

“The way climate change will manifest itself in the UK is in wetter winters and hotter summers.”

# When yield gives way to shield

## Technical Fit for the future

As growing conditions become less reliable, that puts greater emphasis on sowing a seed you can depend on over one that may simply fill the barn. *CPM* analyses the impact of climate change on variety choice.

By Tom Allen-Stevens

**Most growers will want to put the nightmare of the 2020 growing season, and the autumn that preceded it, behind them. But after another challenging drilling period and further unprecedented rainfall over winter, John Miles of KWS UK is getting a horrible sense of déjà vu.**

“You’d expect to get the odd rubbish season, and we have had a few kind autumns before 2019,” he points out. “But you can’t ignore that the weather really is changing with extreme events becoming more frequent. It highlights how farming is on a tightrope.”

John believes resilience will become an increasingly vocal part of the farming language. “It starts with the crop type you choose, and most growers these days aim for a healthy diversity across the rotation. But whether it’s winter wheat, oilseed rape, barley, spring wheat, rye or sugar beet, when you sow you should expect peak performance from the variety you choose.”

The attributes that influence this are largely locked in at the point of sowing, he argues. “But peak performance isn’t just about yield, and this is especially the case

when considering resilience in the face of climate change.”

John’s picked out five areas he believes are key when choosing a wheat variety that’s fit for a future with a changing and increasingly unpredictable climate (see panel on p54). But is climate change something to actually factor in, and is there any science behind these weather woes?

According to the UK Centre for Ecology and Hydrology (UKCEH), an independent, not-for-profit research institute, harvest 2020 was the country’s worst for at least 25 years.

### Satellite data

Crop maps produced annually by UKCEH and Remote Sensing Applications Consultants use satellite data to show the type of crop grown in all two million fields across Great Britain. Last year’s map revealed the area of winter wheat grown was down across the whole country by 44%, winter barley by 37% and the OSR area dropped by 38%, compared with the average for the previous five years. Autumn-sown crop coverage in the East Midlands was worst hit at around 70% down.

Separate UKCEH analysis of detailed data on yields collected during harvest from more than 500 fields across 100 farms in England has shown an average fall in yield across these crops of around 15%, compared to the five-year mean, with the yield in some places down by as much as two thirds.

It’s a direct result of the weather, says UKCEH’s Dr John Redhead, but this cannot be seen as a one-off. “Climate researchers generally agree that the way climate change will manifest itself in the UK is in wetter winters and hotter summers with less rainfall.

“The UK is unlikely to see a smooth transition to a warmer climate in the years

ahead with increasing likelihood that it will be typified by periods of extreme weather with the result that we will experience more years like the last one.”

Using inputs in a more targeted way that gets the most out of them will be a key part of any sustainable production system in the future, he says.

“Such thinking not only makes economic sense. It’s also likely to benefit the environment and help to reduce the causal effects of climate change in the first place.”

John Redhead believes it’s not just a question of taking a fresh look at how crops are grown but also the composition of future farmed landscapes.

“Given an increasingly extreme and unpredictable climate, it’s important to begin to diversify our cropping systems to spread the risk. It’s also important to understand how non-cropped land might impart resilience to such extreme events.

“An emphasis on a greater diversity of approaches would be of benefit and this is certainly borne out by our results suggesting that some degree of ‘land sharing’ rather than total ‘land sparing’ is a more resilient model for the future.”

Going all out for yield might not be the best option for the future, John Redhead ▶



*The wet autumns that caused such misery in 2019 and 2020 are likely to become more frequent.*

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Some degree of 'land sharing' rather than total 'land sparing' is a more resilient model for the future, says John Redhead.

► suggests, and the UKCEH analysis of landscapes backs this up. What the scientists found was that landscapes which delivered the highest relative yields did not necessarily maximise yield stability nor resistance to extreme events in the long-term.



Last year's dry spring is unlikely to be a one-off event, while summers will get hotter with less rainfall.

