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Technical Nitrogen management

Time to cut N?

Nitrogen fertiliser prices soared, as production ground to a halt, energy companies have gone bust and the Government has stepped in. CPM finds out what's been going on and how growers can respond.

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Wholesale gas prices have risen five-fold since the start of the year sparking concerns across the economy. Rising energy costs are fuelling inflation and hitting consumer spending while the higher cost of ammonia is affecting sectors as diverse as agriculture, food processing and water treatment.

The surge in gas prices may have caught some in Government and business off-guard, but the foundations for it have been laid over many years, says Jo Gilbertson, fertiliser sector head at the Agricultural Industries Confederation (AIC).

“There’s no single reason for the increase in natural gas prices. It’s the result of a convergence of factors, some national and global, others market and political.

“There’s been a worldwide squeeze on gas and energy supplies as countries

emerged from lockdown and industry re-opened. China has switched from coal to gas to manage pollution, while Japan and Germany switched-off their nuclear power stations and went to gas post-Fukushima.”

A cold winter in Europe last year also put pressure on supplies, and renewables have contributed less than in recent years.

“The UK has comparatively fewer gas storage facilities than some countries, meaning it buys more on the wholesale market and is exposed to sharp price rises,” explains Jo.

Logistics, storage and handling are issues the UK can overcome with time. But when foreign governments seek to use in-demand natural resources as a means of exerting influence, the responses are limited.

Supply issues

“It has been alleged that Russia is restricting gas output to put pressure on governments in Europe to approve Nord Stream 2, the gas pipeline that will supply gas from Russia to Europe. It has recently committed to increasing supplies once its own storage facilities have been replenished,” says Jo.

Nonetheless, the UK is a small player in the international fertiliser market giving it limited leverage to secure supplies.

“The UK is equivalent to about 0.9% of global nitrate fertiliser consumption and we have to compete in a global market to attract supplies,” says Jo.

Coronavirus has also contributed to the situation. As industries have reopened demand for gas has risen. As ammonium

nitrate (AN) is akin to ‘gas in a bag’ it follows that nitrate fertiliser prices have soared too. At current gas prices urea would equate to £900/t — no wonder fertiliser plants closed.

“Plants operate at full capacity, so even when they re-open the market will remain in deficit, probably through to the end of the season. This is one reason why the fertiliser shortage is expected to continue well into the new year. Our advice is for farmers to speak to their agronomists and suppliers to ensure all the options are looked at in detail,” says Jo.

Higher prices have caught many on the back-foot, but growers shouldn’t despair, says Tom Land, Agrii’s fertiliser technical manager.



Soaring fertiliser prices have been in the pipeline for years, reckons Jo Gilbertson, fertiliser sector head for the Agricultural Industries Confederation.

Calculating your breakeven ratio

- A hypothetical farm has 50t of Nitram 34.5% bought at £250/t and 30t of Lithan 34.5% bought at £650/t giving an average cost of £1.16 per kg of nitrogen
- The average crop price achieved is estimated to be £200/t
- $BER = \text{£}1.16/\text{kg N} \div (\text{£}200/\text{t} \div 1000\text{kg/t}) = 5.8$ kg grain per kg N
- A BER of 5 is considered optimal for cereals
- For every full point increase in a BER over 5, the applied rate should be reduced by 10-11 kg N/ha compared with conventional farm practice
- In this example the N rate would be reduced by 5kg/ha

Source: Agrii

In the first instance, growers should calculate their needs according to their yield expectations and the crop end use, he explains. They can calculate the breakeven ratio (BER) based on the average fertiliser cost, expected yield and anticipated average crop sale price.”

Higher ex-farm prices mean the BER will be broadly similar to typical ratios, but should be based on a revised economic assessment. Bear in mind that BER only considers yield, so should not be used as a guide to meeting grain protein requirements in the case of milling wheat.

“Some will question the affordability but remember that there are finance arrangements available to support growers,” says Tom.

The next consideration should be how to manage the nitrogen growers already have, whether that is in the shed, in the soil or in the crop. Soil nitrogen will be influenced by a

range of factors, notably the weather, but also soil type, previous cropping and the use of manures and other organic sources of nitrogen.

“The Fertiliser Manual (RB209) provides a basic means of calculating soil nitrogen supply (SNS). A better way to gauge the SNS post-winter is soil testing,” advises Tom.

