TEAGASC

January-February 2022 | Volume 33 | Number 1

# Today's Farm

Business, production, environment and countryside issues www.teagasc.ie

## Weighing up your fertiliser options.

### Fertiliser focus



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# contents




Breda Curtin and her son Ed farm in partnership near Meelin county Cork. The Curtins are part of the new Future Beef programme.


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**COVER: Fertiliser prices have reached breath-taking levels. Regardless of their enterprise mix, all farmers are impacted. In this edition we aim to assist farmers to make the very best use of their valuable plant nutrients, be they from animal manures or mineral fertilisers.**\ Mark Goggin

COMMENT


**Mark Moore**
Editor,
Today's Farm


# Living in interesting times

"May you live in interesting times."

These words are regarded as an ancient curse. And we certainly live in interesting times today. The COVID pandemic has reignited and markets for energy and the closely correlated fertiliser price are trending higher; availability cannot be taken for granted.

Against this background of gloom we can find grounds for optimism in the astonishing performance of scientists who have developed Covid vaccines and boosters in record time. Protected urea, where available, is a useful tool in the battle to reduce greenhouse gases.

We should balance pessimism with the knowledge that, at our best, we are a species capable of overcoming the most grievous challenges.

# "Go maire tú i dtréimhse spéisiúil."

Meastar gur mallacht de bhunadh gan cháipéisí an ráiteas seo. Bhuel is cinnte go mairimid anois. Tá paindéim COVID tar éis filleadh go tréan agus tá margaí fuinnimh agus praghas an leasacháin atá comh-ghaolmhar ag ardú as cuimse. San fhadtéarma, tá an t-athrú aeráide mar bhagairt.

I gcoinne an chúlra gruama seo is féidir linn forais dóchais a fháil i bhfeidhmíocht iontach ár gcomhgh-leacaithe eolaíochta a bhfuil vacsaíní agus teanndáileoga forbartha acu ar an dá luas. Táimid i bhfad ó bheith slán ach ba cheart dúinn an doirbhío-chas a chothromú leis an eolas gur speiceas muid agus ar ár ndícheall atá in ann na dúshláin is géire a shárú.

# Winter oilseed rape

Get the benefit of oilseed rape canopies in 2022

### 1. Target P and K applications to soils that need it

- Omit P& K application on P & K index 4 soil and consider reduced P&K in index 3 P&K soils (for one year only).
- Target maintenance application of 35 kg P/ha and 75 kg K/ha for soils with a soil index of 2 or lower.

### 2. Measure your GAI and calculate the N requirement

- Large canopies in the spring contain embedded nitrogen which will reduce requirement of chemical N for 2022.
- Target a GAI of 3.5 by early flowering.
- Adjust the overall Nitrogen requirement taking into account the canopy and target GAI. See table 1 for guidance on different canopies.

### 3. Target you applications for maximum effect

- Crops with large canopies do not need early nitrogen.
- Utilise ASN or urea for the first application to minimise leaching loses as the soils can be close to or at water holding capacity at this time of year.

**–Michael Hennessy**

**Table 1:** Nitrogen application to oilseed rape for 4.5 t/ha crop

| Crop type/ Timing | Split – Mid Feb | Main Split – early to mid March | Seed Fill – early April |
|---|---|---|---|
| Thin patches (GAI 0.5) Total 225 kg N /ha | 70 kg N/ha | 120 kg N/ha | 35 kg N/ha |
| Good crop GAI 1.0 Total 210 kg N /ha | 50 kg N/ha | 90 kg N/ha | 70 kg N/ha |
| Large canopy GAI 1.5 Total 170 kg N /ha | 0 | 100 kg N/ha | 70 kg N/ha |

**Table 2:** Typical fertiliser spend in 2022 and costs worksheet.

| | P kg/ha | K kg/ha | Compound* kg/ha | N ** kg/ha | Total cost €/ha (a) | Your area grown ha (b) | Your total Spend € |
|---|---|---|---|---|---|---|---|
| W. oilseed rape (GAI 1.5) Yield 4.5 t/ha | 35 | 75 | 370 x 10.10.20 | 250 X ASN + 150 x Urea | €608 | | =a x b |

***To apply maintenance dressing, compound @ €800/t**
**** total N = 170 kg/ha based on a GAI of 1.5 in February, Urea @900/t**

## Growing Grass Using Less Nitrogen Fertiliser - Webinar

20 January 2022
**Event time:** 7pm
**Venue:** Online –register on Teagasc website
Join John Douglas and Joseph Dunphy, Teagasc Grass10, and Micheal O'Leary from PastureBase Ireland along with dairy farmer and 2020 Young Grassland Farmer of the Year David O'Leary as they discuss growing grass using less nitrogen fertiliser.

## Utilisation of Nutrients Webinar

20 January 2022
**Event time:** 11.30am
**Venue:** Online Register on Teagasc website
*Tillage Thursdays - Series of Webinars*
This webinar will focus on practical implication of high fertiliser prices from accessing and applying fertiliser to the costs of finance through the season.
The webinar will also hear about biostimulants and if these can play a useful role in the crop production (subject to speaker confirmation).

## Virtual Tillage Conference 2022

On Thursday 13 January at 11.30am, join us for an interactive webinar with researchers and PhD students who will provide insights into current research on managing crop nutrition. Register on the Teagasc website.

## Virtual Sheep Conference 2022 - Session One

25 January 2022
**Event time:** 8pm
**Venue:** Online

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# Big future for Future Beef

**Martina Harrington**
Future Beef Programme Manager, Teagasc Animal and Grassland Research and Innovation Programme.

Future Beef is the new Teagasc suckler beef demonstration farm programme. It consists of a network of 24 demonstration farms positioned right across the island supported by three experienced advisors.

Each farm is typical of their region in terms of farm size, soil type, production system, stock numbers etc. The farms range in size from 13ha to 122ha, while herd size extends from 14-suckler cows right up to 112 cows.

Systems represented on farms within the programme include selling weanlings, finishing heifers and steers, producing under 16 month bulls, with four farms buying in dairy-bred calves.

Mixed beef and sheep farms are also featured, with flock sizes of 50 to 250 ewes. There are also two organic farms. All within the one programme.

When designing the programme, we wanted an 'Operation Transformation' type model. There is one farmer, a 'leader' for the majority of systems within the beef sector – not a small task in the context of Irish agriculture. Regionally, each farm faces the same climatic and environmental challenges as their farming neighbours, while nationally, the financial and time pressures are the same.

Irish beef farmers produce a top-quality product that is sold worldwide and the Future Beef programme will demonstrate how it can be even better.

With the support of the Future Beef team, each farmer will endeavour to adopt efficiencies and technologies, new and old, to make beef farming more profitable, while also making it more environmentally and socially sustainable.

You would have to be living under a rock not to be aware of the growing concern in all sectors regarding climate change. This climate change is been driven by ever-increasing emissions of greenhouse gases (GHG), carbon dioxide ($CO_2$), nitrous oxide ($N_2O$), and methane ($CH_4$).


Breda Meelin and Ed Curtin.

In agriculture, methane makes up 68% of total Irish agricultural emissions,while nitrous oxide makes up another 29.3%. Carbon dioxide only accounts for 2.7% of our agricultural emissions.

### How are methane and nitrous oxide produced?

Methane is a by-product of digestion by ruminants, i.e cattle, sheep and goats. In the rumen, bugs break down forage, a by-product of which is biogenic methane gas. The more fibrous the material, the more methane is produced.

Stored animal manure is also a source of methane. When slurry is stored in anaerobic conditions, the bacteria in the slurry break down the organic content and release methane gas. Nitrous oxide ($N_2O$) is a gaseous form of nitrogen produced in the soil when microbes break down nitrogen (N).

Last year in Ireland, due to the size of the agricultural sector in comparison to other sectors, we produced 37.1% of these gases, up 1.6% on 1990.

As can be seen from the chart below, the next largest emitter is transport at 17.9%. As we are such a large part of the problem, we must become a large part of the solution.

