

# Growing healthy soils

“These varieties could act as the best insurance policies for growers keen to make the move to a no-till approach.”

## Technical Fit for the future

As growers seek to protect their most valuable asset, could varieties have a role to play in building soil health and better biology? *CPM* explores the concept.

By Charlotte Cunningham

**With climate change a topic on everyone's lips, protecting and promoting soil health and biology is something that has been thrust into the spotlight of late.**

Arguably, managing soils — and doing it well — is something that farmers have been invested in long before the Government's interest. But it's fair to say that traditionally, variety choice isn't the first thing that springs to mind when it comes to improving soil health — though that's not to say there isn't potentially a correlation between the two.

Delving deeper into this relatively untapped area is a key objective of KWS' Sowing for Peak Performance initiative.

But for any variety to thrive, understanding the soil and its

characteristics is an essential starting point, explains Elizabeth Stockdale, head of farming systems and agronomy research at NIAB. “Variety choice and soil health do go hand in hand. But having good soils is essential for varieties to express their full potential.”

Building soil health is multi-faceted, she adds. “Every farm — and even every field — is different. While growers aren't able to change their specific soil type, they can manage it to allow the soil to be the best it can be.”

### Fast growing plants

It's important for growers to think about what they want the soil to do, explains Elizabeth. “When a variety is sown, we want it to be able to get away well and the roots to be able to freely explore the pores of the soil so the plant doesn't have to waste energy it could be investing in growth in forcing its way through.

“The best structured soils will be ones that have long wide pores to let the water flow through, as well as small pores to hold water back so it's available to the plant.”

An inhibitor of this, however, is compaction.

And compacted soils go beyond just poor crop performance. In fact, they could be exacerbating the environmental impact

of crop production, believes Neil Fuller, independent soil specialist.

So much so that Neil reckons compacted soil structures could be contributing to the equivalent of 1.5t/ha of carbon dioxide being lost from soils every year in the form of nitrous oxide.

“The way soils are managed has a profound effect on root development which in turn can influence how well the crop responds to nitrogen and other nutrients,” he says. “Climate change and its effects on crop production involve a complex



Looking at the role varieties can play in soil health is a largely untapped area, says Olivia Potter.

set of interactions that require serious thinking about.”

The relationship between soil structure, nutrient interactions and sustainable production in the future is one that is largely misunderstood, believes Neil.

“Ground pressure and soil compaction are major contributors in the equation. The better the soil structure, the healthier the plants, the greater their ability to compete with weeds and the less nitrogen they are likely to require.

“Soil compaction or poorly incorporated organic matter, such as straw, can lead to dense anaerobic layers. Subsequently, nitrogen sitting in cold wet soil can turn to nitrous oxide, which has the potential to be lost from the soil at the rate of 5kg/ha/year.”

While this loss might not be noticed agronomically, it has the greenhouse gas equivalent of 1.5t/ha of carbon dioxide entering the atmosphere every year, which is highly significant, he explains.

Compacted soil structures also inhibit root growth, which in turn affects how plants work with beneficial microbes that are responsible for building stable soil aggregates, making nutrients more available and priming disease resistance mechanisms. This can have a major impact on a variety’s ability to express its full potential, particularly in the critical first 30 days, resulting in an early growth check, which can result in lower Nitrogen Use Efficiency, compounding the problem further, warns Neil.

“Compaction of the top 10cm is particularly important as this is where the

fine branched roots are most active in seeking out nutrition. While deeper roots are more about searching for water and making sure the plant is secure, roots closer to the surface pump carbon into soil to promote biological activity, which in turn builds healthy soil and delivers a greater degree of reliance to crop performance.

“Over 75% of a plant’s nutrition comes from that top layer so making sure it is open, friable and biologically active is absolutely essential. Anything that restricts root development can undermine how beneficial microbes feed and protect the growing plant. Choosing varieties that have the ability to produce good root systems and develop strong interactions with beneficial microbes is a key component of sustainable crop production.

“The effects of compaction, environmental stress and the wetter conditions we are likely to experience at cultivation time as a result of climate change are bad news all round.”

## Alleviating compaction

But not all is lost, adds Elizabeth. The best way to get alleviate compaction is to minimise activity which leads to it. “Here there are a number of things to consider, largely the cultivations we use and how/when we travel on the land.”

So with this in mind, what scope does it leave for varieties to make a difference?

KWS’ Sowing for Peak Performance initiative is based around the ethos that 80% of what a crop can deliver is locked into the seed purchased and as part of this, the firm has been exploring how farmers could use varieties to promote



Getting soils in the best condition is essential for any variety to thrive, says Elizabeth Stockdale.

and build better soil health.

According to Olivia Potter, technical specialist at KWS, there are two main ways breeders and farmers can do just that. “Firstly, we can think about scheduling varieties to minimise travel and ultimately compaction. For example, earlier harvesting means you have more chance of avoiding the worst of the autumn weather and gives you more time to prepare land properly and in a manner that reduces soil damage to a minimum. ▶

## No ‘one-size-fits-all’ approach to improving soil health.

Soil organic carbon is a key driver for soil health, playing a large role in ecosystem functions and the soil’s water holding capacity (WHC).

Without carbon-based organic matter, microbial communities cannot thrive. Microbial communities drive soil aggregation which in turn enhances soil structure and stability, improving workability, aeration, infiltration and WHC, says Colin Lloyd, Agrii’s head of agronomy.

Regenerative practices can increase carbon drawdown and minimise carbon losses, he explains.

