

SOILS FOCUS DELIVERS RESULTS

A focus on soils has delivered results at the Helix National Technology Farm ...

A concerted focus on improving the health and resilience of soils has contributed to a significant improvement in nutrient use efficiency at the Hutchinsons Helix National Technology Farm in Northamptonshire.

Eight years on from his first foray into direct drilling, host farmer Andrew Pitts of JW Pitts & Sons, says the benefits now extend well beyond the initial savings on establishment costs.

One of the most tangible impacts is on Nitrogen Use Efficiency (NUE), which has increased from around 60% under the old plough-based system, to 75-80% now, allowing savings of around 40-60 kg N/ha on his typical application rates for first and second wheats.

“Once soil is working properly for you, so long as you keep looking after it, there are continual benefits to the bottom line from better nutrient cycling and more resilience,” he says. “Our experience shows that if you treat soils with respect and give them what they need, it does work.”

The inclusion of cover crops within a varied rotation, and careful targeting of lime, organic and artificial fertilisers, to better match soil and crop requirements throughout the season has also helped improve nutrient use efficiency, he notes. All are approaches that the farm has been able to hone since becoming the first to join the Helix network five years ago, providing a test-bed for the latest techniques, technology and products in a real-world situation.

No quick fix

Mr Pitts and the Hutchinsons Helix team stress there are no ‘quick-fixes’ or ‘one-size-fits-all’ solutions when it comes to improving soils though. It is vital to allow time for soils to adjust to any new system, and tailor management practices to individual situations.

For Mr Pitts, the transition away from a plough-based system started 17 years ago, when in 2006, he moved to a Vaderstad TopDown heavy cultivator for several years, before trying direct drilling for the first time in 2015. Three years later, the farm purchased its own John Deere 750A direct drill, which is used across most of the 809 ha farmed area today.

Cover cropping has been one of the big success stories at the farm, helping reduce the use of artificial fertilisers by raising background fertility, and improving soil conditions to the benefit of crop rooting and nutrient uptake, says agronomist Michael Shemilt.

N-Min sampling over the past three years shows average residual nitrogen levels are typically 30-60 kg N/ha higher where a cover crop has been grown, and levels of more available nitrate form are consistently higher where the cover has been grazed off by sheep instead of spraying off with glyphosate, he says.

Indeed, last year, one crop of spring barley – after an overwinter cover – was grown without any bagged nitrogen, whereas typically rates would be around 120-150 kg N/ha, Mr Pitts notes. The six-way MaxiGraze mix (containing forage rape, smart radish, stubble turnip, winter vetch, crimson clover and linseed) was grazed off by sheep, and SMN testing showed 140 kg N/ha in early spring.

The addition of organic matter, and the natural structuring and drainage benefits from the diversity of root growth in multi-species mixes really helps crop productivity, and improves the resilience of soils to weather extremes, Mr Shemilt adds.

“When organic matter breaks down, it opens up soil particles, improving structure, natural drainage and workability,” explains Hutchinsons head of soils, Ian Robertson. “At the same time, having more humus in the soil also improves its ability to capture and retain water.

“With our climate predicted to get 20–30% drier in the summer, and 20–30% wetter in the winter by 2050, improving water resilience is something we’ve all got to give more thought to.”

This may require a change of mindset though, as soil water management has historically focussed on getting water through the soil and away via drains as quickly as possible, rather than storing it within the profile, Hutchinsons technical manager, Dick Neale, adds.

Cover crop species selection and management, especially termination timing, plays a key role in water management, as plants draw water towards the surface layers while growing, then once terminated, hydraulic conductivity pulls water back down the profile, he notes.

Assessing what soils need

Before making any big changes to establishment systems, cropping or soil management, Mr Robertson advises growers to understand the physics, chemistry and biology of their own soil and how this influences its behaviour. Doing so can often help identify the causes of other issues, such as poor workability, waterlogging, or inefficient nutrient use.

“Make the right decisions for the soil, as well as for your farm.”

Tight, or poor soil structure, for example, can sometimes be mistaken for compaction, when the actual cause might be an imbalance in soil chemistry, such as the calcium to magnesium ratio – calcium, pushes particles apart, while magnesium holds them tighter together.

Detailed tests, such as the Hutchinsons Gold Soil Test, provide a valuable and repeatable assessment of many different soil properties, giving far more information than standard P, K, Mg, pH tests, Mr Neale says.

Soil testing has proven particularly valuable for Mr Pitts, especially after the wet 2019 season, when some crops on slightly heavier ground failed to establish properly. Visually, it was clear the top 50–75mm of soil was very tight, thereby preventing water infiltration, and causing seed to rot.

A subsequent Healthy Soils Assessment revealed the problem fields generally had a higher clay content, and the sandy clay loam’s naturally high potassium levels were causing the fine soil colloids to stack tightly together, not surface compaction. Shallow cultivation was therefore introduced ahead of drilling on problem fields to help improve water infiltration, in addition to using cover crops for similar benefits.

Shallow cultivations, alongside baling straw, have also been useful for overcoming issues when establishing second wheats into large amounts of crop residue, further demonstrating the need to adapt strategies and remain flexible, notes Mr Shemilt.

There have been clear benefits from the high-resolution Terramap soil scanning too. One example, is a patch of acidic soil identified in one field – something missed with historical ‘W’ pattern sampling. Mr Pitts had planned to take the area out of production given poor crop yields, however on seeing the Terramap results, he decided to target remedial measures to rectify pH. The approach is slowly working, with pH increasing from <5.6 on the worst areas in 2019, to 6.2–6.5 on those same areas in 2021, raising crop yields, and allowing him to keep that area in production.

“We’ve probably covered the cost of Terramap testing in one year,” he notes.

Terramap analysis also shows soils are generally quite high in phosphate and potassium, therefore management efforts are being aimed at helping crops access as much of these reserves as possible, rather than applying any extra, Mr Neale says. In the case of phosphate, lockup can be an issue given the soil’s high iron content, but careful cover crop species selection can help extract phosphate from soil reserves, he adds.

JW Pitts & Sons

- 809 ha (2,000 acres) of combinable cropping
- Varied rotation, including cover crops

- Started direct drilling in 2015 after a nine year transition from a plough-based system
- Strong focus on improving soil health and resilience
- One of nine Helix demonstration farms – see hutchinsons.co.uk/about-us/helix

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