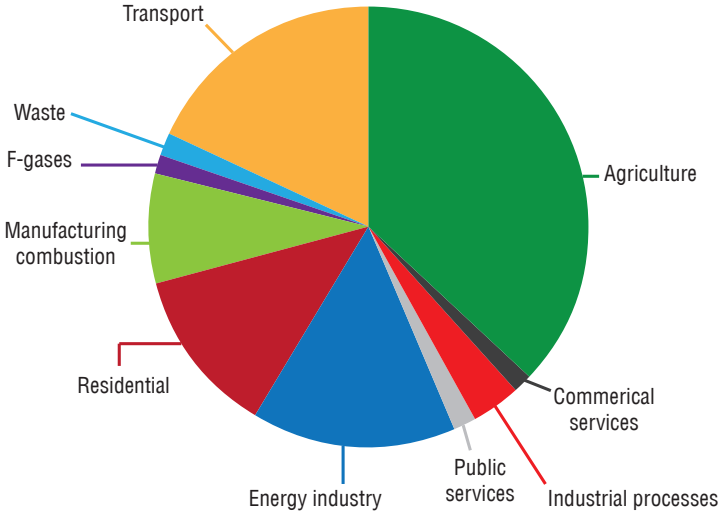
To that end last year, Teagasc launched the Signpost Programme and the Future Beef programme comes under its umbrella.

As part of the Future Beef programme, we will be supporting farmers to adopt technologies to reduce the level of GHG and ammonia emission from participant farms.

### Key objectives

- Create more sustainable and profitable farms.
- Reduce greenhouse gas (GHG) and ammonia emissions.
- Improve water quality.
- Improve biodiversity.

## Greenhouse gas emissions share by sector 2020.



## Ed Curtin, Future Beef farmer

Ed Curtin is a new Future Beef farmer, based in Meelin, Co Cork. He is married to Eileen and last year they welcomed baby Aoibheann into the family.

Ed farms a suckler-to-weanling and dairy calf-to-store/calf-to-beef enterprise in partnership with his mother Breda.

The farm consists of three blocks of land, approximately 43ha in total. One of these home blocks is heavy in nature and is a Special Protection Area for Hen Harriers. Farming restrictions are in place to protect harrier habitats.

The second home block is also heavy clay soil, whereas the third block is rented land which is a lighter, more free-draining soil. Ed also works full-time as an area sales manager with Dairygold.

Ed is optimistic about the future of the beef industry and is focused on making a profit He attributes this to his strong work ethic: "I am target driven, in the day job as well as farming."

He is breeding top-class weanlings by artificially inseminating his 25 Limousin cows with Belgian Blue or Limousin bulls. These calves perform well and averaged 1.12kg per day for 2020-born heifers and 1.26kg per day for the bulls.

Ed had some spring-calving cows, but plans to calve all the cows during the autumn, as it suits the land type on the farm. Some weanlings are kept as replacements, with the remainder sold at 10-11 months of age, weighing approximately 420-450kg.

Ed also buys in over 30 dairy-bred Angus, Hereford and Friesian bull calves and sells these as forward store bullocks at 550kg or more, or finishes them (depending on the market) at 22 months of age).

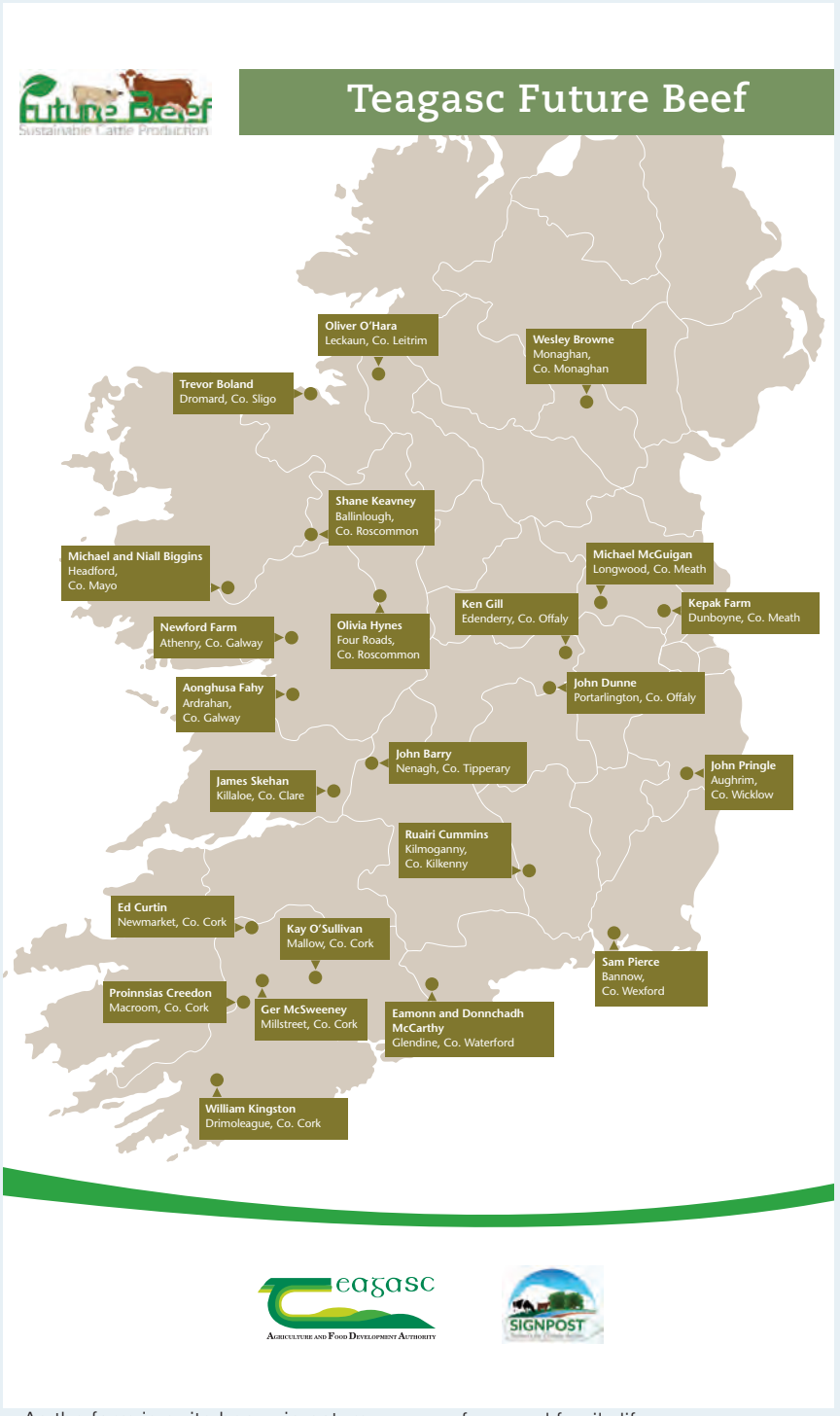
"There's no place in our system for poor-quality silage," says Ed, who aims to make his silage before 20 May every year, and targets over 72 DMD (dry matter digestibility).

This ensures that the cows milk well and are in good condition for breeding. It also means the calves, weanlings and stores perform well over their first winter. Ed tests his silage every year. "This means we can reduce ration costs, as we feed less concentrate, due to the high quality silage in diets."

Producing good silage also contributes to a reduction in methane emissions in cattle. They use less energy to digest leafy silage in comparison with poorer quality, stemmy silage.

Ed knows that it's through a combination of good health, breeding and nutrition that animals perform to their optimum and to ensure he is on track, he weighs all his cattle regularly.

He says: "I believe cattle are here for a good time not a long time, to achieve weight for age and for this it's crucial to monitor daily liveweight gain performance."




As the farm is quite heavy in nature, he will continue to closely monitor his soil indexes and spread lime, slurry and chemical fertiliser to maximise grass production.

The challenges for Ed's farm include:

- Matching his farming system to land type and grass growth.
- Monitoring and improving technical efficiencies on-farm – fertility performance, etc as he firmly believes that "you can't control what you don't measure."
- Managing his Designated Hen Harrier land, which makes up 40% of the total farm area.
- Building soil fertility.
- Balancing his off-farm job with the farm and family life.