“Soil is a finite resource and is being lost through erosion and degradation. Farm ecosystems need to be robust to cope with, and react to, more frequent extreme weather. The Environmental Land Management (ELM) scheme will be based on clean air and water, biodiversity

and improved resource efficiency — regenerative practices could help to improve some or all of these,” he adds.

As part of the Achieving Sustainable Agricultural Systems (ASSIST) programme, researchers from Agrii and the UK Centre for Ecology and Hydrology are working to achieve a better understanding of soil biology to inform future policy and practice.

“Initial DNA barcoding work identified no fewer than 62,000 different bacteria, 2,000 different fungi and 4,000 different eukaryotes in samples comprising just 0.5g of soil from Agrii’s Stow Longa site,” explains Colin.

Applying these findings to practical situations is the next stage of the Agrii project. “Patience and a practical approach to developing and understanding what the right approach is for your business, soil type, location, and local



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situation and challenges. There is no one-size-fits-all answer,” he concludes.



*In KWS trials, KWS Extase yielded the best in both conventionally tilled and no-till situations.*

► “Then there’s the value of resilient varieties to consider. For example, growing a variety that boasts a certain trait could enable less agronomic intervention, again, minimising travel and therefore compaction. Something like KWS Ferris which has BYDV tolerance is a good example of this.”

The other aspect is to think about how growers get crops into the ground — with no-till and minimum tillage becoming focal points as the industry looks to protect soils and the environmental impact of crop production, she says.

Olivia adds that the latter is a particularly untapped area, largely due to trialling constraints, and that the equipment required to carry out small scale trials often isn’t quite as good as it should be.

That said, KWS has been carrying out a number of trials to look deeper into varieties and the role they could play in soil health, particularly in a no-till situation. “Reducing tillage is often associated with yield penalties in the first few years, so we wanted to focus on which varieties growers could choose to reduce the pain in terms of both yield reductions and the potential loss of added-value marketing opportunities when they move from full cultivation to a no-till approach,” she explains. “We really wanted to focus on that transition period.”

## No-till trials

The trials were carried out at Leapingwells Farm, Essex, where a plough-based system has been practiced since 1919 but the intention of brothers Brian and Henry Siggers is now to incorporate no-till practices wherever possible.

In total, 17 varieties were chosen and all drilled at 350 seeds/m<sup>2</sup> in both full cultivation and no-till scenarios, except for the Group 1 variety KWS Zyatt which was also drilled at 450, 550 and 650 seeds/m<sup>2</sup>.

“The two trial plots were situated as close as possible to mitigate the risk of different soil types and they were drilled on 10 October 2019,” explains Olivia.

“Despite the average 15-year rainfall being just 600mm/year in that location, this was right in the middle of the really wet conditions in autumn 2019. The farm’s predominantly heavy land with slightly acid loam and clay soils with poor drainage didn’t help.”

However, two varieties in particular bounced back strongly after the challenging establishment and, by the time of harvest, clear advantages of some varieties in the no-till situation were seen, she points out.

“KWS Extase and KWS Cranium were undoubtedly the stand-out varieties. While the yield of KWS Cranium was 7.97t/ha in the conventional tillage situation — despite the obvious challenges throughout the growing season — it was only around 0.2t/ha behind, at 7.78t/ha, in the no-till situation.

“KWS Extase was the highest yielding variety in both situations with a no-till yield of 7.96t/ha compared with 8.74t/ha with full cultivations. This was still only a difference of 0.8t/ha in what were truly awful conditions.

“In a normal year, both the Cranium and Extase would have been approaching yields of 12t/ha on this land,” reckons Olivia.

So what does this mean for growers?

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## Fit for the Future

In this series of articles, *CPM* has teamed up for the fourth year with KWS to explore how the wheat market may evolve, and profile growers set to deliver ongoing profitability.

The aim is to focus on the unique factors affecting variety performance, to optimise this and maximise return on investment. It highlights the value plant genetics can now play in variety selection as many factors are heavily influenced and even fixed by variety choice.

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sugar beet and maize. As a family-owned business, it is truly independent and entirely focussed on promoting success through the continual improvement of varieties with higher yields, strong disease and pest resistance, and excellent grain quality. We're committed to your future just as much as you are.



*KWS trials have concluded that modern wheat varieties suited to later drilling could be the best bet for growers transitioning to no-till systems and provide greater protection against climate extremes.*

“Effectively, this has proven that growers changing to no-till have the option of choosing a traditional barn filling Group 4 variety in KWS Cranium or hitting high quality markets with high yields of KWS Extase, without major yield penalties,” says Olivia.

“That should provide a lot of peace of mind by reducing much of the potential early losses when switching over to no-till.”

“Both varieties perform well in the late drilling slot and the characteristics that make that so could well be behind their exceptional no-till performance.”

“Both also have outstanding agronomic

packages,” she adds. “KWS Extase benefits from strong septoria resistance (8) while KWS Cranium boasts class-leading yellow rust resistance (8) — both of which go a long way to protecting the plants as they grow.”

The trials continue with the same variety set for next harvest, so further results will help clarify the picture even more in the future, notes Olivia. “But from what we’ve seen so far, it can be concluded that modern wheat varieties suited to later drilling could be the best bet for growers transitioning to no-till systems and provide greater protection against climate extremes.

“Such varieties could well act as the best insurance policies for growers keen to make the move to a no-till approach by minimising the risks of lower yields while land adjusts to the new approach.” ■

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