

“ We do everything at Stow Longa with an open mind. ”

Break it apart to bring it together

Technical Agri-intelligence update

For more than two decades, Agrii's trial site at Stow Longa has helped define an integrated approach to controlling blackgrass. CPM visits the team to analyse the key lessons learned.

By Tom Allen-Stevens

The opportunity for a personalised tour of Agrii's trials site at Stow Longa, Cambs, just at the time the blackgrass is coming into ear and waving its head above the crop, is one not to be missed.

But turning up in some of the heaviest rain seen for months, it's clear a tour of the plots is not going to happen. Instead, it's a dash to the on-site Portacabin, there to be greeted by Colin Lloyd, Steve Corbett and David Felce, who are already tucking into the tea and biscuits. Joining them, you soon realise the real value in the trials is not just the plots themselves but the 21 years of history, of experience and of the wealth of data they've yielded.

"When we first started here in 2000, it was a with tiny trial of just 30 plots looking at different mainly herbicide-based blackgrass strategies," recalls Colin. "Thankfully, the Whitlock family have allowed us to stay, and now our work has grown to cover 25ha, looking at cultivations, rotations, soil health and all manner of interactions."

And it's the interaction that's the key at Stow Longa — it's a heavy-land site with

high calcium soil prone to lock up. But you won't always find definitive answers, notes Steve. "The Agrii approach is to trial something until it breaks and then put it back together again," he says. "And we do everything at Stow Longa with an open mind."

Robust, costed data

Sift through the results — all carefully costed — and you'll find some pretty robust data to support a particular avenue you may be exploring, adds David. "It's worth noting that everything we do is relevant to this soil particular type, although it's a fairly common situation that comes with its challenges."

This, believe the trio, has created the perfect testbed for integrated whole farm solutions, one of the five key aims of Agrii's Green Horizons initiative to improve the sustainability of UK food and farming. It encompasses Agrii's advice on resilient genetics, on climate-tolerant break crops, implementation of IPM principles, and ensuring productivity is maintained as reliance on plant protection products falls away.

Growers' journey into integrated farm

management (IFM) is synonymous with their transition in blackgrass control, notes Colin. "For the first few years at Stow Longa, chemistry dominated, as we had such good control from Atlantis (iodosulfuron+ mesosulfuron). It was 2009 we noticed a serious drop-off in activity and it's not even used now."

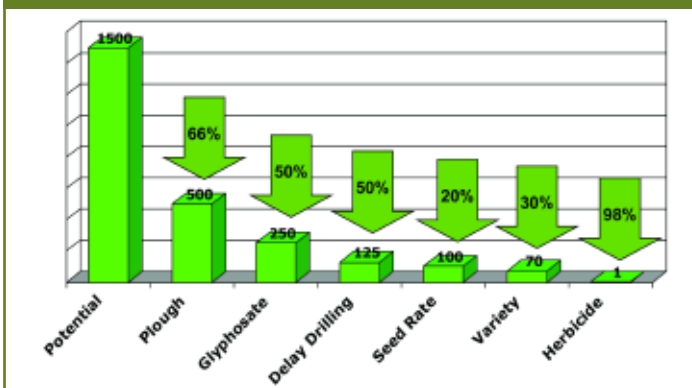
From the outset, the team set about putting to the test the measures research had suggested would bring about a cumulative benefit of cultural control. "We wanted to look at the individual elements that would build into the bigger blocks. Blackgrass is a bully, but if you bully the weed, it can't cope. So one of the first aspects we were particularly keen to look at was the role of seed rates and variety."

Colin points to a set of trials carried out from 2004-09 in which Hereward was compared with Robigus, drilled at 175 and 350 seeds/m². "Across the six years of datasets, there were statistically different reductions in blackgrass and corresponding yield lifts. Overall, there was a 44% difference, which was about the same level of blackgrass control we were achieving ▶

Key cultivation lessons from Stow Longa trials

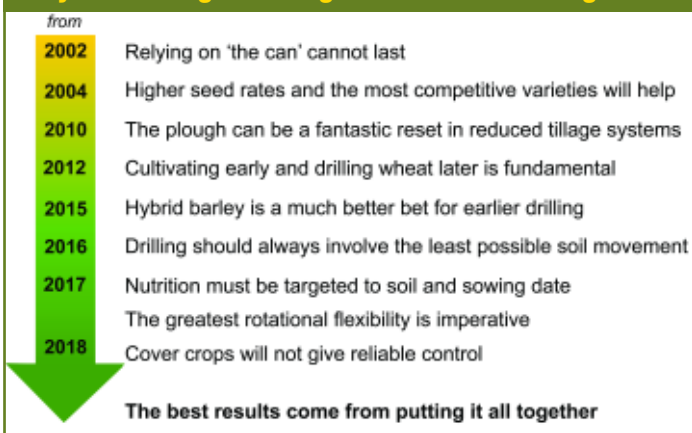
- Blackgrass costs yield — failure to adopt a strategy results in considerable financial losses.
- Cultivations should be carried out early after checking soil structure.
- The plough is useful as a reset tool followed by shallow cultivations.
- Drill later — allow six weeks between the main cultivation and drilling, but watch for a dry September.
- Don't keep moving the ground — blackgrass will grow in the germination zone, so leave the rest of the seedbank out of the way.
- Apply glyphosate using a good product and a decent rate a few days before drilling.
- When you drill, just drill, don't cultivate.
- Use the rotation to lower blackgrass numbers and increase gross margins.

