

### NUTRITION SPECIAL

# Fertilisers in 2022 – record prices – how do we react?



Tim Kerr  
(Hutchinsons Nutrition Manager)

Those of you who received a copy of the Guinness Book of World Records for Christmas may be forgiven for flicking through it to see if “**fertiliser prices**” were featured in the latest edition – as we face the highest ever prices for nitrogen fertiliser, followed closely by just about the highest P and K prices.

**Tim Kerr** (Hutchinsons Nutrition Manager) gives his advice on the best way to manage the situation going into the spring.

12 months ago, 200kg/ha of N, plus 50kg of P and 50kg of K/ha cost about £190.

Today it will cost over £500!

High fertiliser prices – Nitrogen, Phosphate, Potash or Sulphur – are not going away, with market metrics suggesting we need to adjust our sights and be prepared to adapt to more costly fertiliser inputs for more than just this year.

Whilst history can provide some context to what we are facing today, it's more likely trial work and research that will guide us through the current situation. >

100 years ago, the “Hadfield's of Liverpool” Fertiliser diary for 1922 opened with a statement – explaining that they had to turn away “hundreds of tonnes worth of orders” the previous year due to unprecedented demand.

Scroll forward to February 1952 in Westminster – where the Ministry of Agriculture passed an act as part of the Agriculture (fertilisers) bill agreeing to pay farmers a 30% subsidy on phosphate fertilisers - due to the unexpectedly large increase in the price of fertilisers that year!

*Hadfields Diary*

#### COMPOUND FERTILISERS AGAINST HOME MIXTURES

#### HADFIELD'S

#### SPECIAL MANGOLD MANURE

6 cwt. to the acre,

AGAINST

#### SUPERPHOSPHATE,

6 cwt. to the acre, and

#### NITRATE OF SODA.

A Customer writes:—“I am very pleased with your valuable Manure, and do not wish for anything better. I found that the Mangolds grown with your Manure alone were better than the Mangolds dressed with Superphosphate and Nitrate of Soda, which I am sure speaks well of your Manure.”

#### PLEASE ORDER EARLY.

Owing to the enormous demand last season for our Standard Compound Fertilisers, we were reluctantly compelled to refuse hundreds of tons of orders, and consequently disappointed a large number of our friends.

To ensure receiving your supplies for next season, we should recommend you to

#### ORDER AS EARLY AS POSSIBLE

and give us the option of forwarding your Fertilisers during the coming Autumn for use next Spring.

Thanking you for past support.

## > Planning Ahead

For winter cereals and oilseed rape, the first 100kg of N provides the best return on investment. Applying further N after that - the law of diminishing returns begins to impact - with a decreasing incremental improvement in yield for the amount of fertiliser applied.

**“It is a truism which bears repeating, that the most expensive fertiliser is the one that is not in your shed when you want to apply it.”**

So it is worth ensuring you have your Nitrogen bought and on farm in good time. There is no better alternative to fertiliser for replacing that first 100kg.

### Seven-point plan for Nitrogen Planning

#### Summary:

- 1 Calculate your average buying price for a kg of N
- 2 Fine-tune your N recommendations according to your average price
- 3 Measure the N available from the soil
- 4 Adjust N rate according to Soil Mineral Nitrogen (SMN)
- 5 Implement a robust nutrient management plan - covering P,K,S Mg etc
- 6 Ensure the nitrogen is spread as accurately as possible
- 7 Assess the crop potential and adjust later N rates accordingly.

### 1 Calculate your cost of N

- For straight Nitrogen divide the cost/ tonne by kg N/tonne. For example 34.5% N at £690 =  $690/345 = £2.00$  per kg.
- However, it is important to average the value out across all of the nitrogen bought. If you are using NS grades, or NPKS, then use the value of straight nitrogen when the fertiliser was bought to calculate the N value in the fertiliser e.g. 27N 9% SO<sub>3</sub> bought at £420, when 33.5% AN was £450 -  $450/335 = N$  at £1.34 per kg.