Aisling Molloy is Ed's Future Beef advisor and Enda Maloney, who is based in Teagasc Kanturk, is Ed's local agricultural advisor. They will be working closely together over the coming years to improve the environmental and financial sustainability of Ed's farm.

For more information, check out the Teagasc Future Beef web page, and stay tuned to Facebook, Twitter and Instagram for regular updates on all 24 farms, plus information on upcoming farm walks and on farm meetings.

# Costs a concern for 2022

After a good year in 2021, beef farmers will need to plan their use of slurry and fertiliser carefully.

**Aidan Murray**
Beef specialist, Teagasc Animal and Grassland Research and Innovation Programme.

Say it quietly, but 2021 was a good year on cattle farms. Beef price began to rise in spring and like the tide that raises all ships, weanling and store prices followed and have remained buoyant.

This was borne out at a Teagasc outlook and review webinar, which showed that steers, weanling and store prices increased by 12%, 8% and 9% respectively. So, all good on the output side.

In order to generate output, you require inputs, and they too have increased on average across all cattle systems by about 8% in 2021.

In the diagram below, we can see that on cattle finishing farms, expenditure went up by 9%, with energy costs, feed and fertiliser the main drivers. This reflects their increased prices in the second half of 2021.

The big question being asked is what way are inputs prices likely to be in 2022?

Predictions are that input costs will increase again in 2022 on 2021 prices. Big movers are fertiliser, energy and fuel and feed, with other smaller increases anticipated in other direct and overhead costs.

Feed costs are estimated to increase by 10% and from talking to merchants, it is likely to be at least that. Barley being sold at €300/t today to farmers can only be bought at that price now by merchants.

Adding processing, haulage and margin on this could see barley rise by a further €40-45/t. Maize is currently costing €293, so may well go to nearer €325/t. Soya hulls have risen by close to €100/t in little over a year.

Donegal beef farmers Johnny and Curtis Weir.

The level of uncertainty means that many farmers are finding it difficult to fix prices for more than a two month period.

Fertiliser prices are the other input which will see the biggest potential price rise. Although there is a lot of talk of supply being a problem, ultimately price will be the bigger issue.

Some people have already forward bought some of next year's requirement, while others are taking more of a 'wait and see' approach. Indications at present suggest that we are facing into high prices for the first six months of the year, after which we may see some easing.

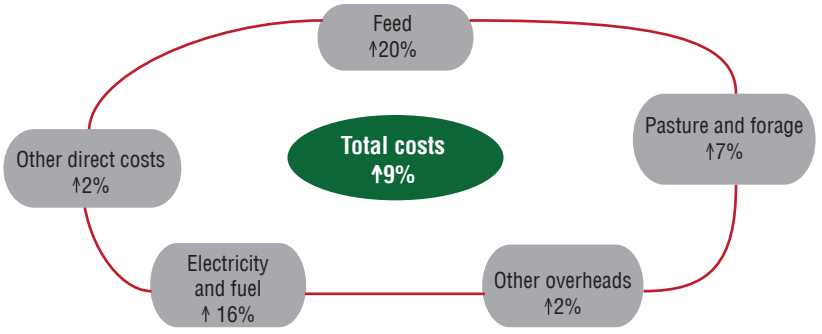
The production of nitrogen is heavily reliant on natural gas as an energy source. The price of natural gas has seen seen a five-fold increase on wholesale markets.

The Dutch natural gas price is really the benchmark for gas prices in Europe and we have seen it go from €17.89/megawatt hour (MWH) in January 2021 to €89.93/MWH on 6 December 2021. The quoted price in December is what will stand in January 2022.

The projected increase in energy and fuel costs will mainly impact electricity and contractor/machinery running costs. There was some fear in the oil industry that the Omicron variant would impact global demand, but those fears have been allayed somewhat by recent medical reports and the future price in February 2022 has risen to $75.50/barrel. The oil price will remain volatile.

With what is coming down the tracks regarding costs, a rethink will be needed at farm level as to how

## Expenditure change in 2021.



**Silage fields should be prioritised to ensure there is sufficient available for winter 2022/23.**

best to mitigate the effect, because the value of output, in our case beef and weanlings/store cattle prices, is unlikely to cover the increase.

As the line graph shows, steer beef prices rose by 12% in 2021, which also resulted in higher weanling and store prices. It is likely that we will have slaughtered around 1.69m cattle in 2021, down from 1.79m in 2020.

Certainly, predictions suggest that we will see an increase in cattle supply in 2022 spread across the year. Slaughter numbers are forecast to be around 1.76m for 2022.

Bord Bia has predicted that prime cattle supplies for 2022 will rise by about 50,000 head over the 2021 figure and cull cow numbers will increase by around 11,000 head.

Predictions also suggest that cattle supplies in the UK will be similar to 2021 levels, while production across Europe will be down this year.

With increased shipping costs, imports into Europe will also be back in 2022, which may help keep a floor on prices here, certainly for the first half of the year.

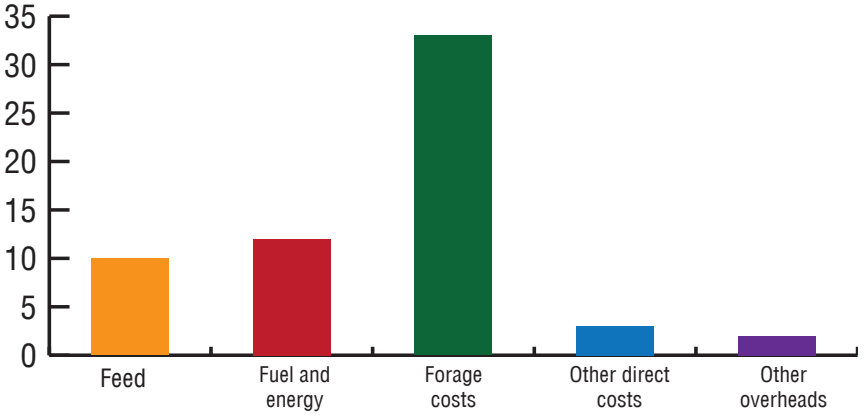
In a nutshell, it looks as though prices will stay firm, but the increase in costs will leave us with less money in our pockets.

## Exposure to increased costs will vary

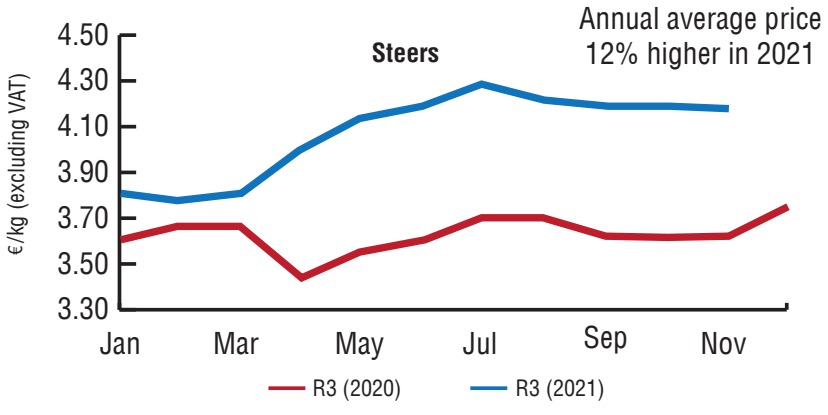
The level of exposure to these increased costs will depend on your level of intensity and farming system.

As the two pie charts on the next page show, you have the variable costs of a suckler-to-weanling store system versus those of a calf-to-beef system. Total variable costs for the calf-to-

### Predicted percentage rise in income costs 2022.




### Irish beef prices are higher in 2021.




Source: European Commission and DAFM

Johnny Weir, Aidan Murray and Curtis Weir.

**How Donegal cattle finisher Johnny Weir will tackle challenges of 2022**

"Our farm is limed and soil tested regularly, so soil P and K indices and pH are good. We may look to reduce P and K rates to just a maintenance level on high index fields on the grazing ground in 2022," says Johnny.

He has recently fitted his slurry tanker with a dribble bar to get more value from slurry.

"Silage ground will be prioritised for slurry application," he adds.

