



“Aspects of precision farming may be precise, but they’re currently far from an exact science.”

When precision becomes exact

Innovation Technology on trial

Tailoring inputs to crop requirements makes sense, but how can you tell what value it’s delivering? CPM talks to two growers taking part in on-farm trials who are determined to pinpoint the benefits.

By Tom Allen-Stevens and Rob Jones

Even the most proficient users of precision farming technology will probably admit they’re not getting the best out of it. For two growers in Agrii’s Digital Technology Farm network, it’s not so much a question of whether there’s a benefit to varying inputs. They’re keen to know how best to apply this capability in the knowledge they’re getting the maximum potential from their crops.

Precision frustration

It’s fair to say that getting to grips with precision farming has been almost as much as a challenge for Peter Cartwright as managing blackgrass, understanding cover crops and improving soil structure and health. As farm manager at Revesby Estate near Horncastle, Lincs, he’s been using precision tools across the 1200ha of cropping with Agrii agronomist, Richard Butler over the past seven years.

They continue to be frustrated with the lack of consistent progress they’ve been able to make with the available technologies,

dipping in and out of variable nitrogen, seed rates and variable P with the seed, in particular.

However, they’re convinced that digital agronomy is the future; digital tools will become an indispensable part of their crop management team; and they feel they’ll look back in 10 years’ time and wonder why they ever had any doubt about their value.

Part of the frustration at Revesby has come from technologies which promise more than they are currently able to deliver in practice and have particular problems communicating with one another, making them net consumers rather than savers of time.

“We’ve always been keen to try new things here,” says Peter. “But just because digital tools allow us to do something doesn’t mean we should do it. Equally, just because something works well in one set of circumstances doesn’t mean it will be as valuable in another.”

An example is applying variable rate phosphate with the seed to improve the consistency of wheat establishment. “Delayed drilling is central to our blackgrass management programme, so this seemed like a great idea. Until we discovered the extent to which work rates were being compromised by continually having to refill the fertiliser hopper.”

Richard notes that wheat’s big demand for P is in the spring. “The generally high pH soils here lock it up. So, we now apply phosphate in a protected form at a low flat rate level with the seed and top it and the potash up variably in the spring.

“This works better all round. Particularly so, as basing our applications on soil sampling by mapped management zones

has really highlighted the inadequacy of the old ‘W pattern’ sampling method of the past. We found that some fields previously assessed as adequate for P were seriously short in some parts.”

While the zoned P, K, pH and organic matter status maps of the estate’s fields pinned to Peter Cartwright’s office wall are a valued aid to soil management at Revesby, he and Richard have found soil mapping of far less value for variable rate drilling.

Originally introduced to help maximise wheat competition against blackgrass, the team called a halt to variable seeding in 2018, having found no reliable way of basing rates on soil type; mainly due to the whole host of other factors influencing establishment — especially moisture retention, stone content and slug pressures.

“However, early April Contour NDVI imagery from Rhiza predicted our wheat yields remarkably accurately last season,



Peter Cartwright is wary of technologies which promise more than they are currently able to deliver in practice.



Things that appear deceptively simple on the surface are often very much more complicated when you look into them.

mirroring the very reliable yield maps we're getting from our New Holland combine," notes Peter.

"Having flat rate sown all our wheat for the past two years, we're basing our variable rate Digital Technology Farm trials on a combination of previous early April NDVI images and yield maps. We're also using last year's wheat NDVI and yield maps for the field in question as the basis for varying our spring barley trial sowings.

"If this produces the results we hope, we should have a much better recipe for variable seeding. I have to say, though, the 30cm spacing of the coulters on our Horsch drill may mean too much competition in the row at higher seed rates. At the same time, what works well for a shy-tillering wheat may not be so good for a more free-tillering one."

Peter's wary that, like many other digital tools, things that appear deceptively simple on the surface are often very much more complicated when you look into them. "They aren't made any easier by the perennial difficulties of moving data between Gatekeeper, Rhiza and our tractors, not to mention flash drive failures," he notes.