### 2 Fine tune your N recommendations according to your average price

- Utilising your average N cost/kg use the winter cereals table published by ADAS (Table 1) to adjust your optimum N rates. For example if the average cost of N is £1.50 and wheat is worth £200 per tonne - it is recommended to reduce the usual amount of N by 30kg/ha.
- On a medium soil - with an SNS index of 1, the usual recommendation for winter wheat would be 220kg/ha - in this example it reduces to 190kg/ha.
- However if the average N price/kg is £2/kg - the suggested reduction is 60kg/ha - in this example reducing the recommended N rate to 160kg/ha.
- For winter wheat on most soil types that figure of **160kg/ha** is the most likely minimum rate for this spring, based on fertiliser and crop prices at the time of writing.

### 3 Measure the N in the soil

- Embedded within the fertiliser recommendations in RB209 are assumptions about the levels of nitrogen that the soil can supply.
- Where these assumptions are most likely to be accurate, and therefore not worth measuring, is where there are no organic manures being applied, no cover crops grown, or for soil types that are generally low in residual nutrition (typically light, free-draining soils).
- But when manures or cover crops are employed - or the soils are naturally fertile, it is worth checking how much nitrogen is going to be available to the crop using the N-Min test.
- The result will provide a valuable insight into the nitrogen expected to come from the soil - potentially allowing for more precise Nitrogen applications to fulfil crop requirement.

**Table 1. Adjustments to N Recommendations**

| Source of N                  | Fertiliser N content |
|------------------------------|----------------------|
|                              | %                    |
| Ammonium Nitrate             | 34.5%                |
| Urea                         | 46.0%                |
| Urea-Ammonium Nitrate Liquid | 28.0%                |
| Cost of fertiliser nitrogen  | £/kg N               |
|                              | Grain sale price     |
|                              | £/tonne              |
|                              | 50                   |
|                              | 75                   |
|                              | 100                  |
|                              | 125                  |
| <b>DECREASE</b>              | 150                  |
| <b>INCREASE</b>              | 175                  |
|                              | 200                  |
|                              | 225                  |
|                              | 250                  |
|                              | 275                  |
|                              | 300                  |

#### 4 Adjust N rates according to the Soil Mineral Nitrogen (SMN)

- If you have high levels of available from the soil – this could be classified as nitrogen “in the bank” – and could be included in the overall calculation of your cost of N/kg – at a much lower level than current fertiliser prices.
- For example, you could include extra N from the soil at £0.70/kg. This could mean an overall reduction in your average N price – which in turn could change the optimum N rates in the tables previously referred to.
- The N-Min result will provide guidelines for you – and these will sometimes be an upward adjustment as well as a reduction.
- If more N is recommended as a result of the NMin – the figure may need further adjustment depending on your average N price per kg, as it may exceed the optimum N depending on the cost per kg of N.

#### 5 Implement a robust nutrient management plan – covering P,K,S Mg etc

- Nitrogen use efficiency will be adversely affected where there is a shortfall of any other essential nutrient. By following the guidelines for Phosphate, potash and sulphur application from RB209 – this should deliver sufficient macronutrition to support maximum NUE.
- Micronutrients such as manganese, boron and molybdenum all make a contribution to nitrogen uptake, and where known shortfalls are common – these should be applied as the crop develops rapidly.
- However, it is always worth reviewing the effects of the season on nutrient availability, for example dry spells can quickly result in shortages of potassium, magnesium and boron – which in turn will rapidly reduce nitrogen uptake.

- Lower optimum N rates will not result in a lower requirement for these nutrients. Omitting or reducing rates of nutrients below recommended rates could be very expensive – if that results in a reduction in the NUE of the fertiliser you are applying.

#### 6 Ensure the N is spread as accurately as possible.

- Even if you are using the same fertiliser through the same spreader – it is still important to check the spreader, calibrate it carefully and ideally have a tray test carried out to get the setting as accurate as possible.
- The cost of a tray test is negligible compared to the cost of the fertiliser being applied, and many growers will be using fertiliser they have not used before – making it very important to check how the fertiliser spreads. In addition, an expert pair of eyes can pick up minor faults on spreaders that we might miss.

#### 7 Assess the crop potential and adjust later N rates accordingly

- There are a number of ways to do this – from the experienced naked eye, walking the crop, to satellite imagery and sophisticated technology for measuring N in the crop.
- Wheat can produce up to 20 tillers per plant, and tillering will usually end by GS31. Generally, a high tiller count shows high yield potential as each tiller can produce an ear.
- Tiller survival is linked closely to nitrogen uptake, and it may be worth considering applying more of the total N early to help maintain tiller numbers as well as boosting late tiller development – and therefore yield potential.

