthworms are abundant, such as in the autumn. But actually, what would be incredibly useful, is if this task took place in the summer months. This is when the birds' food source is in the top few centimetres of the soil profile, it's also when land is drying out so they may be unable to access those invertebrates," she explains.

"For bird species in decline, this information could be telling; admittedly soil sampling in arid conditions is difficult. Conversely, for those who still have penetrable soils and an abundance of earthworms in the summer, sharing the actions undertaken to achieve

that would also be very valuable."

However, at the end of the day, Jackie just wants more regular earthworm sampling to take place. "There is general interest but simply not the level of enthusiasm there to actually do something, but perhaps this could change if the process was enabled by emerging technologies," she concludes.

To answer a few questions regarding approaches to earthworm sampling, and therefore contribute to its development, email: jacqueline.stroud@warwick.ac.uk



Earthworm midden

A tell-tale sign for the deep-burrowing anecic group of earthworm is a 'midden'.

A non-invasive measurement method

Independent research is taking place to help inform a potential new method for measuring earthworm activity based on what they sound like

Is it possible to measure earthworm numbers non-invasively? That's the question being posed by researchers at Warwick Crop Centre.

Led by soil scientist Dr Jackie Stroud, an independent project is underway to build robust data and a quality scientific methodology to enable a potential new acoustic measurement system.

The work uses an existing algorithm which evaluates an acoustic recording. "Unlike bats and birds, earthworms don't seem to have an acoustic signature, but the algorithm can be used to measure burrowing activity which is related to abundance," she explains.

In a bid to better tailor this to soils, Jackie is 'planting' specified numbers of earthworms within a laboratory environment – based on the AHDB

soil health score card figures – and recording their movements to run through the algorithm. Then, by working with a statistician, the subsequent data can be interpreted to help validate and fine-tune the system.

Jackie's team is also collecting 24-hour recordings from long-term experiments at Rothamsted Research, taking acoustic recordings during the day and night from a range of situations such as under-sown cereals. "This is generating a huge amount of data but will enable us to interpret the patterns over time and compare field types to understand potential trends," she adds.

Once armed with a wealth of data, Jackie says it could provide a key indicator as to the effectiveness of long-term regenerative farming practices on soil biodiversity in the UK.