



“It’s only when data is used to gain insight that it starts to provide value.”

Technical Diagnostics

Instant intelligence

Most farms are generating big data but how to interpret it isn’t always clear. *CPM* explores how three different technologies could help join the dots and aid on-farm decision-making.

By Lucy de la Pasture

Technology has become an integral part of modern farming, with data capture and interpretation entering a new era due to the advent of some nifty digital tools. Artificial intelligence is poised to step in to make sense of data where interactions are so complex its meaning is impossible to fathom, and rapid qPCR has entered the picture as a tool that can pick up the absence or presence of invisible disease to aid fungicide decisions.

Most familiar are the data capture tools which have taken variety selection to another level. June is traditionally the month of variety demonstrations, when treated and untreated plots display the best and worst characteristics cereal varieties have to offer. It’s a month when planting decisions for the autumn begin to take shape — eye-catching varieties entice with their promise, but all growers

know that the only true test will be once its roots are anchored in their own farming system.

Sorting out the winners from the losers at harvest used to be a best guess based on the space a variety took up in the grain store, but the advent of yield meters on combines provided a ready reckoner for a crop’s performance. The rapid progress being made in field management software has moved the ability of growers to quickly access a crop’s performance on by a quantum leap, as trialists of Bayer’s Climate FieldView have discovered.

Real-time harvest data

The digital technology provides real-time harvest data and those trialling it are finding it’s helping them to make informed and instant decisions on variety choices and drilling suitability.

One of the trial farmers is Jack Pile, who with his father is responsible for the EPC Groupe farm at Great Oakley in Essex. Jack knew the oilseed rape variety Campus performed well but didn’t realise it was typically delivering an extra 0.4t/ha over other varieties grown on the farm. As a result, it’s now his OSR variety of choice.

“The yield analysis tools immediately highlighted its superior performance and four days later we were cleaning seed ready for drilling the next crop,” he notes.

The information gleaned at harvest also mean they quickly decided to stick with

winter wheat stalwart, KWS Santiago. It performed extremely well in a third wheat spot last season in a field originally earmarked for another crop, says Jack.

“The appalling autumn of 2019 changed drilling plans substantially and it was one of the few fields we could travel on to drill. It averaged 10.5t/ha, which might not sound exceptional to some, but the better parts of the field achieved 12-14t/ha.

“We’ve always known headland compaction reduced the field average, but by how much wasn’t clear until Climate FieldView data started coming off the combine. You just don’t get detailed data like that from a weighbridge.

“It was also immediately obvious which areas of the field we have to focus on to improve. We cancelled a seed order and with home saved Santiago decided to grow it for the eleventh year running. ▶



Digital platforms can deliver real-time information which can help decision-making on the farm.

adaptable

(adj.) able to change in order
to suit different conditions



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The information gleaned from using FiedView has enabled Andrew Ward to refine his drilling plans in the confidence that Skyscraper performed better than Shabras when late-planted.

► The decision was made before the combine even left the field.”

Another grower using the app to make instant decisions on varieties is Andrew Ward of Glebe Farm, Leadenham in Lincolnshire. Andrew stuck with Shabras and LG Skyscraper for the 2020/2021 season but changed sowing schedules when yield data came in from the combine.

“Both perform well here, but Skyscraper

delivered an extra 0.6t/ha over Shabras when drilled later. This season our drilling plans were again hindered by the weather, so we started with Shabras and held Skyscraper back for November-drilled fields.”

Unseasonal weather

Both feel ‘up to the minute’ decision making could become more important for them. Again, this season has been met with unseasonal weather, with some areas receiving more rain in the first few days of May than the whole of April. And if climate models are right, more of the same erratic weather patterns can be expected. Both are of the opinion that FieldView may not change their decisions but it’s likely to confirm them more quickly.

Time and decision making were also the subject of a recent AHDB webinar with Norfolk monitor farmers Andrew and Sam Melton. Like many they have plenty of data, but it’s putting it to good use that’s important.

In the past, the ability to manage and evaluate data has been limited by incompatibility issues or complex system

interfaces but digital technology is improving at staggering speed.

Andrew and Sam manage over 1400ha, around Wisbech in Norfolk and have been using MyJohnDeere to collect machine data and Gatekeeper for farm records. Now they are also trialling Climate FieldView to evaluate ‘big data’ potential. By big data they mean the ability to collect prescriptive variable rate data but also analyse the benefits through overlaying it with yield data captured real-time from the combine.