Nitrogen availability

“The result should always be seen in the context of the environment, and it may be that the value is not as expected. Soil compaction, high organic matter and winter rainfall will affect the result. In cases where the value is higher than expected, understanding nitrogen availability in the short term will also be important to calculating the final rate,” he adds.

There is also the nitrogen stored in the crop which is likely to be higher this season than in the past few seasons because of



Adjust N rates judiciously – RB209 provides good guidance.

the favourable establishment conditions this autumn.

“I fully expect a lot of crops to have high reserves that can be accounted for when calculating the soil nitrogen supply.

In oilseed rape especially, the green area index should be considered alongside the soil reserves,” says Tom.

With crops showing good potential, growers will understandably be keen to exploit this and with crop prices above average they are likely to be willing to invest where necessary to fulfil it, he adds.

“With crops in good shape, the role of other nutrients should not be overlooked. Sulphur is essential in supporting nitrogen utilisation and protein assimilation. Where ammonium sulphate cannot be applied, products such as Polysulphate, which is a blend of potassium, calcium, and magnesium, has been shown to be highly effective at supplying freely available nutrients at the time of need,” says Tom.

If there's an opportunity to save on nitrogen, it comes in the form of potassium, but there's no hard-and-fast rule, it's highly situation dependant, he adds.

“In some situations, spring-applied potassium can replace the need for ▶



Agrii's Tom Land expects a lot of crops to have high N reserves that can be accounted for when calculating soil nitrogen supply.

Shaving the kilograms to save the pounds

With fertiliser prices reaching new heights, hitting the spreading calibration nail on the proverbial head could make all the difference to margins in the coming season.

Though the calibration book is a well-versed tome on most farms, revisiting best practice could help curb unnecessary use. With a warning from Origin Fertilisers that imported nitrogen fertilisers could be more variable in size and spreading characteristics than British farmers are used to, it's doubly worth paying extra attention. Here are Yara's steps to optimise application:

1. Match machine settings to the physical properties of the fertiliser. Calibration settings are all influenced by particle size distribution, bulk density, and flow rate. Fertiliser won't just vary depending on type, but between producers — so always read the bag. Spreading settings are supplied by manufacturers and can be accessed online, so growers can set the spreader to the desired application rate (kg/ha) at a specific working width. Spreader height is also detailed



- and can be set in the field. Remember settings are based on ideal conditions.
2. Adjust the angle the fertiliser hits the disk – this governs spreading distribution.
3. Check the flow rate controller – this determines fertiliser application rate and can be checked in the manufacturer instructions.
4. Perform a tray test – it will allow for fine-tuning and ensure the spreader is operating accurately. Tests can be conducted by the farmer or a calibration expert.



First applications of N will give best return on investment, says Natalie Wood, country arable agronomist at Yara.

agronomy manager at Yara UK. “A flexible attitude is required — make a plan based on the current situation, but don’t let that constrain your actions in spring.”

“Realistically, this is not a year to be pushing for yields,” adds Natalie Wood, country arable agronomist at Yara UK. “That first 160kgN/ha is where you’ll get the best return on investment, even at increased fertiliser prices. When it comes to the final 50kg or so of nitrogen, where the ROI isn’t as high, that’s when tools can assist, such as our N-tester. It will help you see whether it’s right to consider that additional application depending on crop economics. It’s all about managing risk. The right steps to take will become clearer as we move through the season.”

► additional nitrogen, but it depends on the SNS and the wider nutrient availability for the given soil. In all cases, the supply of both potassium and sulphur should not be a limiting factor; this is where the value of a nutrient management plan comes to the fore. Agrii trials suggest that depending on the situation an additional 50-80kgK/ha has enabled nitrogen rates to be cut by 40-50kgN/ha.”

Yara urges farmers to look closely at this season’s upcoming nitrogen applications to ensure return on investment is maximised. “If prices change further, then we will need to adapt,” says Mark Tucker, marketing and

Foliar nitrogen

Given that the nutrient uptake efficiency (NUE) of granular fertilisers can be relatively low in dry springs, consider foliar nitrogen, adds Tim Kerr, crop nutrition manager at Hutchinsons. Applying nutrient directly to the leaf offers more efficient uptake than surface-applied fertilisers taken in via roots. Crucially it does not rely on soil conditions.