## Sowing for peak performance: climate resilience

These are the five key impacts of climate change on cereals production and examples of crop and variety decisions that mitigate against these:

1. Need for resilient varieties that establish well despite adverse conditions.
2. Balancing early and late varieties and importance of variety scheduling through drilling, spraying and harvest periods.

3. Disease resistance and making best use of reduced windows of opportunity for fieldwork.
4. Importance of standing power and lodging resistance.
5. Summer management, especially drought resistance and early harvest.

Source: KWS UK

"Yields were most stable in landscapes with high coverage of both arable land and semi-natural habitats, which can include grasslands with some degree of agricultural management, evenly distributed throughout the landscape," he says.

"This suggests that there are potential trade-offs to be made in managing landscapes for resilience over shorter versus longer timescales and this will be an important challenge to address in developing sustainable agricultural systems in the future," concludes John Redhead.

## Breeding for the future

For the grower, this may feel like a dim and distant future, but it's one KWS head of wheat pre-breeding Jacob Lage is dealing with today.

"It could take 20 years for noticeably warmer, drier summers and wetter winters to come to the UK, but it takes at least 10 years from the first cross to bring a

new variety to market," he notes.

"So we're bringing the traits in now that will make wheat fit for the future. We're also identifying any gaps there may be in the gene pool and looking at exotic material to see whether we can breed in characteristics that will ensure even greater resilience."

So how is Jacob addressing the five key impacts of climate change John Miles has picked out? "When it comes to establishment, we're now on the verge of making routine use of drones in the breeding plots," he reveals.

"The key is to spot the differences as soon as the plant emerges. With drones you can survey thousands of plots and compile very accurate datasets. That's giving us the metrics to understand how individual crosses will perform across a whole range of scenarios."

While the breeding system ensures nothing with poor germination ever gets through, there are differences, notes John.

## Variety plots help growing for the future

There are two main factors that drive variety choice for Philip Bradshaw, who farms at Flegcroft Farm, Whittlesey near Peterborough on the edge of the Fens: establishment and agronomics.

"We're all no-till and have been for five years, and while we farm a total of 230ha, a third of this is a block 20 miles away, so scheduling and disease management are also important," he says.

So is the market for his wheats, and with a Whitworth biscuit mill nearby, that makes KWS Firefly a good fit. "It's biscuit quality with a reasonably sound agronomic package. It also has orange wheat blossom midge (OWBM) resistance, which is a useful trait for risk management."

Informing Philip's variety decisions is a series of on-farm trials he's carried out for the past 10 years. One field is given over to 6-7 wheats direct drilled in 1ha plots that are carefully managed and monitored, with a summer open day (usually) for other growers in the area. "They're not replicated trials, but it's a good opportunity to see them growing and gauge

their relative performance."

All KWS varieties, Zyatt, Siskin, Firefly Extase and Parkin are in the ground and were also taken to yield last year. Kerrin and Kinetic were in the trial for 2020, but dropped this year in favour of Cranium. Drilling for 2021 harvest took place in late October following peas. "We have problems with blackgrass, so we're looking for varieties that establish well in no-till late in the season. We put in catch crops, so want wheats we can drill into green cover," adds Philip.

With yields from the plots ranging from 10.1-13.3t/ha, Zyatt is the star performer in Philip's view, and makes up the rest of his wheat area. "The Zyatt plot was slightly chewed by rabbits at one end, and actually Parkin and Kinetic yielded better. But they're feed types and we pay for off-farm storage, so reckon we should aim for the quality markets," he explains.

With reasonable disease scores, Philip feels Zyatt is a good fit alongside the Firefly. "We're aiming to reduce crop protection and fertiliser



Philip Bradshaw has a series of on-farm trials to inform his variety decisions.

Photo: Chris Brudenell

inputs, and I believe it's ultimately through having healthier soils we can achieve healthier crops. So we're looking for varieties that will complement our system to ensure we're fit for the future."

“The most interesting material comes out of challenging conditions. KWS Cranium powers through from a late sowing in Dec or Jan, for example.”