As well as the accuracy of early April Contour NDVI imaging in predicting wheat

yields, Peter and Richard have been finding GCVI (chlorophyll) images useful in timing their OSR desiccation.

Providing the imagery is 'ground-truthed' by checking key areas of the crop for ripeness, they stress it gives a far better overview of the field's state of maturity than they can get from trying to fight through the canopy on the ground.

The accuracy of the Rhiza system coupled with New Holland yield mapping is also proving invaluable in the treated/untreated trials on which they base their wheat variety choice.

The 18 varieties they trialled in 10m strips last season, for instance, showed Graham, Shabras, KWS Zyatt, Skyscraper and Costello as the stand-out varieties, with Graham's performance mirroring its average across the farm.

This year they are monitoring 19 wheats in 0.5ha plots with different input regimes, using Rhiza to highlight differences in the onset of any nutritional deficiencies as well as disease development.

"Today's digital and precision technologies are fundamental to accurately setting up, managing and recording the performance of these and the other trials we run across the farm," points out Peter.

"They have been essential too in establishing and managing the controlled traffic system that proved a godsend in allowing us to travel through last winter on land where fieldwork was almost impossible back in 2012. As a result, the winter crops we have all received the treatments they needed when they needed them.

"While we continue to be 'digitally frustrated', we have actually been finding the technologies increasingly valuable in a number of ways. We're looking to make more and more of them as our DTF trialling shows us how they can best be applied to our own particular needs."



Richard Butler has found that zoning fields has revealed some fields previously assessed as adequate for P were actually seriously short in some areas.

Nailing the benefits

Just because you have the ability to vary inputs, it doesn't mean you should. AS Clark and Son, based near Saffron Walden in Essex, has used precision farming technology since 2010. But Sam Fordham, responsible for precision across the arable business, is keen to establish exactly what benefits this brings.

"We've been variably applying seed and fertiliser and recently purchased a SAM Vision sprayer with variable-rate capability, so we can now target PGR and fungicide to where it's needed, too," he says. "But I feel we haven't truly nailed down how to get the best from the technology. We should ensure we're clear on that before we start varying everything we apply just because we can."

Sam is the third generation involved with the family business, run by his uncle Andy Clark and cousin Matt Clark across 1331ha of mainly chalky boulder clay on the Essex/Cambs/Herts border. Matt also provides the agronomy input as part of his role as an Agrii agronomist. Sam himself is also technical manager with Rhiza, so it's hardly surprising he has a vested interest in how precision farming technology is adopted.

"As we've upgraded kit over the years, we've always looked to have variable-rate capability — that's not the limiting factor for us, and there are plenty of businesses that have done the same. But what I find with Rhiza customers is that 90% of any problems they have with the technology comes down to having the time or the right people to get the best out of it," he says.

That's where AS Clark has an advantage, Sam feels. Along with Matt, who's an equally keen advocate of precision farming, sprayer and drill operator Lewis Stalley, who's BASIS-qualified, is a "real asset" for the business, he says, equally at home with an iPad, using Rhiza to scout areas of concern for Matt to later investigate, as he is setting up the sprayer for optimum application. "Also having your agronomist working closely with

Farm Facts

Revesby Estate Horncastle, Lincs

- **Soil Type:** Medium to sandy clay loams
- **Cropped Area:** 1200ha
- **Enterprise Mix:** Wheat, spring barley, OSR, winter and spring beans, spring oats, sugar beet, cover crops
- **DTF Trials:** Variable nitrogen and enhanced nutrition in winter wheat, variable seeding spring barley
- **Key trial hopes:** "We want to find out how we can best make digital and precision technologies work together to save us time and improve profitability."



Technology on trial



Sam Fordham wants to be clear on how to get the best from the technology, rather than varying every input just because he can.

► your digital technology adds huge scope to getting more from your precision investment," he adds.