“The NUE of some foliar N products is as close to 100% as you can get, so there’s a good chance that you could make up much or all of any reduction in applications of less efficient

RB209 extended version of Table 4.22 embraces current prices and trends for cereals

Source of N	Fertiliser N content	Fertiliser Cost									
		Home product									
Ammonium Nitrate	34.5%	£173	£259	£345	£431	£518	£604	£690	£776	£863	
Urea	46.0%	£230	£345	£460	£575	£690	£805	£920	£1,035	£1,150	
Urea-Ammonium Nitrate Liquid	28.0%	£140	£210	£280	£350	£420	£490	£560	£630	£700	
Cost of fertiliser nitrogen	£/kg N	£0.50	£0.75	£1.00	£1.25	£1.50	£1.75	£2.00	£2.25	£2.50	
Harvested rate price (£/tonne)		Change to recommendation for ALL CEREALS									
	200	0	-40	-70	-95	-110	-120	-130	-150	-160	
	250	20	-30	-50	-70	-80	-100	-110	-120	-130	
	300	40	0	-30	-50	-70	-80	-90	-110	-120	
Decrease	350	50	10	-10	-30	-50	-70	-80	-90	-100	
Increase	400	70	30	0	-20	-40	-50	-70	-80	-90	
	450	80	40	10	-10	-30	-40	-60	-70	-80	
	500	90	50	20	0	-20	-30	-50	-60	-70	
	550	90	60	30	10	-10	-20	-40	-50	-60	
	600	100	70	40	20	0	-10	-30	-40	-50	
	650	110	70	50	20	10	-10	-20	-30	-40	
	700	120	80	50	30	10	0	-10	-20	-30	

Source: AHDB/ADAS

granular nitrogen fertiliser.”

Well-applied organic manures in the spring can provide large amounts of nitrogen and with higher efficiency rates than seen with autumn-applied manures — as much as five times more, says Tom.

As long as the amount applied isn’t exceeding the field limit of a Nitrate Vulnerable Zone (NVZ) or creating a pollution risk, then there’s no reason not to apply manures or slurries in the spring.

Finally, ensure the fertiliser spreader is properly maintained and calibrated to avoid wasting fertiliser and money.

“The standard measurement

of spreader inaccuracy is the coefficient of variation (CV). Typically, a CV of 10% is achievable for most fertiliser spreaders which are set up correctly,” says Tom.

“Striping is often an indication that spreaders are not set up correctly for the nitrogen fertiliser. When spreading is visible the CV is circa 20%, at this point financial losses could be between £40-60/ha. A fertiliser with a CV between 15 and 20% may not show in field signs of striping however, the inefficiency of spreading could result in significant yield loss and wasted fertiliser,” he adds. ■

Smart tools to help make best use of limited fertiliser supplies

As well as improving nutrient use efficiency, growers might also consider making changes to their nutrient management plans (NMP), by adopting new smart tools.

“NMPs are not only a good way to calculate how much fertiliser you need, but as a general guide for your overall farm strategy,” explains Natalie.

“Historically NMPs have been quite simple. You receive an overall fertiliser rate for each field while considering N, P and K. Smart tools can now offer more dynamic nutrient planning, which will be much more helpful in planning your full crop nutrition programme.”

Tools like Yara’s Atfarm allow the user to

create a nutrition plan, using raw parameters like soil type, rainfall, yield, organic manures and others, but users can also split N, P and K into optimum timings.

In a year when farmers are limited on the amount of nitrogen they can apply, variable rate applications (VRAs) can really aid efficiency. “Using satellite imagery paired with the algorithm from the tractor-mounted N-Sensor, smart tools can give a greater degree of accuracy of variation in crop growth than normalised difference vegetation index alone.”

VRAs are powerful when it comes to improving NUE; ensuring that only the amount of nitrogen required is applied, so reducing waste.

The more targeted approach helps boost yield in poorer areas, while decreasing lodging in spots with high biomass. Finally, it delivers a more even crop for harvesting.

“Variably applying nitrogen can increase yields by up to 4%, alongside increasing your NUE significantly,” says Natalie. “Being able to set the min and max rates of nitrogen in the software also enables you to control how much you want to apply in total at each timing.

“This is a year when nitrogen is going to be one of the limiting factors of crop growth, so growers should make full use of the tools available to them.”