Jacob notes that increasingly wheats are drilled in no-till situations. “We have to respond to that and select varieties with early vigour without the benefit of mineralised N from disturbed soils. We’re always looking to associate the genetics with what we see in the field, but with these traits that’s super complex as there’s a whole range of genes interacting to give the characteristic you’re after.”

Growers are also looking for a broad portfolio of wheats, notes John Miles, to spread the workload when suitable windows seem to be getting increasingly narrow. “It’s where varieties like KWS Parkin fit in — early to drill and early to combine, too.”

A changing climate will inevitably result in a shift in pest and disease pressures. “It’s where the advantage of having a pan-European breeding programme comes in,” notes Jacob.

“We may see more issues with fusarium in the UK, for instance, and there’s some promising resistance we’re selecting for in French and German lines that we can bring

to the UK. We’re also working closely with the academic community on public-funded pre-breeding programmes such as Designing Future Wheat, identifying traits and resistant genes in exotic and landrace varieties.”

Standing power is a trait UK breeders have always selected for, however. “The UK is relatively high-yielding with top-heavy varieties that have always needed some of the stiffest straw in Europe, so UK wheats are in a good position,” says Jacob.

But again it’s not a trait with a close genetic association and relies on robust screening to ensure a new variety introduction doesn’t literally flop. John Miles adds that growers in the Fens are often the first to call out a wheat that slips through the lodging net. “You rarely get weak-strawed varieties, but KWS Siskin was one where some growers found its credentials didn’t stand up in the field. Parkin does particularly well, though, being shorter and notably stiffer than many others.

“It’s also worth noting that standing power conflicts with early season vigour — if you’ve selected for one, you’ll have to manage the other.”

Drought tolerance and the ability of



*Jacob Lage is looking to associate the genetics with what he sees in the field, but the traits he’s chasing are super complex.*

a wheat to withstand high summer temperatures are again characteristics that come through from the pan-European programme. French wheats in particular tend to have a faster maturity than UK types, and suitable crosses can be selected that have a fit in drier UK situations.

“There’s a good range of maturity in UK wheats, from Parkin that’s Grafton early to Cranium that’s a +2 on the AHDB Recommended List. It’s important to have a range of all varietal qualities, taking a more holistic view. If you select simply on the basis of 0.5t/ha yield difference, that’s a benefit you’re increasingly unlikely to see as the climate becomes more challenging,” John Miles concludes. ■

## Variety profile flags up hidden weaknesses

Risk management has always been part of the job for Prime Agriculture agronomists Steve Baldock and Philip Simons. But the matrix of decisions is getting undeniably more complicated.

“While once it was a question of choosing a variety with the best standing ability if drilling early, now you’re looking for good disease scores, slow development, BYDV tolerance and competitiveness against blackgrass, as well as standing ability,” notes Philip.

Advising for clients across Norfolk and Suffolk, they aim to put together a variety profile for each business, explains Steve. “Firstly you’re fitting varieties to the situation, but you also have scheduling throughout the season in mind. So a farm that follows a regenerative agriculture-style policy, for example, is looking for good disease scores and reliable establishment in a no-till scenario. And will a first wheat stand well where manure is applied?”

“But then growth through the spring and harvesting dates must be borne in mind, especially on larger units, so spraying and combining can be prioritised for optimum results.”

Steve feels the approach shouldn’t be seen as too restrictive. “The varieties you choose must meet the farm’s main objectives. The advantage of a detailed profile is that you identify any slight weaknesses that need to be managed, and that



*A farm that follows a regenerative agriculture-style policy is looking for good disease scores and reliable establishment in a no-till scenario.*

helps plan the season.”

Absolute yield may become less important, argues Philip. “We all want 12-13t/ha, but a reliable average of 10t/ha with appropriate costs may be a better strategy — it’s the 6t/ha disaster you want to avoid.

“A variety that establishes well after roots will likely skip through its growth stages quickly in spring. Make sure you’re not faced with a large block of rust-susceptible wheat that needs spraying all at the same time, and remember that a septoria score of 7 can behave like a 5 when wheat is drilled early. It’s about spreading risk as weather becomes less predictable and extremes more frequent,” he says.

## 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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