Potential cumulative benefit of cultural control in blackgrass



Source: Moss and Lutman, 2009

Key Stow Longa black-grass control learnings



Source: Agrii

▶ with Atlantis.”

The trials attracted the interest of breeders and a protocol was developed. “There have been attempts to develop a genetic index to help breeders identify the traits behind competitiveness against blackgrass. But these have never really been pinned down, even though the effects in the field are real and measurable,” notes Colin.

Currently around 40 varieties are taken through Agrii's blackgrass competitiveness trials each year. They're assessed both by effect on wheat yield and reduction in blackgrass population. “Some varieties actively suppress blackgrass while others tolerate a high population, so we rate them on a matrix of criteria. Stow Longa being a heavy-land site, percentage establishment is also important, and we look at that, too.”

Skyfall remains Colin's star variety, leading the

competitiveness scores, although KWS Extase is coming close, he says. “RGT Gravity performs well if drilled late, but poorly against blackgrass in the early slot.”

While later drilling has long been established as a key component of good blackgrass control in wheat, at Stow Longa, the Agrii trials have also looked closely at barley since 2015. Drilled late, there's not much difference between wheat and barley, but there's considerably less blackgrass in in early Oct-drilled barley crop, especially if a hybrid variety is grown. Take this through to margin over input cost and the team typically find hybrid barley outperforms wheat in a bad blackgrass situation by five times when drilled early.

Another fundamental part of the Stow Longa contribution to blackgrass management has been the work on cultivations. This started shortly after Steve Corbett joined the team in 2009.

The effect of continuous establishment systems on blackgrass control



Source: Agrii Stow Longa 2015; cv Edgar @ 350 seeds/m²

“We wanted to test exactly what the plough could do to control blackgrass compared with other commonly used cultivation systems, and then follow it up in subsequent years, to assess the effect over a five-year rotation. There were high levels of blackgrass in Barn/Burnt Field at Stow Longa, in its third year of wheat — more than 500 ears/m² — so this was chosen as the site for the trials,” he says.

Cultivation trials

Working with Lemken, the 6ha of cultivation trials initially comprised six regimes: three were non-inversion tillage, one deep and two shallow, carried out with a Lemken Karat; a Claydon strip-till drill was used at a late Sept and mid Oct drilling date; and, of course, the plough. Apart from an early strip-till treatment, all plots were established in mid Oct.

“There were two significant findings from the first year: the plough achieved 98% control — by far the highest — while there was 50% greater control from delaying in the strip-tilled plots,” notes Steve.

In the second year, ploughed and strip-tilled regimes were overlaid with the field established into oilseed rape. “This time the plough followed by plough produced worst results as the previous year's seed was simply brought to the surface. But where the plough followed strip-till, that achieved the best result. It was clear that how you move the soil, both within the year and year to

year, was critical to good control. We also noted the strip-till system was still shifting quite a bit of soil, the leading tine of the Claydon drill bringing up seed that had been buried the year before.”

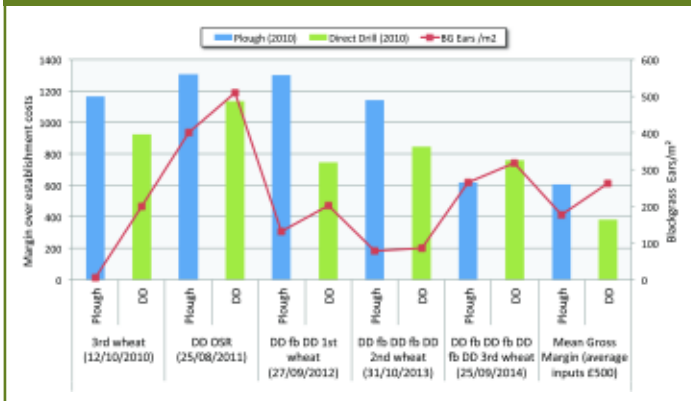
By year three, the effect on yield was really beginning to be apparent — where two years of strip-till had followed the plough, a first-wheat yield of 7.21t/ha was achieved, with a blackgrass control level achieved of 84%. Min-till followed by two strip-till years resulted in half the yield with 33% control.