That puts them in a good position to carry out trials, as part of the Digital Technology Farm network. There are two variable-rate seed trials underway — one on winter wheat, drilled in Nov, while the spring barley trial was established in March. In a parallel trial in three areas of wheat, variable-rate N will be compared with a flat-rate application.

"I reckon we've nailed variable-rate seed," says Sam. "Our soil type varies from chalky to heavy clay with some lighter land in Herts, and we've seen how varying seed improves establishment. Introducing Matt's agronomic advice into these plans to account for blackgrass and slug pressure for instance, along with Andy's experience of the farm has allowed us to really fine tune the seedrates. I hope the DTF trials here will quantify the benefits. It's on variable-rate N where I have more questions."

Sam reveals that his "pet hate" is varying N to achieve an even yield. "If you have parts of the field that perform better than others, that's where you should focus your input spend. I don't think we know enough yet about how to get this right, however."

The analysis provided through the trials, along with tools available with Rhiza will help bring the answers Sam's looking for. "You can already see a correlation when comparing NDVI maps with a gross margin map. The Agronomics approach here should deliver robust data with statistical confidence — on-farm trials of precision farming haven't come under that level of scrutiny before."

In this first year of trials, it's just the nitrogen and seeding aspects they'll be investigating, but Sam hopes this will point the way on other inputs. "It does make theoretical sense to vary PGR — clearly if you're pushing areas of a crop for yield, this could all go to waste if it falls flat, so you'd want to give those areas a robust PGR programme. But equally where you're holding back on N, if the crop receives too much PGR that will cap its potential.

"Matt and I are less convinced with varying fungicide, however. If you have more biomass the crop may be more prone to disease and you have a larger surface area to cover, but there are other dynamics to do with resistance and population dynamics — we need more information before we can confidently tailor inputs."

Aside from the trials, being part of the DTF network will bring benefits in itself, adds Sam. "Having trials data from your own back garden is



With agronomist Matt Clark working closely with the farm's digital technology this adds huge scope to getting more from its precision investment.



The business now has a sprayer with variable-rate capability, but it's unclear just where the benefits lie to using this.

always valuable. The difference with the DTF trials is that on every farm we're adding in the agronomy input from the Agrii advisor to interpret the data. Sharing this information around the network should us bring us some really valuable insight into how all farmers can use the technology to improve on-farm productivity.

"I'm also keen we explore data transfer and interoperability — these aspects form a real bugbear for growers. We have some potential solutions we're going to be looking at, and there's real value in having a network of open-minded farmers who'll be sharing experiences."

Sam is looking forward to understanding more about the benefits AS Clark can get out of the technology it already has. "Auto-guidance is a no-brainer quick fix — you can see very clearly the value you get. Other aspects of precision farming may be precise, but they're currently far from an exact science and you don't always get it right the first time you use it. It won't be a quick fix, but I do think the DTF trials will bring us confidence and clarity." ■

Technology on trial

CPM is working with Agrii and Rhiza to gain the best possible insight into the pioneering Digital Technology Farm network set-up this spring with growers across the country to scientifically prove and improve key elements of digital agronomy on a field-scale.

Spanning a wide range of soil types as well as rotations and farming systems, the trial and demonstration network has embarked upon a programme of studies employing the ADAS Agronomics precision field data analysis and reporting model to secure the most statistically robust results

This series of articles looks behind the scenes at the digital journeys of the growers involved, the issues they have with current technologies, the future they see for them and what they most want to gain from their innovative initiative.

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Farm Facts

AS Clark and Son, Saffron Walden, Essex

- **Soil Type:** Chalky boulder clay, heavy Essex clay, sandy loams with gravel
- **Cropped Area:** 1331ha
- **Enterprise Mix:** Wheat, winter and spring barley, OSR, spring and winter beans, plus spring wheat and spring oats this year
- **DTF Trials:** Variable nitrogen in winter wheat, variable seeding in winter wheat and spring barley
- **Key trial hopes:** "We want to nail down the true benefits that variable rate applications offer so we can use the technology to its full potential."