"To reduce grass demand on grazing land, we will aim to finish more cattle out of the shed in the spring. Top priority will be to get silage in and have the pits full going into the summer."

beef system are €1,070/ha compared to €508/ha on the suckler system.

The higher costs on the calf-to-beef system reflect a much higher output and stocking rate than the suckler system, but their exposure to increased costs in 2022 is also higher.

Meal feeding and fertiliser costs on the calf-to-beef system account for 66.8% of total costs, compared to 47.8% on the suckler-to-weanling system.

It is important to realise that, irrespective of your farming system and level of intensity, a plan of how to tackle the input cost issue will be needed and burying your head in the sand is not a solution.

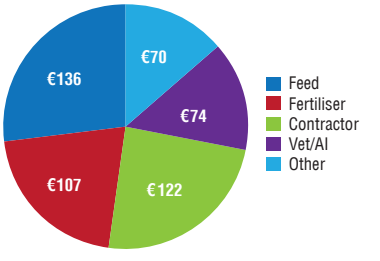
You will read a lot about this issue in the agricultural press in the next few months and a number of options will be put forward, some of which will be applicable to you and others which will not be. Advice around soil fertility and using lime to correct soil pH to make nutrients available will be applicable to most.

Better use of slurry in terms of timing and application method will help cut fertiliser requirements. Applying fertiliser at times which will maximise response is crucial.

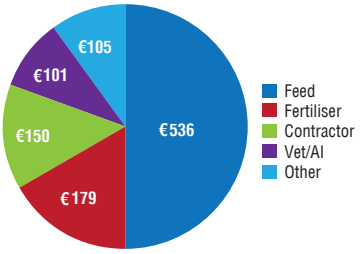
Some cattle that can be finished out of the shed in the first half of the year will reduce the demand at grass rather than turning them out. Empty cows should be moved on. Some people will opt to buy silage stocks to save their own supply, so that less silage will have to be cut. Some may opt to keep less stock.

I think it is vitally important that we look at the bigger picture. We need to prioritise our requirement for feed next winter by conserving sufficient silage this year, otherwise we will just be pushing the problem down the road.

**Suckling to weaning/store variable costs per hectare 2020.**




**Calf to beef variable costs per hectare 2020.**



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# What sheep farmers can do about high feed and fertiliser costs

**Michael Gottstein**
Head of Sheep Knowledge Transfer, Teagasc Animal and Grassland Research and Innovation Programme.


Fertiliser and feed are two of the biggest direct (variable) costs on sheep farms. Feed prices have been rising steadily over the last year and the price rises do not show any signs of abating. Fertiliser nitrogen prices will be multiples of what farmers paid in the spring and summer of 2021.

In this article, I focus on some of the steps that can be taken on sheep farms to reduce the reliance on purchased feed and fertiliser, and identify alternatives that will help underpin animal performance and farm profitability.

## Concentrate feed

In 2020, according to the Teagasc National Farm Survey, the average sheep farmer spent just over €37 per ewe and lamb unit (ewe plus 1.34 lambs weaned) on concentrate feed.

A 20% price increase would add just under €8 to this figure. The scope to reduce this figure is huge and can be achieved by improvements in management of winter feed, flock health and grassland.

## Steps to reducing concentrate usage:

- **Test your forage:** Different batches will need to be tested separately. Don't wait until feeding out time to do this – it will be too late to formulate your feeding plan.
- Identify the best forage and earmark this for the ewes in the last six weeks of pregnancy.
- **Boost forage intake:** Ensure that sheep have access to forage at all times.
- If roughage digestibility is poor but plentiful, consider removing refusals earlier. This will increase the digestibility of the forage consumed.
- Chopping forage will increase intake and reduce concentrate requirement.
- **Monitor Body Condition Score (BCS)** and house/supplement ewes before BCS starts dropping.
- **Identify any internal/external parasites** that require treatment and eliminate them.
- **Pen ewes separately** according to litter size and lambing date. Ultrasound pregnancy scanning will reveal this information where raddle marks have not been used.
- **Ensure that you have enough trough space** so that all animals can eat their fair share at the same time. You will need between 500-600mm each for most lowland ewe types.

## Shop around for the best supplementary feed

Rations don't have to be complex. Simple two- and three-way mixes that include a mineral and vitamin supplement should suffice in most cases. Additional protein is generally only required in the last two weeks of pregnancy.

## Grassland fertility

Fertiliser cost increases likely mean that the option of applying the same quantities in 2022 as have been applied in previous years is simply not an option for most sheep farmers.

When reducing the dependence on chemical fertilisers, it is critical to ensure adequate grass is available for grazing livestock and winter forage for the coming year. The aim should be to maximise grass growth while at the same time using chemical fertiliser strategically to boost growth where most needed.

- Take soil samples to establish the level of soil fertility.
- Apply ground limestone (according to soil sample results) as soon as possible. This will mobilise nutrients from the soil, in effect making fertiliser available that has been locked up in the soil for years.
- Once all animals are turned out this spring, do a winter fodder budget. This will help to establish how much fodder is left over and help you to calculate how much ground needs to be closed up for silage/hay in the coming year.
- Calculate how much fertiliser you can purchase. Keep in mind the cost relative to what was purchased the previous year and the scope of merchant credit. Your annual fertiliser allowance should be allocated to priority areas first (e.g recently reseeded, silage ground etc) and then divide the balance among the grazing areas in small allocations to aid grass growth and quality.
- Maximise the use of slurry and farmyard manure (FYM) by using it earlier when utilisation will be better and it can play a greater role in offsetting some of the chemical fertiliser requirements. Use low emissions slurry spreading equipment if possible.
- Seek alternative sources of organic manure if available locally (e.g pig slurry, etc).

• Purchase the minimum compound fertiliser you need to maintain soil fertility in 2022. You can return to applying P and K build-up rates in subsequent years. On high soil fertility fields (P and K Iindex 4) no compound fertiliser is required so savings can be made. This leaves the majority of your fertiliser budget for straight nitrogen fertiliser (e.g. protected urea if it's available).

### Grow more grass by improving your grassland management

• Keep grass that has been closed since October/November for the ewes after lambing. Don't be tempted to go in and re-graze these areas in order to delay housing.
• In 2022, limit your residency period to between three to five days to protect your regrowths and maximise growth rates.
• Reduce the number of grazing groups on the farm. This makes it easier to achieve shorter residency periods and allows for faster regrowth.

### Stock numbers

On highly stocked farms (over 10 ewes per hectare), look at ways of reducing stock numbers that will not have a negative effect on profit.
• On average, anywhere between 6% and 10% of ewes will be barren at scanning time. Consider selling these, rather than carrying them over empty.
• At lambing time, there will be a number of ewes that lose lambs or haven't enough milk to rear lambs. Again, consider culling these quickly to reduce grazing pressure.
• Ewe lambs retained as replacements, but scanning empty, could also be earmarked for slaughter to avail of strong lamb/hogget prices.
• Consider selling ewes scanned carrying single lambs if stock numbers are still too high.
• It is unlikely, we hope, that fertiliser prices will stay this high and there will be opportunities to restock by keeping extra ewe lambs etc in the autumn of 2022.

### Build resilience into your system

The coming year will be an opportunity for sheep farmers to take stock of their production system. Look at what is working and what is not. All farms have things that can be done better.

Use this opportunity to map out how you can make your farm more resilient into the future. Investment in soil fertility, incorporating clover, upgrading grazing infrastructure and using better genetics will all improve the sustainability, profitability and resilience of your farming enterprise.

> Fertiliser nitrogen prices will be multiples of what farmers paid in the spring and summer of 2021

Early spring grass

# Nitrogen for spring grass

## Apply slurry and bagged fertiliser prudently to get the best return

**John Maher**
Grass10 campaign

**Deirdre Hennessy,**
Teagasc Animal and Grassland, Research and Innovation Programme Moorepark.

### Early nitrogen (slurry or fertiliser) application

Nitrogen, either in slurry or fertiliser form, is essential to encourage early grass growth. The timing, and which fields to give early N, are key decisions. Potential grass growth rates are low in early spring but even modest responses to slurry or fertiliser N are worthwhile as this extra grass is more nutritious and cheaper than even very good silage. And, despite the higher fertiliser prices, it's a better investment than concentrates.