“There were also big differences in drilling date — in the continuous plough, drilled late the yield was a respectable 8.56t/ha with 93% control. But the yield in the early drilled plot was just 2.89t/ha,” says Steve. The work had proved some fundamental issues about how plough to control blackgrass, leading to the production of *The Guide to Good Ploughing* with Lemken.

By the end of the trial in 2015, over 2000 data points had been recorded from the site, which translated into some clear guidelines on how best to use the plough and direct-drilling across the rotation. “If you do the same thing year after year and drill early, you get in a mess. The continuous plough, drilled late achieved the best result.”

So what about a strategy using both ploughing and direct drilling? “Comparing the margin of a continuous direct-drilled system versus one where ploughing is carried out rotationally,

Effect of rotational ploughing compared with direct drilling



Source: Agrii Stow Longa 2010-15; DD – strip-till with a Claydon Hybrid.

we found you have to direct drill for at least four years before you achieve a better result than including one year of ploughing. But over the course of the rotation, it would have cost you over £1000/ha to get there,” summarises Steve.

The trials, all meticulously costed, also showed the effect of drilling date. “Averaged over four years, there was a difference in yield of almost 2.5t/ha per year, £381/ha — that’s compelling data,” notes Steve.

In the long-term rotation trials, which continue to this day, the team also been assessing the value of spring cropping among other tactics, notes Colin. “Can you get good results from spring barley on heavy land? We found yes, you can, and no, you can’t in equal measure — the classic Stow Longa answer. It all depends on how you do it.”

The trials showed that waiting a month to drill — mid March rather than mid Feb — consistently gave a good result, an average difference of £231/ha. “This was particularly the case with the trial block under cover crops — drill too soon and you throw away the benefit these can bring you,” he adds.

The other crucial element they found was to carry out all cultivations in the autumn and move the land as little as possible in spring. “Make one wrong decision with spring cropping on heavy land and it’ll come back to bite you,” notes Colin.

Currently there are also on-going trials addressing the role of cover crops and looking closely at soil biology. “We’re finding the assumption that the plough is always bad for soil

Effect of drilling date over the rotation



Source: Agrii Stow Longa 2010-15

health is a simplistic one. But what we now have from 21 years of trials at Stow Longa is a fantastic array of data. Moving forward with the latest digital

systems, we can analyse new findings against this historic dataset, and really unravel the secrets of an integrated approach.” ■

Agri-intelligence update

The latest in our long-running series with the country’s most extensive agronomy R&D network gives *CPM* readers exclusive insights into exciting areas of Agrii’s Green Horizons initiative to improve the sustainability of UK food and farming in practical ways with the best scientific intelligence.

Each article explores an important facet of one of the initiative’s key priority actions being developed in detail in separate Insight Reports.

As well as cultural controls for key weeds, pests and diseases, the third of these reports — Providing

Integrated Whole Farm Solutions — examines the many improvement opportunities offered by leading-edge genetic, biological, digital and soil health advances. It is available to download from www.agrii.co.uk/greenhorizons



Steps build to an improved margin

As the relative newcomer, David Felce joined the Stow Longa team in 2015, and also farms nearby on similar soils. “My interest is seeing how the findings play out on a field scale, particularly in relation to how soils behave, and how you can tailor nutrition.”

With the later drilling window proven as by far the best option financially on heavy soils with bad blackgrass, the plan was to establish guidelines to feed the later wheat better. Various nutrition regimes were trialled in 2016/17 on late-drilled Skyfall sown at 400 seeds/m². “The soil is Index 2+ for both phosphate and potash, so in theory shouldn’t need additional applications. However, there’s a high calcium content and pH, so lock-up can be a problem. What’s more, these soils have relatively

high silt content, which combined with a clay subsoil also influences how they behave,” he notes.

The trial showed that applying available phosphate at drilling resulted in a margin over input cost of £19.50/ha. Applying just Heartland Sulphur (70P, 70K, 70S) gave a 0.48t/ha yield advantage, but a negative MOIC. “But a programmed approach, where the two strategies are combined with spring-applied Kaynitro S (adding a further 42kg/ha K₂O) led to an MOIC of £99.50,” says David.

K isn’t needed until spring and is then taken up by the crop in large quantities, while P placed close to the seed helps the new roots which often can’t access P locked in the soil, he explains. “It’s worth

considering precision nutrition in a different way, especially on high calcium soils.”

Looking at cultivations, soil inspection showed it tended to pack tighter, limiting root growth, under direct drilling than where land had been ploughed. “Minimum cultivations appeared to compromise soil health, at least in the short term. But could we improve the situation with rotation, cultivation and nutrition?”

Hybrid barley fared better under a direct-drilled approach than wheat, while tailored nutrition was found to help the situation further. “So it’s clear there are steps, layers you can build in that improve blackgrass control and overall margin by carefully tailoring cropping and nutrition,” David concludes.