

Optimising crop potential after wet weather woes

Winter wheat is generally the most profitable combinable crop on many farms, but the difficult start to the season means this spring will be a key time for expert agronomy to help maximise crop output.



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Hutchinsons technical manager Dick Neale and technical support manager Neil Watson look at how growers can maximise the remaining yield potential from autumn-sown crops.

Good establishment is widely recognised as the key starting point to maximising yield potential in any crop, but for some winter wheats sown last autumn, that fundamental building block looks decidedly shaky. Exceptional rainfall across central parts of the UK throughout autumn and winter meant many crops were sown late into sub-optimal seedbeds, while others were simply not drilled. Some crops that did get sown also then faced weeks of waterlogging that significantly hindered establishment.

The foundation phase from drilling to growth stage 30/31 is such an important part of the crop's life - so, after the difficult winter, crops now need all the help they can get to boost outputs.

"It's not the case everywhere, as conditions last autumn weren't as wet in Scotland and parts of southern England, so growers were able to make better drilling progress and crops look much better. The main concern is across central England, especially the Midlands and Lincolnshire," says Dick.

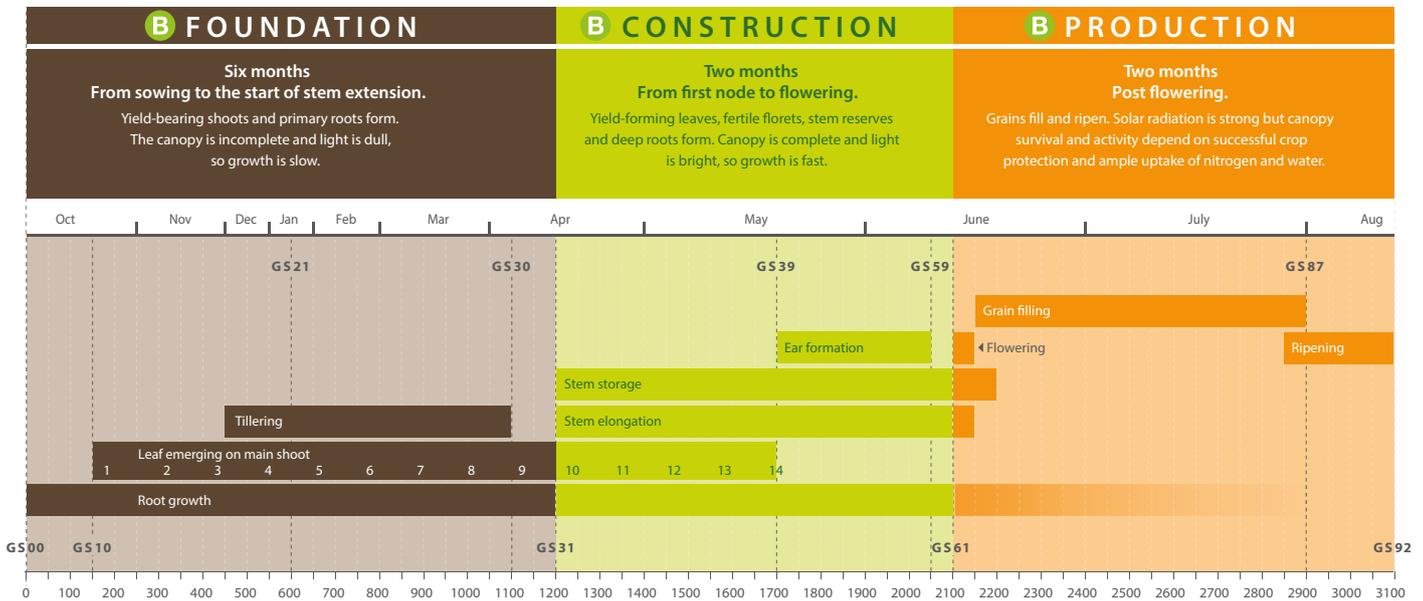
Even where soils were not completely saturated throughout the profile, capping and poor infiltration in the top 10 - 12cm exacerbated surface waterlogging in the main seeding zone.

In the worst cases seeds rotted in wet, anaerobic soils, while other crops have experienced poor root growth, posing challenges for the remainder of the growing season, adds Neil.

"Crops need to establish a decent root system early to support and sustain the plant's biomass throughout the growing season. But that root structure isn't there this year and I don't believe crops can make up in the spring what they should have put down in autumn."



An illustration of the three critical phases of wheat development



An extract from the *Wheat Growth Guide*.

Courtesy of the AHDB

> **There are three key phases for crop development in spring, at GS 30/31 when tiller and spikelet production is determined, GS 39 when the number of grains per ear is established, and around GS 75, when the size of the grain vessel is set** (see extract from AHDB *Wheat Growth Guide* – above).