Targeting early turnout and high grass utilisation will increase the total grass growing capacity of your farm. Applying slurry or fertiliser in early spring (weather permitting) will grow more grass and also assist sward recovery after grazing. There will be more grass available for the next round.

### Dry land

The recommendations for early slurry, once allowed, and fertiliser N application are outlined in Tables 1 and 2. For drier farms, about 40% of the farm should get an initial application of slurry in January/February. After grazing has started in February, slurry can be applied on these grazed areas.

Most of the remainder of the farm should get 29 kg of protected urea/ha (23 units of protected urea/acre). About 15% of the area that gets early fertiliser N is then grazed and slurry applied in late February. It should get an additional 29 kg of protected urea/ha (23 units of protected urea/acre) in March.

Everywhere else should receive an application of 50 kg/ha of protected urea (40 units of protected urea/acre) in March. Following this plan will result in about 75 kg/ha (60 units/acre) of total N applied by early April.

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### Heavy land

The early spring slurry and fertiliser application strategy is a lot more challenging for those who farm on heavier land. Generally, both fertiliser and slurry application targets have to be lower and later. Flexibility in application is essential, as not every paddock will be able to carry machine traffic.

However, some paddocks will be trafficable and slurry needs to be targeted on the low grass cover paddocks with low soil fertility at about 2,500 gals/acre as outlined in Table 2 on page 16.

Applying fertiliser N also requires flexibility. Target the paddocks that will give the best response first.

### Less intensively farmed land.

On more extensive farms and farms where there is not a high demand for early grass (regardless of soil type), follow the slurry and fertiliser strategy outlined in Table 2.

### Slurry for spring grass

High fertiliser prices can be offset, to some degree, by making more and better use of slurry. Getting the application rate right will help maximise the contribution slurry can make. Aim to get slurry out as soon as the closed period ends, providing conditions allow.

Slurry can be used to replace the N fertiliser application on a high proportion of the farm (see Table 1 and Table 2). An application of about 2,000-2,500 gals of slurry/acre will supply about 20-25 kg N/ha (16-20 units N/acre). Prioritise the paddocks with lower soil phosphorus (P) and potassium (K) status for slurry application.

Paddocks with the lowest grass covers should be preferred for slurry application. There will be a need for greater flexibility required to get slurry spread.

- Target the most watery slurry in the farmyard to be spread.
- Use LESS methods such as trailing shoe, dribble bar, etc. These machines apply slurry closer at the surface and can be used where the cover of grass

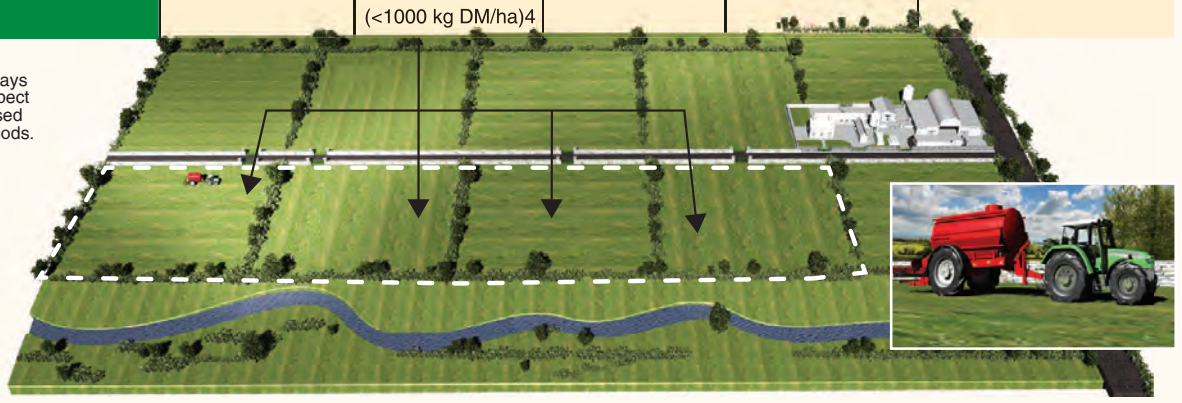
Continued on p17

## Table 1. Nitrogen fertiliser and slurry application plan for the early spring period on well-drained soil

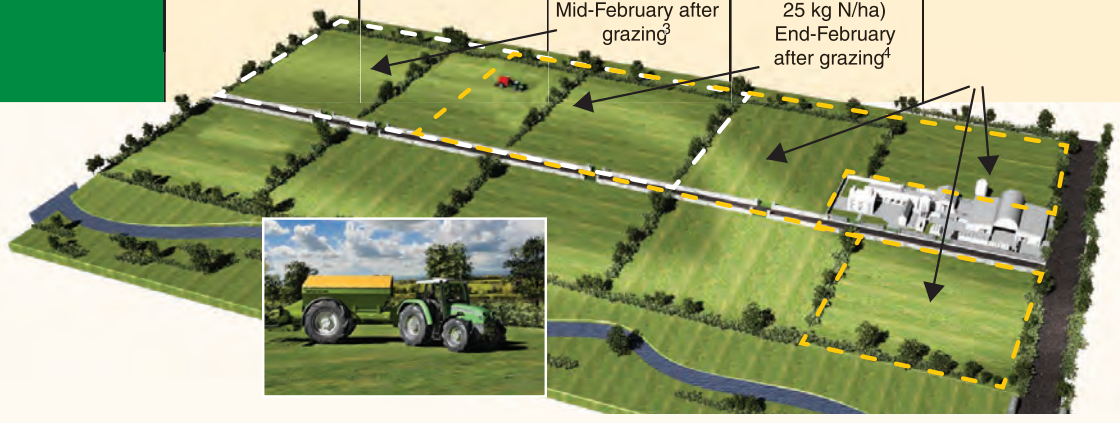
Dotted white line indicates areas receiving slurry. Dotted Yellow line shows areas receiving bagged fertiliser. Each field is 10 acres and 10% of the farm area.

| Fertiliser/Slurry Split | Product | 40% of Farm Area | 15% of Farm Area | 15% of Farm Area | 30% of Farm Area |
|---|---|---|---|---|---|
| **January/ February** [1] | **Cattle Slurry** [2] | 2,000 gals/ac (16 units N/ac – 20 kg N/ha) Lower covers (<1000 kg DM/ha)4 | | | |

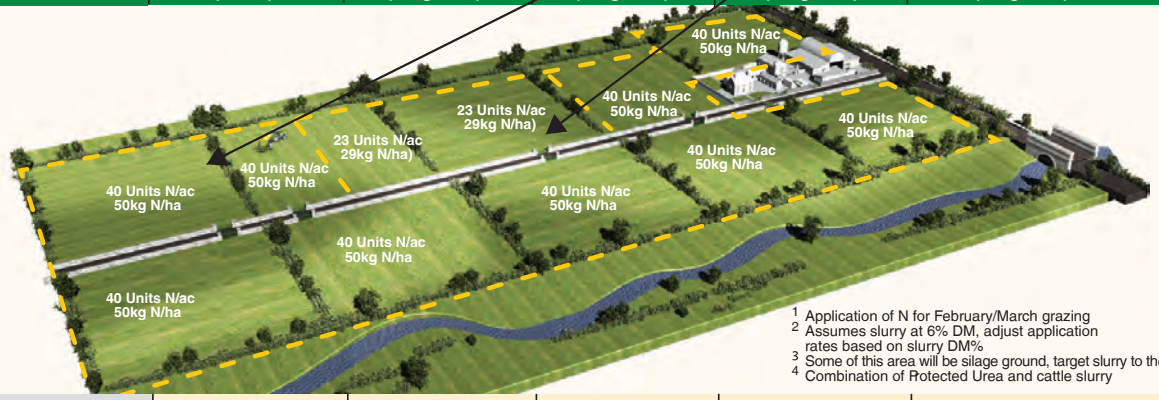
Always respect closed periods.



