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# A circular approach tells its own story

**Green Horizons**  
Livestock underpin some of the most sustainable arable systems in the country. CPM travels to the furthest reaches of Scotland and Wales to find out how two very contrasting systems fit in.  
*By Tom Allen-Stevens and Rob Jones*

Farmed animals present something of a sustainability conundrum: on the one hand, slurry and manure applications can cause pollution while the methane is a damaging contributor to greenhouse gas emissions. But organic applications to the land reduce dependence on synthetic fertiliser use, and managed well, livestock can enrich soil biodiversity and lift an entire cropping rotation.

On the banks of the River Spey in Moray, east of Inverness, Bill Smith seems to enjoy the scampering and scurrying of his young piglets. They're clearly curious about the visitors to their barn and have left the bales they were playing on in

favour of a version of grandmother's footsteps.  
The piglets form a bed-and-breakfast enterprise on the 161ha Byres Farm Crown tenancy Bill runs as part of a 485ha family farming business. But it's what they leave behind that interests him more.

**Manure, mulch, crop**  
“Pig muck is supposed to be high in nitrogen, but these piglets arrive at seven weeks old from outdoor herds and stay on farm for seven weeks before moving to a finishing farm at 75kg liveweight, leaving manure with a very high straw content,” he notes.

“But I like that — we're growing low N malting barley, and what I'm looking to do is feed the ground that feeds the mulch crop that gives the barley its goodness.”

Bill runs the arable side of the business, alongside his father John and brother Alan, who looks after its main livestock enterprises. These comprise 180 suckler cows, moving away from continental breeds towards Aberdeen Angus crossed with Lincoln Reds and Stabilisers. There are also 450 Lleyln/Logie hybrid ewes.

Half of the farm's 320ha of Laureate spring barley are destined for Boort Malt and Crisp Maltings, who supply the Glenlivet and Aberlour distilleries respectively. The crop is rotated with temporary grass, but the main break is the cover crop that precedes it.

“The most important crop is the mulch — it'll spend up to seven months in the ground while the barley grows for just five,” continues Bill. “So we aim for a circular system in which the arable complements the livestock and the animals complement the arable. All the straw is baled and turned into muck, and every block of land has its own source of manure. That for us is where the arable cycle starts.”

Bill's joined by his Agrii agronomist Andrew Simpson. With drilling of the spring crop just about to start, it's a chance to take a look at the predominantly sandy loam soils and discuss progress of the arable side of the business. “Spring barley ▶

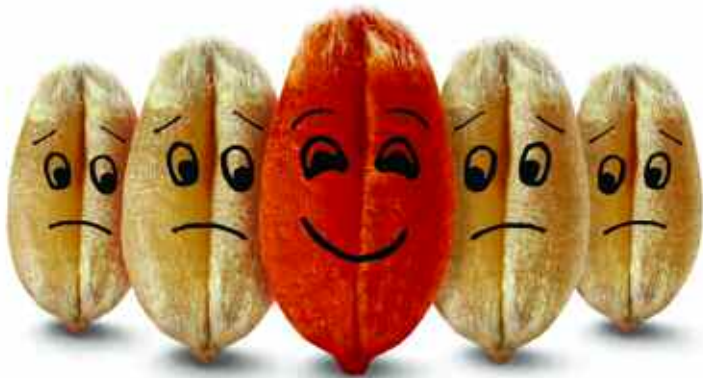


The piglets at Byres Farm leave behind manure that provides the right balance to feed the ground that feeds the mulch crop that gives the barley its goodness.





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*Manure is usually applied before establishing the cover crop at Byres Farm, but sometimes it's applied just before ploughing.*

► is a very important crop for this part of Scotland and can be the only arable crop some soils will see," notes Andrew.

"This is light land with some blow-away sands. If all you grow is spring barley after spring barley, the performance will dip and the soil will degrade. It can spend much of the year with no roots growing through it, so it's important to keep organic matter levels up, that it retains its structure and that there's plenty of life in the soil throughout the year."

Bill's settled on a mix of white mustard and fodder radish, drilled at 8kg/ha, although this may be raised to 10kg/ha. "We first started growing cover crops 10 years ago. I wanted a demo of a Väderstad Spirit drill in the autumn, so at the suggestion of our Agrii agronomist, we did a mustard trial."

He finds white mustard provides plenty of fast-growing green cover, while the fodder radish puts down a good root to

help with soil structure.

"Generally, we sow a greater share of the mix with mustard, but on heavier land, we may flip it round and drill more radish. We have tried phacelia, but that doesn't provide the ground cover we're looking for after spring barley. The other advantage of mustard is that it dies in the frost," he explains.