“If everything’s right at each of these critical times, we may still be able to get a good crop, but there’s no buffer or margin for error this season, as that’s already been used up.”

Keeping canopies greener for longer will help claw back some yield. Work by the Yield Enhancement Network (YEN) shows that keeping a crop green (at the end of the of the season) for an extra week adds around 1 t/ha to final yield.

That requires strong, healthy canopies that are adequately supported by a good root system - something proving a real challenge this season.

Boost rooting

The immediate focus for those with struggling, backward crops is therefore to improve root development, which in turn will support above ground biomass growth and tiller retention.

While autumn is a key time for early root development, roots grow rapidly as soil temperatures rise in spring, with growth rates typically peaking at 18mm/day during the crop’s construction phase (GS 31 to 61). Some 70% of total root length is found in the top 30cm of soil, according to the AHDB *Wheat Growth Guide*.

Poorer root systems have less surface area to access soil water and nutrients, so require more support from applied nutrition, especially where there has been significant leaching (notably nitrogen and sulphur) caused by high winter rainfall.

Early applications of nitrogen, sulphur, potassium and phosphate that went on in February and March will have helped root development, but growers must ensure crops remain well-nourished with a “little and often” approach over coming weeks, adds Neil.

“It’s no use waiting until you see deficiency symptoms, as the damage is already being done by then.”

Dick says individual crops and soils will need careful assessment for nutrient requirements and timing this season, and a tissue test pre-GS 31 may be useful. “But don’t test unless you intend to react to the result,” he adds.

Phosphite (e.g. Advance 66) applied before GS 31 has been shown to boost root tip growth - the softer part of the meristematic root zone mainly responsible for absorbing nutrients - so there may still be time to treat backward crops where not done so already.

Poorer root growth may increase the risk of more root lodging later in the season as plants have less anchorage. This risk may be mitigated by thinner, shorter canopies and lower yield potential, but is something to remain aware of, especially in taller varieties with more leverage.





Understand the possible scenarios for crop nutrition problems before making final decisions.

1. A typical soil deficiency; not enough in the soil or being recycled to support crop requirements
2. A temporary imbalance/ lack of availability; possibly due to dry soils, poor root development, or inability of the crop to explore the full rooting zone for nutrition. Even when roots move deeper to absorb moisture there may be a gradient differential of nutrient supply. Mg for example takes much of its nutrient through mass flow - just when peak crop requirement kicks-in (late season) – this is the very time soil is likely to be at its driest
3. An imbalance due to interaction with of other nutrients affecting uptake.

Keeping crops clean

Protecting and maintaining green leaf area for as long as possible with a well-planned fungicide programme is essential, so resist the temptation to unnecessarily cut input costs because yield potential is lower.

“There could be a real temptation to spend as little as possible on poor, backward crops, but you’ve got to push crops to get the most from them, otherwise it becomes a self-fulfilling prophecy,” says Dick.

Allowing any disease to take hold reduces the crop’s photosynthetic capacity, increasing the likelihood of earlier senescence and lower yields. If crops have fewer leaves to start with, it is even more important to protect them.

He acknowledges later-drilled crops will be at lower risk from *Septoria tritici*, but warns the weather during April is a key driver of later disease risk and rust remains an on-going concern after the mild, wet winter.

He favours starting spray programmes with an early triazole-based T0 fungicide, typically applied from late tillering to the start of stem extension (GS 25-30), to protect young plants from overwintered disease, especially mildew and rust. The T0 also “buys time” in the event of the GS 32 (T1) spray being delayed and reduces pressure on that chemistry.

“We regularly see a benefit to tiller survival from using a triazole-based T0. This is particularly true in bad yellow rust years, as varietal resistance

> Targeted nutrition

Tailoring any fertiliser product choice precisely to crop requirements and growth stage is essential, so regular in-season tissue testing could help identify potential deficiencies before symptoms occur, Neil says.

Accurate testing also helps maintain balanced nutrient availability to the plant, as a deficiency or excess of one can hinder the nutrient use efficiency of another. Manganese, for example, has been shown to improve the uptake of other macro and micro nutrients.

Tissue tests for all nutrients within the plant should be combined with actual or estimated crop biomass at the time, to calculate any nutrient shortage.

Supporting tillers

Most tillering occurs in autumn and is determined by sowing date and temperature, with maximum shoot number typically reached in early spring.

“Tillering continues until the terminal spikelet has formed in the developing ear,” explains Neil.

“A combination of light and temperature triggers this shift from vegetative growth to apical development, even if insufficient time has allowed enough tillers to be produced per plant.”