It’s early days, but both Andrew and Sam feel it’s relatively easy to get data on the platform and is user-friendly for farmers, who spend as much time outside the farm office as in it.

FieldView was first used to collect yield data from combines and Andrew and Sam were pleased that they could see field progress and yield results in real-time. It hasn’t changed any crop decisions this season but might do next, says Andrew, but what it has done is to demonstrate the potential the technology offers.

When evaluating variable rate fertiliser application from a field of wheat, the ►

Demystifying AI in agriculture

“Data is everywhere in agriculture but on its own, it means nothing. It’s only when data is used to gain insight that it starts to provide value,” says agri-tech entrepreneur Hannah Senior, who is a board member of the UK’s agri-tech centre for Crop Health and Protection (CHAP).

One of the tools that could help growers interpret data and solve problems is artificial intelligence (AI) but it’s a word that has been so hyped up it can create barriers. The concept of AI requires demystifying, she believes.

“AI still sounds very futuristic and has attracted a lot of hype. For many, this makes it feel out of reach and unapproachable. We can remove this mystery and strip it back to a simpler approach — AI is essentially a tool that can help to solve problems.”

Being clear about the problem you’re trying to solve is also part of appreciating how AI could prove useful, she says. “That might mean describing and making sense of large, overwhelming data sets, or understanding a web of connections that are too complicated for us to easily hold in our minds.

“There’s enormous potential to use AI to help get to grips with some complex topics. For instance, it can help us better understand a network of relationships in biological systems,

which our brains alone struggle to cope with.”

One of the areas Hannah believes AI could provide a win for agriculture is in the collaborative use of data.

“Data is generated within agriculture and the food chain, but how do we connect those pools of information together? How do we work together? When we start to think like this, it’s possible to identify gaps and opportunities and find the real issues that need to be resolved in order to make these technologies work for us.”

These issues go beyond the obvious ones of improving productivity and efficiency, believes Hannah. The insights gained from the use of AI in agriculture could have huge potential to make wider environmental gains in areas such as improving biodiversity or soil health, she says.

“The challenge here is that this area will probably have less financial impact for individual businesses. The risk is that, despite the potentially huge non-financial impact, it might be seen as lower priority.”

However, with the direction of support for farmers being realigned to payment for public goods in the guise of the fledgling ELM scheme, analysing natural capital and solving environmental conundrums is fast becoming a much higher priority for growers.

Hannah believes that CHAP can help the



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industry find a way for AI to work for everyone in the food chain. More broadly than AI, she says it’s time for agriculture as a whole to widen its horizons and look at what other industries do.

“This fosters cross-sector learning. We can use the CHAP Advisory Group to invite ‘outsiders’ to share their success stories and challenges, allowing agriculture to find ways to build on these prior experiences rather than build everything from scratch.”

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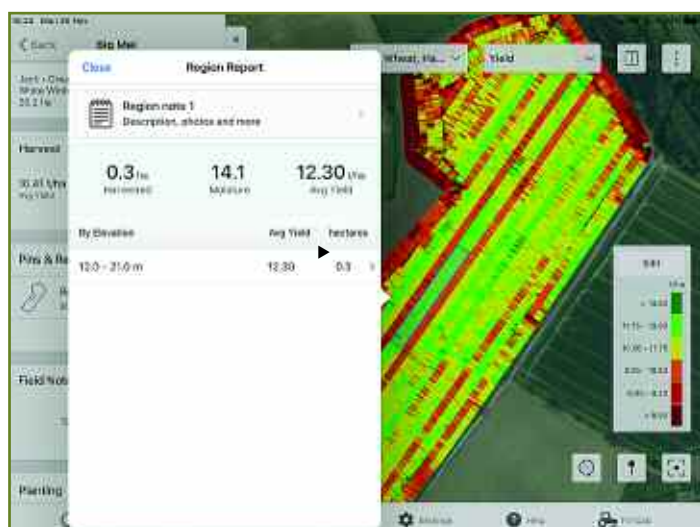
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KWS Santiago performed well as a third wheat at Great Oakley in 2020, securing its spot in the farm's rotation.