(Source: ADAS Research Review No. 97)

### Fertiliser Cost

£/tonne product

|       |       |       |       |       |       |       |        |        |
|-------|-------|-------|-------|-------|-------|-------|--------|--------|
| £173  | £259  | £345  | £431  | £518  | £604  | £690  | £776   | £863   |
| £230  | £345  | £460  | £575  | £690  | £805  | £920  | £1,035 | £1,150 |
| £140  | £210  | £280  | £350  | £420  | £490  | £560  | £630   | £700   |
| £0.50 | £0.75 | £1.00 | £1.25 | £1.50 | £1.75 | £2.00 | £2.25  | £2.50  |

Change to recommendation for ALL CEREALS

kg/ha N

|     |     |      |      |      |      |      |      |      |
|-----|-----|------|------|------|------|------|------|------|
| -50 | -85 | -115 | -135 | -155 | -170 | -185 | -195 | -205 |
| -20 | -50 | -75  | -95  | -115 | -130 | -140 | -155 | -165 |
| 0   | -30 | -50  | -70  | -85  | -100 | -115 | -125 | -135 |
| 15  | -10 | -35  | -50  | -65  | -80  | -90  | -105 | -115 |
| 25  | 0   | -20  | -35  | -50  | -65  | -75  | -85  | -95  |
| 30  | 10  | -10  | -25  | -40  | -50  | -60  | -70  | -80  |
| 35  | 15  | 0    | -15  | -30  | -40  | -50  | -60  | -70  |
| 40  | 25  | 5    | -5   | -20  | -30  | -40  | -50  | -60  |
| 45  | 30  | 15   | 0    | -10  | -25  | -35  | -40  | -50  |
| 50  | 35  | 20   | 5    | -5   | -15  | -25  | -35  | -45  |
| 55  | 35  | 25   | 10   | 0    | -10  | -20  | -30  | -35  |

Measuring chlorophyll in the leaf to indicate nitrogen in the crop.



## Struggling for Sulphur?

One of the consequences of a reduction in fertiliser production has been a shortage of NS fertilisers such as CF Double Top. Alternative Nitrogen + Sulphur products are not easy to come by – but there are different ways of applying sulphur:

### 1. Potash Plus (37% K – 23% SO<sub>3</sub>)

– winter wheat at index 2 with straw removed should have 85kgs of K applied – ideally in early spring. Applying 230kg of Potash Plus would supply the K required plus 53kg of SO<sub>3</sub>.

- The price of the sulphur in potash plus is very cost-effective versus the sulphur in NS grades. This allows the use of straight nitrogen and doesn't require an extra application.

### 2. Polysulphate (14% K – 48% SO<sub>3</sub>)

– where the soil K index is higher – for example index 2+ where straw is incorporated, an application of Polysulphate at 120-140kg will supply both the recommended K and S.

- Both polysulphate and potash plus also contain valuable magnesium.

### 3. Sovereign Sulphur 90% S (225% SO<sub>3</sub>)

– if there is no requirement for K – or it has already been applied, then using straight elemental sulphur is an option. As this is a concentrated form of S – the recommended rate is only 25kg/ha for cereals.

- This can be spread with conventional fertiliser spreaders in winter or early spring and will break down to become plant available over the growing season.

## Green Area Index

GAI is most commonly used in oilseed rape, but worth measuring in cereals too – the GAI will allow you to calculate the amount of N already in the crop.

As a guideline a wheat crop with a GAI of 1 contains 30kg N, whilst an oilseed rape crop with a GAI of 1 will contain 50kg/ha of N. There are apps available which will measure GAI using a smartphone or tablet. The amount of N in the crop can be used to modify subsequent N rates.

N in the crop (like N in the soil) can be viewed as nitrogen in the bank – so this can be valued accordingly and incorporated into your average N cost to calculate the optimum N rate.

NDVI imagery can give a good idea of biomass development. Within fields there are often areas that perform badly – this will be backed up by the biomass maps. Consequently, you can choose to pull back on nitrogen. Using the guidance in RB209 – a 20kg/ha reduction of nitrogen would be appropriate for every tonne of lower yield potential.