Tillering is directly linked to vegetative growth, therefore advanced crops with many leaves inherently produce more tillers than more backward, thinner

crops. Weather, crop competition and the availability of water and nutrients then determines what proportion of these tillers produce ears.

Growers cannot influence tiller production in spring, so must focus on retaining, protecting and manipulating existing tillers to maximise yield potential.

1. Ensure soil fertility is sufficient for crop needs. Some tillers will die between stem extension and flowering if there are insufficient nutrients, especially nitrogen, as plants divert resources into fewer remaining leaves and tillers. Nutrients must be easily available to plant roots, so ensure you use an appropriate product to achieve this.
2. Remove apical dominance. Application of plant growth regulators (such as products based on chlormequat or trinexapac-ethyl) before GS 31 can suppress apical dominance in the main stem and other tillers, thereby encouraging any remaining tiller buds to grow and produce additional tillers. This use of PGRs is not focussed on straw strength or reducing straw lodging. Hutchinsons trials have shown phosphites can enhance the performance of growth regulators.





Tips to get timing right

- T1 GS 32 (second node detectable) - apply the T1 fungicide as soon as leaf 3 has emerged. Fully dissect plants to determine the exact stage of leaf 3 emergence.
- T2 GS 37-39 (flag leaf just - fully visible) - apply sprays once the flag leaf is at least 75% to fully emerged
- T3 GS 59 (full ear emergence). Apply the T3 fungicide as soon as ears are completely emerged and flowering is about to start.

> often does not kick-in until later in the season and only a handful of varieties have juvenile resistance.”

Products based on prothioconazole + tebuconazole, or azoxystrobin are key options; the latter potentially offering benefits to root development.

Targeted T1 spray

For the T1 fungicide, growers are advised to stay flexible and treat crops individually according to varietal susceptibility and disease risk at the time.

In high disease pressure situations, there may be a need for the stronger curative activity offered by SDHI chemistry, combined with a multi-site active such as chlorothalonil, which can be used until 20 May 2020.

The new-generation triazole fungicide Revysol (mefentrifluconazole) also looks strong against Septoria and rusts and is available in combination with an SDHI if required.

In lower-risk situations, it may be possible to make some savings with a standard triazole plus multisite approach at T1, saving Revysol or SDHI chemistry for the flag leaf timing. Including prothioconazole with the T1 offers particular benefits against rust and eyespot.

Strobilurins, such as azoxystrobin, fluoxastrobin or pyraclostrobin are another option that brings an alternative mode of action to spray programmes, plus strong activity against rusts. Applying strobilurins

earlier in the season (T0 or T1) can also boost root development and nutrient scavenging in backward crops. Azoxystrobin or fluoxastrobin-based products may also help reduce take-all.

Flag leaf spray

The top two leaves of a wheat plant are responsible for around two-thirds of total yield, so protecting these with a robust, well-timed T2 fungicide is key to maximising yield-building capacity.

Growers with backward crops may well be questioning where to spend money on fungicides this season, and while the T0 could be one that some have cut back on, the T2 remains the most important application and should deliver the greatest return on investment, especially if there is high disease pressure.

There are proven benefits from using SDHI chemistry at this GS 37 to 39 timing, although Revysol is another leading contender this season. Hutchinsons trials at T2 last year showed it kept crops greener for longer, which was worth an extra 0.3-0.4 t/ha compared to previous triazole/SDHI chemistry, Dick notes.

Inclusion of Revysol-based products at the flag leaf timing is particularly important where improved curative control of Septoria is necessary. It is important not to delay the flag leaf fungicide timing even if the gap between T1 and T2 is relatively short, since that would leave the flag leaf exposed to disease infection.

Hitting the right timing

Accurate timing is vital to optimising efficacy of T1 and T2 sprays, and Neil warns that late-drilled or struggling crops are likely to race through growth stages quickly as temperatures and day length increase.

This could shorten the interval between spray timings and make it harder to hit the right growth stages, so close monitoring of leaf emergence is vital.

There are some big variations in growth stages regionally and within fields, which will be a challenge to manage. Close monitoring and careful leaf dissection are needed to optimise spray timings.

QUESTION & ANSWER

How do I boost later crop greening?

Crops typically produce 60% of total biomass between flag leaf emergence and maturity, so applying late nitrogen, or including a strobilurin at T3 (GS 59) could help keep canopies working longer. Non-scorch nitrogen products like N-Durance 28 are an extremely effective way of applying late nitrogen:

- For yield, apply at GS 39 with the T2 fungicide
- For grain protein, a further application can be made with a T3 fungicide.

Also consider including magnesium with ear wash sprays where required to boost chlorophyll content and aid grain fill.