► results were revealing. “The better parts of the field used 47-54kgN/ha to deliver a yield of 12.4t/ha. For poorer areas,

the yield dropped to 10.8t/ha but N-use increased to 84-88kgN/ha,” notes Andrew. Andrew and Sam like trialling

differing strategies and products on farm and are currently in the middle of an establishment trial covering various cultivation methods, including shallow or no-tillage strategies and a more conventional plough-based system. For good measure, cover crops are being added in as part of the initiative.

The full results won't be known until harvest, and one advantage of FieldView's real-time connectivity is they can see yield data via the app as it happens. The data FieldView and MyJohnDeere capture will provide them with a comprehensive picture of the different approaches. Biomass images will give an indication of trial differences through the season and it has already

shown operation costs of £30/ha to £116.00/ha, when machinery depreciation is factored in.

Capturing real-time field data might sound complicated but isn't, claims Bayer's Max Dafforn. Data is captured by the FieldView Drive, a device that plugs into the diagnostic port of the combine, tractor or sprayer. Viewing is simply a case of pairing with a no-frills iPad via a Bluetooth connection, he explains.

“You don't need to have a data connection to use FieldView but if you do, it uses just 1GB of data to stream 1000ha of real-time data.”

Drive set-up is also straightforward in most situations. “In most cases it's simply a case of ‘plug and

Uncovering the latent threat

Septoria is one of those diseases that can sneak up on you. Leaves can appear green and clean and then, all of a sudden, blotches appear revealing the hidden hand of septoria at work.

Discovering when the septoria pathogen is lying latent in the leaf could make decisions about applying fungicides to different varieties much easier and that's exactly what a new diagnostic test from Microgenetics can do, explains Chris Steele, the independent biotech company's crop diagnostics product manager.

SwiftDetect was launched in March and will be exhibited at the Cereals Event at the end of the month. Although it's been developed specifically for crop diagnostics, the origins of the technology lie in a rapid test that was developed to detect microbial contamination in the pharmaceutical industry, explains Chris.

That led the company to explore other industries where the technology could be of benefit, he adds. The test uses quantitative polymerase chain reaction (qPCR) to identify septoria.

“The rapid test uses a patented method to increase the sensitivity of qPCR, meaning that it can detect low levels of Septoria tritici in wheat leaves — even to the single cell level,” he explains.

It's the first such technology to become commercially available, though Bayer are currently developing their own Rapid Disease Diagnostics which is being tested extensively in the field this season.

“Our aim at Microgenetics is to help growers

use fewer fungicides — protecting the environment and saving money in the process. Future developments could see the test identify other key wheat diseases, from mildew to yellow and brown rusts, and diseases in other crops, including barley, oilseed rape and potatoes.”

The technology isn't limited to disease detection, says Chris. It's also possible to develop the test to stratify different strains of the pathogens present — something that would give growers a powerful insight into resistance management on their farms. Soil-borne pathogens can also be targeted.

AICC member Stephen Harrison of Southwest Agronomy has been using the new test this spring and reckons it's proving helpful. “It's allowing us to tailor fungicides based on what's actually happening in the crop. This season septoria levels were very low as final leaf three emerged so we were able to use entirely protectant materials and save second generation SDHIs and Univoq (fenpicoxamid+ prothioconazole) until later.”

Stephen got a feel for what qPCR testing could offer in 2020 trials, when each emerging leaf layer was sampled in multiple varieties. “Although it wasn't a high disease year, the testing did present a picture of how septoria builds up during the season. The results meant that we could confidently base fungicide applications at the final leaf one (T2) timing on Ascra Xpro (bixafen+ fluopyram+ prothioconazole) programmes. The information helped gear the system by indicating the degree



Stephen Harrison says the results of qPCR tests raise a question about how septoria resistance is working in more resistant varieties.

of eradicant or protectant activity needed in the crop.”

He believes that while the diagnostic test takes some of the guesswork out of the equation, the results also raise a question about how septoria resistance is working in more resistant varieties.

“We don't really know how varietal resistance works. Does it lengthen the latent period of the disease or can a resistant variety simply handle more cells of the pathogen than a susceptible one?”

Overall Stephen believes SwiftDetect is a useful tool that links to his overall strategy of evidence-based advice. In the future he intends to use the test by targeting barometer farms and varieties to improve his understanding of how septoria is developing in his area.

play'. Once the drive is installed in the diagnostic port, you pair up the machine via the cab app. This typically takes a few minutes and for anyone who runs into a problem, support from the FieldView team is available."