Measuring the chlorophyll in the leaf is also a good indicator of the nitrogen in the crop. The Yara N-Tester both measures the chlorophyll and uses this to interpret nitrogen levels in the crop. This provides a recommendation for how much more N is required.

The N-Tester can be used once 100kg N has been applied – and the recommendations followed up to the optimum N rate that has been calculated.

## Improving Efficiency of Fertiliser Use

Any improvement in Nitrogen use efficiency will also make a valuable contribution to achieving significant reductions in Greenhouse gas emissions.

Typically, at least 75% of the carbon footprint of wheat lies in the nitrogen fertiliser applied. Improving productivity /kg of N applied will reduce the carbon footprint of a crop.

If you would like advice on Nitrogen planning, please talk to your Hutchinsons agronomist or one of our nutritional specialists: [information@hlhlt.co.uk](mailto:information@hlhlt.co.uk)



Tom Jewers (Host of Helix East Anglia)

"It's a big call to cut applied fertiliser rates based on what may be available from a cover crop, so we need to better understand what's going on."

Indeed, N-Min testing last January recommended applying just 80kg N/ha, although Tom acknowledges he was reluctant to cut rates that far and stuck closer to his usual 120kg N/ha. Average grain nitrogen of 1.7% achieved malting spec, suggesting nitrogen release from cover crop material may be relatively slow, possibly over several seasons depending on soil biology.

"The winter barley following that trial does look much better, but it's hard to say whether that's due to conditions this autumn or the additionally available soil nitrogen. We'll continue monitoring the situation."

## Preventing losses

Sampling of water from field drains last winter provided further evidence of the value cover crops play in retaining nutrients.

Nitrate test strips showed negligible levels in the outfall from the cover crop trial field, whereas levels were noticeably higher in water from the neighbouring field of direct-drilled winter linseed, which had been slow to establish due to wet conditions.

Drains from the cover crop field also started running three weeks later than from the linseed - a pattern Tom has seen elsewhere on the farm.

"Ultimately, this work and the other fertiliser trials at Helix East are all aimed at improving Nitrogen Use Efficiency (NUE). Last year we did well at 70% NUE, but we need to be nearer 80-90%, especially with fertiliser at £690-700/t."

Follow progress at Helix East Anglia and our other Helix sites via [www.helixfarm.co.uk](http://www.helixfarm.co.uk)

# Capturing nutrients with cover crops

The soil health benefits of cover crops are widely recognised, but trials at the **Hutchinsons Helix East Anglia demonstration farm** in Suffolk are shedding more light on their ability to capture and retain valuable nitrogen.

## The work measured the amount of nitrogen contained in three cover crop mixes, and their impact on the following crop of RGT Planet spring barley.

Mixes included Hutchinsons **MaxiRooter** and **MaxiN**, both made up of the same eight species but at differing ratios. MaxiRooter is dominated by radishes and mustard which produce deep vigorous root systems, while MaxiN is dominated by the nitrogen-fixing legumes of vetch and crimson clover. These were used alongside the farm standard mix that contained nine species, but became dominated by mustard.

The 5ha field, previously in winter wheat, was divided into thirds with all mixes broadcast into stubble on 15 August 2020, before a stubble rake and rolls.

## Nitrogen capture

Although covers developed at different rates, all three mixes established well, putting on good biomass, which captured and retained significant amounts of nitrogen.

Soil and crop nitrogen assessments that October revealed all mixes contained upwards of 50kg N/ha (in dry matter), with the MaxiRooter mix recording the highest amount at 145kg N/ha. Soil Mineral Nitrogen was similar across all three, at around 30kg N/ha.

"Even the MaxiN mix, which was slower to establish in the wet autumn and didn't put on as much biomass, still captured significant crop nitrogen," comments Hutchinsons Fertiliser & Crop Nutrition Specialist Rob Jewers.

Yield mapping in the following spring barley suggested 2021 yields were slightly higher following the MaxiRooter mix, although Mr Jewers says more work is needed before drawing conclusions, as that part of the field often performs slightly better.

Further investigations will focus on the proportion of nitrogen being fixed and/ or scavenged from the soil, how and where nitrogen is stored in the cover crop (i.e. stem or tuber) and the timing and speed at which nitrogen is released to following crops, influenced by the carbon:nitrogen ratio.