| Fertiliser/Slurry Split | Product | 40% of Farm Area | 15% of Farm Area | 15% of Farm Area | 30% of Farm Area |
|---|---|---|---|---|---|
| | **Protected Urea (NBPT)** | | | **23 Units N/ac (29kg N/ha)** | **23 Units N/ac (29kg N/ha)** |
| **February** [1] | **Cattle Slurry** [2] | | 2,500 gals/ac – 25 kg N/ha) Mid-February after grazing[3] | 2,500 gals/ac (20 units N/ac- 25 kg N/ha) End-February after grazing[4] | |



| | Product | 40% of Farm Area | 15% of Farm Area | 15% of Farm Area | 30% of Farm Area |
|---|---|---|---|---|---|
| **March** | **Protected Urea (NBPT)** | **40 Units N/ac (50kg N/ha)** | **40 Units N/ac (50kg N/ha)** | **23 Units N/ac (29kg N/ha)** | **40 Units N/ac (50kg N/ha)** |




[1] Application of N for February/March grazing
[2] Assumes slurry at 6% DM, adjust application rates based on slurry DM%
[3] Some of this area will be silage ground, target slurry to these fields.
[4] Combination of Protected Urea and cattle slurry

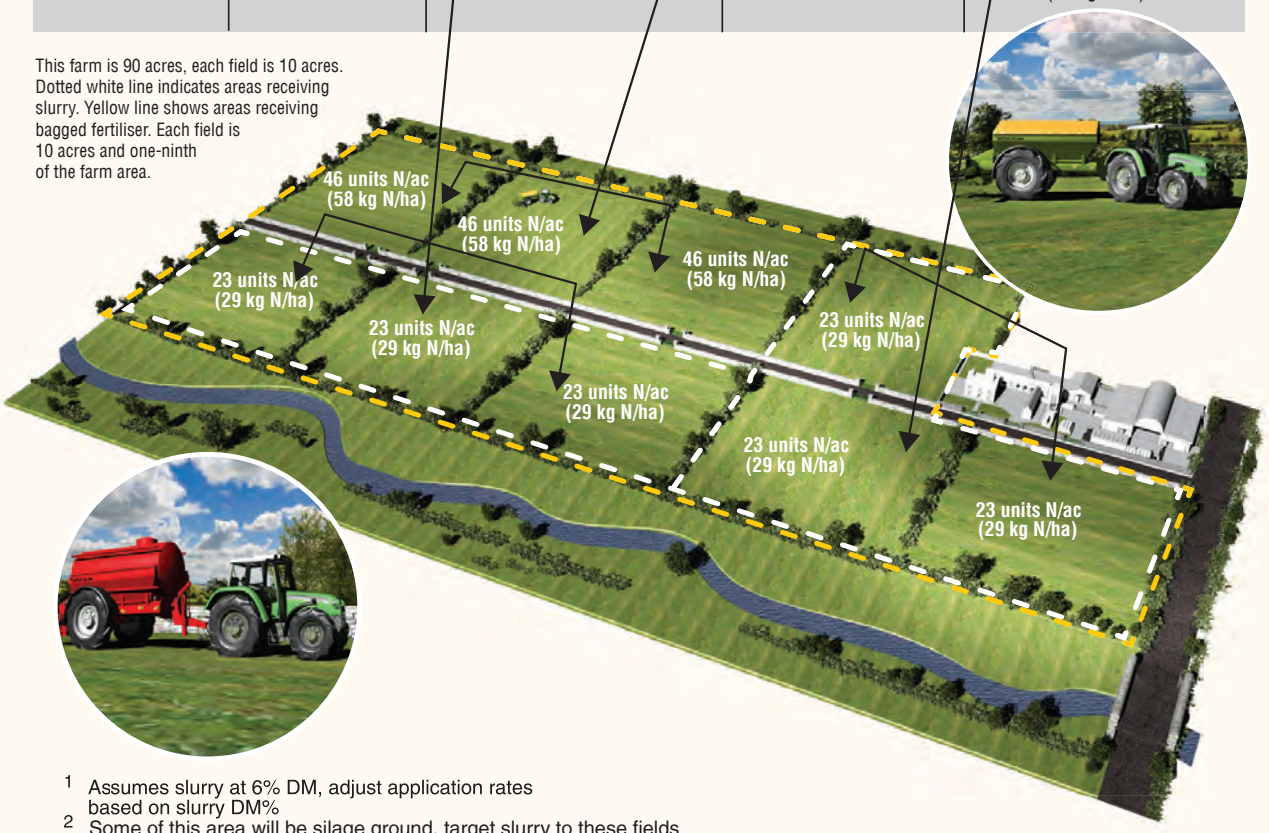
| | | | | | |
|---|---|---|---|---|---|
| **Total N by 1st April** | **Slurry + Fertiliser N Units/ac (kg/ha)** | 56 units N/ac (70 kg N/ha) | 60 units N/ac (75 kg N/ha) | 66 units N/ac (83 kg N/ha) | 56 units N/ac (70 kg N/ha) Total 60 units N/ac (75 kg N/ha)4 |

# Early spring grass

**Table 2. Nitrogen fertiliser and slurry application plan for the early spring period on heavy soil, less intensive and/or later turnout farms (flexibility in application is essential on heavy land)**

| Fertiliser/Slurry Split | Product | 33% of Farm Area | 33% of Farm Area | 34% of Farm Area |
|---|---|---|---|---|
| February/ March | Cattle Slurry[2] | 2,500 gals/ac (20 units N/ac) Driest land with lowest cover and some silage ground (Depending on land wetness and weather, this may be more or less than 33% of farm)2 | | 2,500 gals/ac (20 units N/ac) Driest land with lowest cover and some silage ground (Depending on land wetness and weather, this may be more or less than 33% of farm)2 |
| | Protected Urea (NBPT) | 23 Units N/ac (29kg N/ha) | 46 units N/ac (58 kg N/ha) (Can be completed in 2 splits) | 23 Units N/ac (29kg N/ha) |
| Total N by 15th April | Slurry + Fertiliser N Units/ac (kg/ha) | 43 units N/ac (54 kg N/ha) | 46 units N/ac (58 kg N/ha) | 43 units N/ac (54 kg N/ha)<br>Total 44 units N/ac (56 kg N/ha)3 |

This farm is 90 acres, each field is 10 acres. Dotted white line indicates areas receiving slurry. Yellow line shows areas receiving bagged fertiliser. Each field is 10 acres and one-ninth of the farm area.




1 Assumes slurry at 6% DM, adjust application rates based on slurry DM%
2 Some of this area will be silage ground, target slurry to these fields.
3 Combination of Protected Urea and cattle slurry

is higher than 400-500 kg DM/ha with minimal grass contamination.

Sometimes grass responds better to an application of slurry than N fertiliser. This is due to the fact that there is also P and K in slurry. Phosphorus is crucial for early spring grass growth, particularly where the soil P status is poor.

The targeted application of slurry in spring, based on soil test results, will ensure the most efficient use of slurry nutrients for grass production and minimise potential ammonia losses. Using LESS methods has a large positive effect on reducing N losses and also increases slurry N value, thereby increasing pasture growth and reducing fertiliser N requirements.

### Response to early nitrogen

The best response to early fertiliser N application will be achieved when the soil temperature is above 5°C (and rising) and in paddocks that:

- Have predominantly perennial ryegrass.
- Have been recently reseeded.
- Are drier, free-draining, south-facing etc.
- Have a grass cover over 500 kg DM/ha.
- Have good soil P and K fertility.

### Precision fertiliser application

Knowledge of farm grass covers (grass availability on farm) and current grass growth rates can lead to more efficient use of fertiliser/slurry N. The MoSt grass growth model, operated by Elodie Ruelle at Teagasc Moorepark, is used to predict grass growth on 87 farms across the country. Grass growth predictions will restart in early spring to help in decision-making around N fertiliser application.

The growth prediction will be combined with weather forecast data (rainfall and soil temperature) to provide information for decision-making around fertiliser/slurry in any particular week.