The cover crops are generally left ungrazed as it's the biomass Bill looks to benefit from. However, tired grass leys may be put into kale in early summer ahead of the spring barley, and stubble turnips are also grown. "We find it's the green matter that brings us the bugs, the worms and soil biota," he adds.

The cover crop is incorporated from the start of December with the farm's 7f plough and press, with no glyphosate used. Bill believes this still presents the best way to prepare the land, although like many in the area is looking at what reduced cultivations and



*(From L to R) Phil Davies, Dai Llewellyn and James Davies check on Ludchurch Farms' first cut silage.*

direct drilling may offer.

"When it's right for our soils to go to direct drilling, we'll do so, but they're not there yet. Also yield is key — we're achieving 6-7t/ha of spring barley plus the straw and don't want to compromise that output," he says.

"However, we are noticing a difference in the soils — the heavier ones used to glisten when you turned them over, but now they plough more easily and leave a more friable surface. They hold their structure better and yields are creeping up."

Bills feels the job of feeding the crop is more than half done before the barley seed goes in. "The trick is to treat the mulch crop as a proper crop, aiming for good establishment and to feed it. We'll usually put the muck on before the mulch, but sometimes apply just before ploughing," he notes.

"It's difficult to know which is bringing the most benefit and I think they complement each other. What's more, we're always learning and introduce new ideas that can help the system — our circular economy is rather like a whirlpool that brings in things and develops aspects I didn't anticipate."

One of these may be the farm experiences and events business the family has created that welcomes the public of all ages, especially children. Run by Bill's wife, Helen, Byres Farm has a weekly Fun Farm activity group for pre-school children to learn about what's happening on the farm, take part in related craft-making and see and feed animals in the animal paddocks.

Experiences for older visitors include tractor driving and a malting barley whisky tour, in which Bill guides a group through the fields, and explains what he does to grow a "magical" crop.

"We've established a network of farm margins and also offer a pollen and nectar tour and a farm sculpture walk, where we've teamed up with local artists. It's a good way to grow the business without growing the acres. But it also gives us the opportunity to tell the soil story — how the goodness they taste in a bottle of Glenlivet starts with the care we give to the soils.

"And it gives us all a real sense of perspective — as a family, we've always aimed to farm in an environmentally friendly way, that keeps the long-term interests of the land at its heart. We're not doing what we do to tick a box, but because we genuinely feel we're farming in the right way, and I think our visitors appreciate that," concludes Bill.

## Slurry feeds the soil

Masses of mycorrhizae and an upsurge in mole populations are 'living' proof of the success of the increasingly regenerative integration of cropping with Ludchurch Farms' substantial dairy herd, near Narberth on the south western tip of Wales, over the past four years.

This stems from the determined effort Phil Davies, his wife Louisa and son, James have been making with Agrii agronomist Dai Llewellyn to put the most sustainable crop production science into the 600ha of 'arable' land on the Green Horizons' network farm.

"It's amazing how much things have improved in such a short time," stresses Phil, pointing to a veritable mat of mycorrhizae in the stubble of this year's first silage cut and a wonderfully rich, well-structured, root-filled soil beneath it.

Weighbridge records show a dry-matter yield of around 20t/ha of silage from new leys from slurry and nitrogen inputs that RB209 suggests would be suitable for target yields of 12-15t/ha. Wheat for crimping achieves 14t/ha at 35% moisture.

"As well as what we see and measure ourselves, our slurry contractors tell us how much better the ground is travelling. And our mole man simply can't believe the extra pressure we're putting him under! Our focus on mixed cropping with year-round roots in the ground and the most effective organic manuring is really paying dividends."

With 140-150cm of annual rainfall on silty clay loam soils, everything Ludchurch Farms grow supports their high output



*A mat of mycorrhizae in the stubble of this year's first silage cut overlays a rich, well-structured, root-filled soil at Ludchurch Farms.*

1250-cow Holstein herd which, in turn, supports their cropping with large volumes of muck. While grass silage remains an essential part of the rotation, its area has been reduced markedly from 300ha to 200ha currently in favour of cereals.

Winter and spring wheat and winter barley are crimped and clamped with a preservative, which allows harvest to be pulled back by 2-3 weeks away from the farm's wettest month — August. There's extra work to dry the cereal straw before baling, but it saves Phil more than £150,000/year in bought-in straw, he says. "With rolled wheat trading at well over £300/t, if you can get it, and haulage charges of £20-£25/t from England, our approach certainly stacks-up at the moment."