## Confidence to change rates

Tom Jewers, whose family farm hosts the Helix East Anglia demonstration, is keen for more detail about the nutritional benefits of cover crops, as they are key to the rotation ahead of spring barley. Some 65ha of cover crops were grown this season.

"Growing spring barley for malting means we have to be careful about when additional nitrogen becomes available to ensure we meet end user specification.

Image 1: crop performance map

**Using fertiliser efficiently is important in any season, but the financial rewards from simple improvements could be much greater this spring given the higher cost of nitrogen.**

The mapping technology within Omnia offers an excellent way of improving fertiliser efficiency by allowing growers to target applications more closely to crop requirements and yield potential, Hutchinsons Fertiliser & Crop Nutrition Specialist **Rob Jewers** says.

“Whether growers lucked-out by securing fertiliser early for £0.80/kg, or had to pay upwards of £2.00/kg, it remains good environmental and business sense to use inputs as efficiently as possible.”

### Start with yield maps

Higher yielding crops generally respond best to fertiliser and have better nitrogen use efficiency (NUE) than underperforming parts of the field, so identifying such variations is a good starting point for improving efficiency.

Omnia allows users to easily do this using existing data, by combining multiple years of yield maps into a single crop performance map (see image 1), which clearly highlights consistent variations in yield.

“Previously, the focus was often on bringing poorer areas up, to even-out the yield variations, but the emphasis has changed,” Mr Jewers says. “Now, we want to target applications to higher- yielding areas that will respond well, and potentially scale back rates on poorer areas.”

Results from winter soil analysis (e.g., SMN) can be fed into this planning process, and Omnia also includes a new facility to calculate the break-even ratio, allowing recommended rates for optimum yield to be adjusted according to fertiliser cost (£/kg) and grain price (£/t).

### Refine plans

The crop performance mapping and breakeven ratio provide a baseline of fertiliser requirements across the field, which can be fine-tuned during the growing season using Omnia’s satellite imagery module to generate variable application plans for use in the field.

Satellite imaging options include a standard RGB image for identifying visual differences in the canopy, alongside more detailed NDVI

imaging (see image 2). RGB and NDVI images are freely accessible to Hutchinsons agronomists and most Omnia users and are best used for highlighting differences in vegetative growth earlier in the season.

As growth accelerates towards late April into May, Mr Jewers says chlorophyll index imaging (CHI) provides a more accurate assessment of canopies.

“Remember, variable rate plans are only a plan. You still need to manage individual situations and make adjustments based on what’s happening in the field,” notes Mr Jewers.

That may mean adjusting rates according to results from leaf tissue testing or specific lodging or disease risks, for example.

### Identify issues

Before finalising variable rate plans (image 3), growers must examine any poorer performing areas highlighted by crop performance mapping to identify likely causes.

“It may be something relatively simple to fix like surface compaction or it could be a more fundamental issue with drainage or soil structure,” says Mr Jewers.

Soil pH often gets overlooked, but can have a significant impact on fertiliser efficiency, so is well worth testing, he adds. This can be done with a quick pH test kit, or by using **TerraMap** high definition soil scanning, which provides an accurate digital map of 27 different soil properties.

**Questions about this article? Please contact us: [information@hlh ltd.co.uk](mailto:information@hlh ltd.co.uk)**



**Rob Jewers** (Fertiliser and Crop Nutrition Specialist)

# Make more of fertiliser with digital mapping

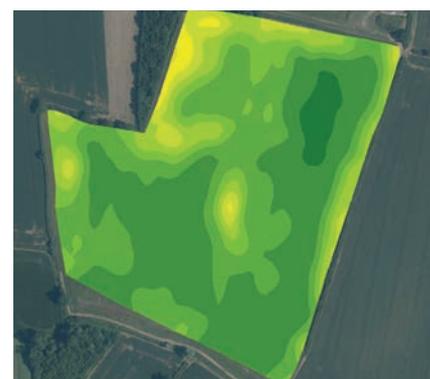
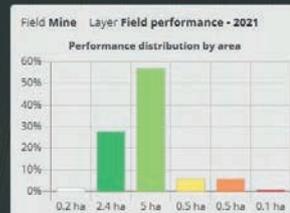


Image 2: NDVI/satellite image



Image 3: variable application plan

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