The information available from the MoSt grass growth model and from PastureBase Ireland (PBI) will be:

- Average grass growth for the previous week recorded in PBI by county and a comparison with the previous year for the same period.
- Grass growth average by farm (87) and by county for the next seven days.
- Average forecasted rainfall for up to the next seven days for the 87 locations.
- Average forecasted soil temperature for up to the next seven days for the 87 locations.

This information will be collated weekly and available every Tuesday through the Grass10 newsletter (www.teagasc.ie/crops/grassland/grass10/grass10-newsletter) and PastureBase Ireland website (www.pbi.ie) and the Met Éireann twitter account.

> The targeted application of slurry in spring, based on soil test results, will ensure the most efficient use of slurry nutrients for grass production and minimise potential ammonia losses

You should monitor weather forecasts, more carefully than ever when planning fertiliser or slurry applications early next spring. Application of slurry or fertiliser N should be avoided if heavy rainfall is expected. This, obviously, will help minimise losses. Fertiliser is expensive and slurry is now a more valuable form of N, P and K. Maximising the benefit of these inputs is essential.

### Protected urea

Recent studies have shown that protecting urea with a urease inhibitor reduces loss of ammonia to the environment by about 80%.

Teagasc research has shown that protected urea grows the same amount of grass as CAN under real-world grazing conditions. Currently, protected urea is at a lower cost per unit of N than CAN. Protected urea can help reduce N losses to water by holding N in the ammonium form, which is more stable in soil.

# Get more from slurry nutrients

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Teagasc-Dairygold Joint Programme

Would you accept bagged mineral fertiliser without a nutrient label or with only an estimate of what you were buying? Definitely not, most would answer, particularly with the current high fertiliser prices.

Yet we routinely apply slurry and manure with often at best an estimate of their nutrient delivery using average standard values. While this is an improvement over no estimate, we can do better. A slurry or manure test will cost about €50-€80, or about the cost of two small bags of CAN currently.

In this article, we provide tips to control costs by helping you up your game on slurry/manure management for 2022, be it in grassland or arable cropping.

## Right place

Do you have recent soil test results? If you do, pull them out – if you do not, there is still time to get them. A soil test is essential for saving money by targeting manures to where they are needed. Index 4 Phosphorus (P) and/or Potassium (K) fields are not the place for applications of valuable slurry/manure.

In grassland or arable cropping, target slurry and manure to fields at index 3 or lower, and fields that have the highest demand for P and K i.e silage ground. Remember that 75% of the value of slurry is from its P and K. Do not be tempted to use more slurry on the grazing ground in 2022 at the expense of silage ground.

This will leave you lacking P and K for silage crops that will come at high cost when purchasing bagged fertiliser. Excessive slurry applications can also lead to overdoing K on the grazing blocks, potentially leading to issues with grass tetany in spring.

For silage, grazing or arable ground, ideally focus on the index 1 and 2 soils, as it is here the yield benefit from P and K will be greatest. New research from Teagasc Johnstown Castle is showing that where slurry is used to deliver P to low index soil, the plant P availability is better compared to the same rate of conventional mineral P fertiliser. This represents a significant cost saving and more bang for your P by simply putting manure in the right place.

Have you thought about the evenness of spread? Splash plate spreaders often have a poor spread pattern. Visiting Danish farmers some years ago we were told that uneven spread was a factor in moving away from splash plate there.

Be particularly cautious of spread pattern when using slurries for cereal

**Table 1:** Average nutrient content of slurries sampled in the early 2000s compared to the average values in a range of storage tank types in the Teagasc-Dairygold joint programme.

| | | LESS | Splash-plate spring | Phosphorus (P) | Potassium (K) | |
|---|---|---|---|---|---|---|
| | Slurry Dry Matter % | Units N/1000 gals | Units N/1000 gals | Units P/1000 gals | Units K/1000 gals | Number of samples taken |
| Teagasc early 2000s | 6.3 | 9 | 6 | 5 | 32 | |
| Teagasc/ Dairygold 2021 | 6.7 | 11 | 8 | 5 | 27 | 128 |
| Covered tanks | 7.3 | 12 | 9 | 6 | 29 | 53 |
| Open towers | 6.5 | 9 | 7 | 5 | 25 | 9 |
| Open tanks | 5.5 | 8 | 6 | 4 | 23 | 15 |
| Lagoons | 4.3 | 7 | 5 | 3 | 17 | 4 |

# to save costs in 2022

crops; the penalty for a poor spread pattern can be lodging in addition to "streaking" of the crop.

The use of a dribble bar or trailing shoe can overcome this issue. The trailing shoe and dribble bar places the slurry in narrow lines reducing loss of valuable N that is instead retained for grass growth. Teagasc research has shown that using a dribble bar/trailing shoe will increase the N content of your slurry by three units N/1,000 gals compared to using a splash plate.

- **Tip:** Use your soil tests to guide manure to low P and/or K fields, target fields with the highest demand for P and K i.e silage ground, set-aside 2,500-3,000 slurry/ac for the silage ground on grassland farms, use a dribble bar/trailing shoe to get the best N value from the slurry.

## Right rate

How can you apply the correct top up rate of expensive bagged fertiliser if you don't know what nutrients you applied using slurry or manure? Slurry survey work by Teagasc in the early 2000s showed a 17, 11 and 15-fold difference in available N, P and K, respectively, across the range of farms sampled.

In 2020/21, slurry samples from dairy farms across the south-west of the country found high variability. N ranged from 3-17 units /1,000 gals, P from 1.1-12.5 units 1,000 gals and K from 4.5-46 units/1,000 gals. The type of storage tank the slurry came from had a large influence on the nutrient content of the slurry (Table 1).

The more watery the slurry the lower the N, P and K values. Slurry from covered tanks had higher N, P and K content than slurry from lagoons (Table 1). If slurry from covered tanks is to be spread on grazing ground, adjust the rate per acre. For instance, 2,000 gals/ac from a covered tank will supply 18-22 units N/ac, whereas slurry from an open tank/lagoon will have to be applied at 2,500 gals per acre to supply a similar application rate of N.

The results of Teagasc's work highlights the impor-

Continued on p20

**Table 2:** Supply of N, P and K depending on the tank that slurry comes from.

| Slurry type | Application rate | Nitrogen (N) (units/ac) | Phosphorus (N) (units/ac) | Potassium K (units/ac) |
|---|---|---|---|---|
| Standard Teagasc values | 3,000 gal/acre | 27 | 15 | 96 |
| Covered tanks | 3,000 gal/acre | 33 | 18 | 87 |
| Open tanks | 3,000 gal/acre | 24 | 12 | 69 |
| Lagoon | 3,000 gal/acre | 21 | 9 | 51 |
| First cut silage requirement (Index 3) | | 100 | 16 | 100 |
| First fertiliser round for grazed pasture | | 23 | | |

tance of testing the slurry/manure you will be applying. Spending time to work out what nutrients you are applying with your advisor and tailoring a prescription for the correct balance of fertiliser needed to meet the crop requirements is a prudent and cost effective exercise.

Many labs across the country test slurry and require a 0.5-1l sample that has been well agitated beforehand.

Evacuate and ventilate prior to agitating and take great care with slurry gases and potential falls when collecting the sample. Using the slurry tanker to suck out a couple of loads from the agitated storage tank and collecting a sample from the tanker gate valve after the first tanker is spread is an option.

- **Tip:** Match your slurry application to the demand for P and K, adjust application rate based on your slurry test results or the type of tank you are taking the slurry from.

### Right timing

Nitrogen use efficiency of slurry is at its highest in the spring, with an extra three units N /1,000 gals available in springtime compared with spreading in the summer.

When the slurry spreading open period arrives, every extra day you can hold slurry in the tanks brings you closer to the time where growth and efficient use of those valuable nutrients will be ramping up.

On many farms, capacity will be tight but the temptation to empty tanks should be resisted. Only spread enough slurry to allow you to carry through until applications are needed on the silage ground.

If using slurry or manure for spring arable crops, keep application as close as possible to drilling. Incorporate slurry/manure as quickly as possible to retain the maximum amount of the N value.

- **Tip:** Retain enough slurry to cover the first-cut silage ground, as it has the highest nutrient demand.

### Right source

The source in this case is choosing the correct slurry for the correct field or crop.