But maize has no place in the business. "We tried it once, but we simply can't afford to undo all our soil improvement ►

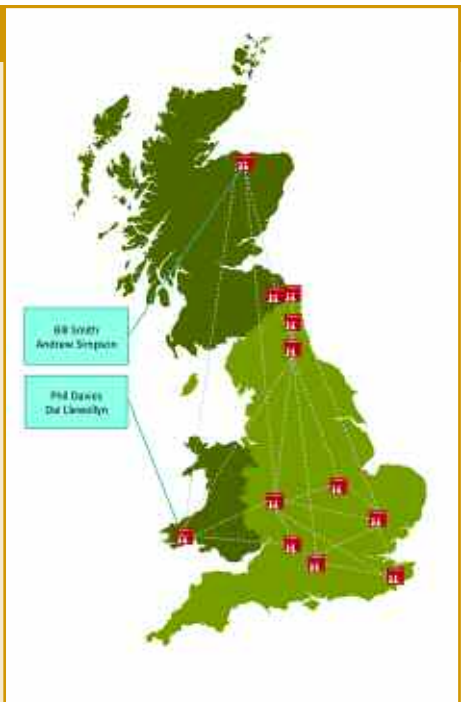
## Green Horizons

The farmer network is part of Agrii's ambitious Green Horizons plan of practical action to improve the sustainability of UK food and farming.

Focussed on increasing farm productivity and viability, providing integrated whole farm solutions, improving soil resilience, enhancing the environment, and extending stakeholder engagement, this initiative brings together the best scientific intelligence and farm experience to inform future improvement action.

Network growers are working alongside Agrii's extensive variety, soil resilience, IPM and other trial work, and collaborative projects with a range of partners to share ideas, test approaches and showcase progress.

Up-to-date information and a series of specialist insight reports is available from [www.agrii.co.uk/greenhorizons](http://www.agrii.co.uk/greenhorizons)







*Where some of Ludchurch Farms' ground doesn't get sufficient low disturbance lifting ahead of direct drilling, crops invariably struggle.*

► efforts by growing it. It disrupts roots in the ground and provides no opportunities for manuring the growing crop."

Having started to move away from a traditional plough and power-harrow drill regime 6-7 years ago, the Davies family's reduced tillage journey really began in

earnest in 2018 when they brought in Dai Llewellyn with the challenge of raising their cropping game.

## Balance of cropping

"Our key objective was to apply the best, most sustainable arable approach to grass production," explains Dai. "We were also keen to make much better use of the dairy slurry. At the same time, we wanted the best balance of cropping to support the herd. And one which had the greatest flexibility to adapt to milk price and input cost changes."

A 6m Horsch Avatar SD drill has become central to the cropping. This allows the cereals to be drilled direct into grass or cereal stubbles and cover crops wherever possible, but it's equally at home in soils lightly cultivated with the Horsch

Joker or lifted with the more recently acquired He-Va Stealth.

This flexibility is important with a relatively high silt content, making the ground susceptible to shallow panning; especially so with the intensity of trafficking involved in a multi-cut silage system, not to mention regular umbilical slurry applications.

"We've learnt how important it is to get poor soils into the right condition for direct drilling in the first place and to keep them there with strategic low disturbance metal at depth whenever necessary," points out Dai.

The grass cutting height has been raised to 100mm, rather than a more traditional 50mm. This sacrifices a little first cut yield — although mainly of stem. However, it reduces stress on the crop to massively improve recovery and subsequent yields, as well as its contribution to the soil, he says. Replicated on-farm trials of the bio-stimulant, PhysioCrop, and growth enhancer, Smartgrass, have proven their effectiveness in boosting fresh-matter yields.

One fundamental change in the management has been to make better use of dairy slurry across all cropping. "In the past it was more a matter of finding a place to put it. Now, every part of our ground can be served with our separated slurry storage and umbilical application system," says Phil. Tankers are confined to one small area of each field headland to minimise pressure on the soil, he adds.

"Analysing the slurry allows us to apply around 35kg/ha available organic nitrogen plus liquid N+S for each silage cut. We apply a similar amount of slurry N to the winter cereals in two spring splits and spread the separated solids on our spring crops."


The urease and nitrification inhibitor LiquiSafe is routinely added to all the liquid fertiliser following farm trials, which showed it consistently gave the same crop performance from 15% less nitrogen.

While the system is working well, Phil notes that one potential cloud on the horizon is the move by the Welsh Parliament to make the whole country an NVZ. "Our umbilical regime for applying carefully controlled and targeted amounts of separated slurry to growing crops carries the least possible risk of nitrate pollution. Yet the NVZ limits on organic manuring will force us to cut back hugely on this resource, which is so valuable for our soil condition and productivity and means we'll need to buy-in a whole lot more fertiliser. And what will we then do with the muck? It's crazy," he says. ■

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