Healthier soils pay dividends in wet conditions

At the national Helix Technology Development Farm in Northamptonshire, Andrew Pitts of J W Pitts & Sons, drilled around 60% of his planned 400ha (1,000 acres) of winter wheat last autumn, despite half a year's rainfall (385mm) falling between mid-September and mid-January.

He believes the farm's concerted focus on improving soil health over the past 14 years was instrumental in allowing any drilling progress last autumn, and has also made it easier to travel on land in the spring. Soils include heavy Hanslope and chalky boulder clay, alongside Banbury clay and some lighter land.

"There were a couple of patches on the worst clay areas (43-45% clay content) that failed to establish, but the majority of winter wheat looks ok, although I expect yield potential is 10-20% down on where it should be, given the season so far."

Direct drilling transition

The farm's focus on soil health features rotational changes, the introduction of cover crops, removing unproductive areas from production, organic matter additions (greenwaste compost) and a wholesale shift in cultivation policy.

The 2019/20 season is the second year the farm has direct-drilled all crops with its new John Deere 750A drill, after starting the transition from a plough/power-harrow—based system back in 2006. Initially, a Vaderstad TopDown disc cultivator was used to move soil to around 23cm (9") deep, before gradually reducing tillage depth to nearer 5-10cm (2-4") over several years.

"Soil health has always been hugely important on this farm and this year we've reaped the benefits of a very good, friable soil structure, with excellent natural drainage, to get where we are with minimal damage."

"Switching to direct drilling has been a constant learning curve and we're still learning. Being a Helix demonstration farm has been good to make us look at how we can improve, or do things differently, though."

Working with his Hutchinsons agronomist Michael Shemilt, land has been assessed and monitored in a variety of ways to target and monitor the impact of management changes. This includes Healthy Soils assessments, high definition nutrient mapping with TerraMap, multiple layers of yield and crop data analysis using Omnia and regular soil nutrient testing.

In addition, regular (monthly) plant tissue tests are done ahead of the main fungicide timings, to identify potential nutrient deficiencies that need correcting.

"Last year testing showed magnesium was often in short supply, so we applied slightly more, typically from GS 37-39 onwards," notes Mr Shemilt. "Peak demand for magnesium is at flowering which can be when soils are at their driest, so if you think there's likely to be an imbalance it's important to get it applied earlier." >



condition and providing a more timely entry for a higher-margin crop in the autumn (e.g. milling wheat).

“We know harvest 2020 will be a tough one and short-term cashflow will be a challenge, but farming is not about one year. Rather than damage our soils for several years to come by trying to force a crop in, it’s better to take the hit now and focus on getting land into the best position to produce a profitable crop in 2021, to compensate for this year.”

Tips for optimising crop potential

- Be prepared to invest in backward crops to get the most from them
- Focus on supporting root growth, retaining tillers and prolonging green leaf area with targeted nutrition, PGRs and fungicides
- Monitor crop growth stages closely to ensure optimum spray timings
- Ensure the gap between fungicide sprays does not exceed 3-4 weeks
- Be flexible - treat crops individually, as blanket approaches may be less effective
- Inspect soils to identify structural issues to address after harvest (e.g. subsoiling, drainage)
- Be prepared to make bigger changes on consistently poor performing areas e.g. putting headlands or field corners into stewardship, using cover crops and changes to cultivation strategy.

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> Keeping crops healthy

Mr Pitts knows that supporting root growth is key to getting the most from winter crops this season and recognises the value of early, targeted nutrition.

His favoured approach has been to apply around half of nitrogen in split doses before GS 30, alternating between solid ammonium nitrate, liquid urea, and solid ammonium sulphate, depending on crop requirements, growth stage and conditions. Rates are varied according to crop need, soil mineral nitrogen levels, weather and any growth regulation requirements.

A robust fungicide programme is maintained on first and second wheats. This typically includes four sprays, with stronger SDHI chemistry used at T2 in most years. T1 and T3 sprays are kept more flexible depending on variety, the weather and disease pressure at the time.

Mr Shemilt has worked with Mr Pitts to analyse some 19 years of yield maps using the Omnia precision

farming software; information that has been central to planning how to get the most from cropped land and for deciding the future of difficult-to-manage areas.

Yield maps have been converted into gross margin maps using the software, allowing them to easily identify the most resilient and profitable parts of the farm, as well as those that are loss-making and may be better off being put into environmental stewardship.

“There’s no point throwing good money after bad,” says Mr Pitts. **“Take a longer-term view and ask yourself whether cropping poor headlands or field corners is the right thing to do from a whole-farm business management perspective.”**

Changes can be more seasonal too. For example, on parts of the farm that could not be drilled last autumn, or where crop establishment was very poor, land has gone into a spring break crop or a multi-species cover crop over the spring and summer, as a way of improving soil