And you do get a lot of data. Connect with the combine and precise packets of field data feed through but also moisture content, machine elevation and its progress through the field can be viewed, explains Max.

"The beauty of FieldView is seeing these changes in yield values as the combine moves throughout the field. It's detailed information 'there and then'. Your evaluation of the reasons for variable yield results from across a field can start before the combine is being readied for the next field."

The reports created by FieldView can be shared with others who aren't using the digital platform. For a farmer wanting their agronomist to see detailed yield variation across a field, or as applied data, it can be transferred by phone or device via mobile connectivity.

"Many decisions are made jointly with agronomist or a farm team. Sharing detailed data quickly can only improve the decision-making process," adds Max.

One agronomist who did just that is Velcourt's Kieran Walsh. He used the real-time functionality to look at yield data despite being in France at the time. This was at the request of Rory Clark, who farms near Cirencester and had concerns about soil conditions in the field, so Kieran viewed the combine telematics as the wheat was harvested.

"Rory wanted to look at yield performance across the field, identifying the poorer and better parts of the field. Being mid-August there was a need to get the following OSR crop drilled, so seeing all the data coming off the combine



Live data can be shared with others not using the FieldView platform, explains Max Dafforn, which offers the potential to link agronomists to field data as it happens.



AHDB Monitor farmers Andrew and Sam Melton are trialling FieldView, which they can see has potential to help evaluate practices on the farm.

helped us make decisions quickly."

Max admits there have been some compatibility issues but says this was inevitable with the range of farming strategies and machinery on UK farms. "When it comes to machinery options, it's

a diverse landscape in the UK. There were bound to be some teething troubles but FieldView machine compatibility is accelerating at pace," he concludes. ■

● For more on Climate FieldView, see Digital Direction on p83.

qPCR testing informs ICM approach

Crusoe (AHDB Recommended List septoria score of 6.2) was compared with KWS Firefly (7.0) at two sites in Microgenetics field trials last season. Leaves were sampled from the emergence of leaf three in both untreated and fungicide-treated areas, with subsequent samples collected at one-week intervals.

"When leaf three emerged (indicated as timepoint 1 on the graph), the qPCR data shows there was no detectable level of septoria in either field. By the second week (timepoint 2), the Crusoe crop in Wiltshire had a medium to high level of septoria present, which gradually increased throughout the season in both the treated and untreated areas of the field.

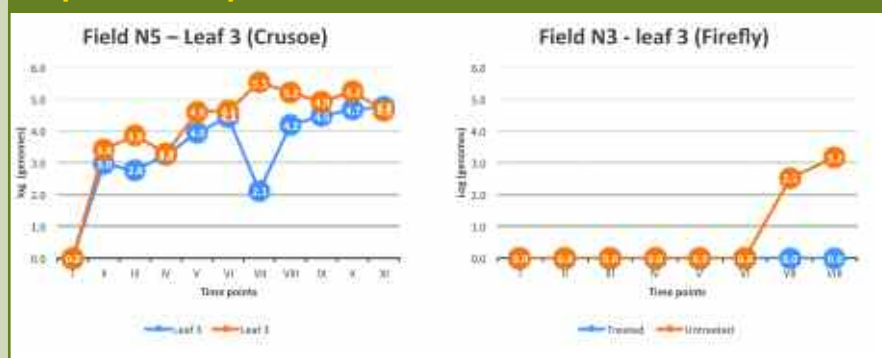
"For this field, there is a clear trend for a higher level of septoria in the untreated than in the treated area. There was a dip in septoria

levels at six weeks after the emergence of leaf three, which the agronomists involved in the trial believed coincided with a fungicide spray which temporarily knocked back the disease.

"Conversely, the Firefly crop in Cambridgeshire continued to have no detectable level of septoria until timepoint 7 when disease levels increased in the untreated samples. Septoria wasn't detected in the treated samples at any point during the trial," he adds.

The results perfectly illustrate that fungicide programmes should be flexible and that involves a change in mindset, believes Chris. "Using the test as part of an ICM approach can inform fungicide decisions and enable appropriate dosing of fungicides because you know how much disease is actually present."

Septoria development on different varieties



Source: Microgenetics, 2020