For example, higher dry matter slurry from covered tanks with higher P and K content should be targeted to silage ground or fields with lower indexes for P and K.

We can see in Table 2 that applying 3,000 gallons per acre of slurry from a covered tank will supply enough P and K for first-cut silage at index 3, whereas 3,000 gallons per acre of slurry from an open tank/lagoon will leave you well short on P and K.

The more concentrated slurry from a covered tank will also be more suitable to move over a distance, due to its greater nutrient content.

More watery slurry from an open tank or lagoon will be better suited to grazing fields once the silage ground is covered. The N will get washed in quicker and lead to lower contamination of the grass for grazing livestock.

- **Tip:** Identify the tanks in your farmyard that are better suited to silage ground or index 1 or 2 ground vs grazing ground.

# Lime – the new fertiliser



**Mark Plunkett**
Teagasc Crops Environment and Land Use Programme, Johnstown Castle.

Lime will play a key role in reducing the impact of projected high fertiliser prices in 2022. Optimising soil pH will increase the availability of soil N, P and K, and increase the efficiency of applied nutrients, such as organic manures (cattle slurry) or chemical fertilisers (CAN/urea/18-6-12 etc),

- **Soil N supply** – Liming acid (pH over 6.0) mineral soils to the optimum soil pH of 6.3-6.5 will result in the soil N supply increasing by 70kgN/ha/year. This will reduce farm chemical N requirements and fertiliser N costs by about €167/ha (€67/ac).
- **Fertiliser N efficiency** – Maintaining optimum soil fertility increases the efficiency of applied N from 35% on low fertility fields to 63% on fields with optimum pH, P and K (see Figure 1).

In 2022, building soil P and K levels may not be a priority due to high P and K prices. Correcting soil pH alone will result in an improvement in N efficiency from 35 to 53% where soil P and K are sub-optimal (Figure 1).

With record fertiliser N prices, spending money on lime to correct soil pH will ensure a better return from each kilo of N applied. For example, for every 100kg N/ha applied, the available N to grow grass increases from 35-53kgN/ha.

- **Soil P availability** – Correcting the soil pH increases the availability of soil P and its utilisation from either cattle slurry or chemical P fertiliser by the growing crop.

A study completed at Teagasc Johnstown Castle demonstrates how critical lime application can be for increasing soil P availability (Figure 2). For example, liming an acidic soil (pH less than 5.5) alone increased the soil P by around 6mg/l. On many farms, this would remove the need to build soil P levels and increase the productivity (1t dry matter/ha) of the grass sward at the least cost.

**Figure 1:** Percentage nitrogen use efficiency and grass growth response to N fertiliser across grassland fields according to the status of soil pH, phosphorus (P) and potassium (K) fertility.

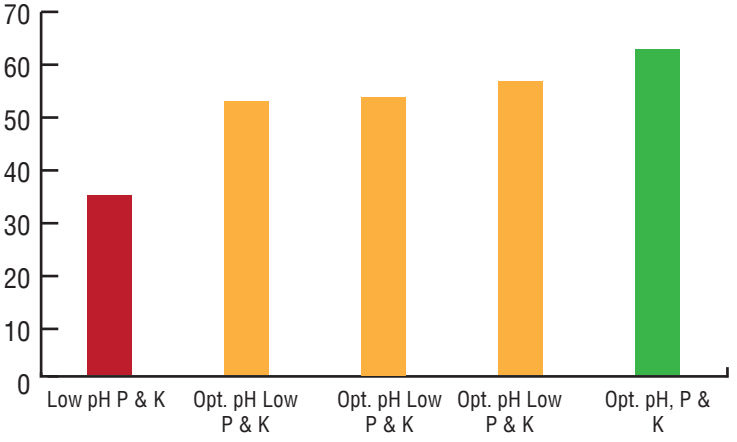
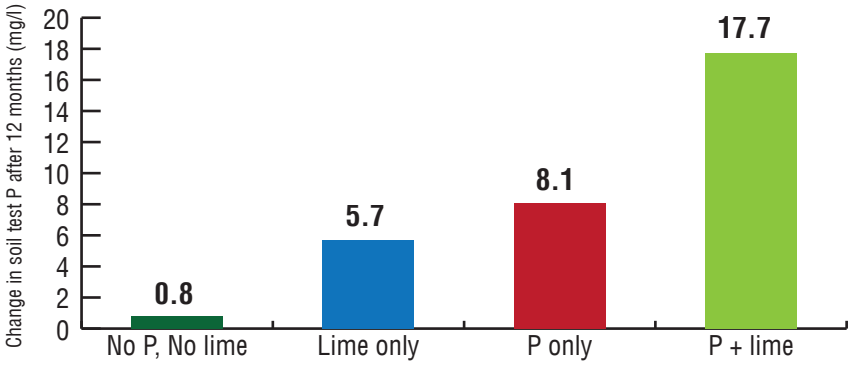



**Figure 2:** Average change in soil test P (Morgan's P test) across 16 mineral soils treated with P (100kg/ha of P), lime (5 t/ha of lime), and P + lime and re-tested after 12 months.




## Take every opportunity to apply lime

When it comes to applying lime, we must take every opportunity during the growing season. Lime can be spread on any day of the year, provided soil and weather conditions are suitable.

- **Grazing ground** – When fields have been grazed off is an ideal time to apply lime. Earmark blocks of land that need lime based on a recent soil test report – for example, this could mean ordering a load of lime (20- 25t) after each grazing rotation to correct soil pH.

This could be done on number of occasions during the year when soil and weather conditions are favourable. This will not impact grazing animals, as the lime will be applied to low grass covers. Even in the event that a small amount of lime remains on the leaf, it will not affect grazing animals.

Aim to avoid covers of 600-800kg DM/ha. Pasture Base Ireland (PBI) shows that grass covers tend to be lowest during April and August, offering good opportunities for lime application.

- **Silage fields** – Ideally, leave a minimum of three months between applying lime and closing for grass silage. Check soil pH levels and plan lime applications over the coming weeks.
- **Lime and slurry** – Leave three months between the application of lime and cattle slurry to reduce the risk of losing up to 50% of the N.

Where lime has been applied over the winter period and winter rainfall has washed it into the soil, you can reduce the interval from three to two months between lime and cattle slurry applications. Alternatively, to reduce N losses from slurry, apply the cattle slurry first and then apply the lime seven to 10 days later.

- **Lime and urea** – A similar situation as 'lime and cattle slurry' in relation to N loss. Apply the urea first and apply the lime seven to 10 days later to reduce the risk of N losses.

Where protected urea is used, early trial work indicates that it is safe to apply protected urea to fields that have been recently limed.

# If necessary, soil test now

With prices for fertiliser nitrogen (N) and N-P-K blends more than double those of 12 months ago, it's essential to know the nutrient requirements of each field.

**Mark Plunkett and David Wall**
Teagasc, Crop, Environment and Land Use Programme, Johnstown Castle

### Have you conducted soil analysis for your farm?

Conducting soil analysis is essential to gather the soil fertility information on each field or paddock on the farm. Soil analysis results will allow you to determine the right product, for the right place at the right rate and the right time for a specific farm.

This information is provided for a very small cost of just €1.25/ha (0.50c/ac) for soil sampling and analysis. This is a tiny fraction of the cost of chemical fertiliser.

Of the three major fertiliser nutrients, the increase in cost of N has been largest at ~€2.18/kg N currently, compared to ~0.85c/kg N, which is an increase of 140% since 12 months ago. The current cost of phosphorus (P) (€3.69/kg) and potassium (K) (€1.31/kg) have increased by 85% and 55%, respectively, over last season (prices at time of going to press).

By updating the soil analysis on your farm, areas where P and/or K savings can be made can be identified. Soils with high acidity (pH <6.3) can be targeted with lime applications to drive overall increased N, P and K use efficiency.

In a year with high fertiliser prices, minimising additional expenditure may be high on the agenda; however, it is critically important that soil fertility does not suffer as a consequence of misguided fertiliser use.

### Do your soils require lime?

On receiving soil analysis results for your farm, the first area to assess is the soil pH levels and to identify where lime applications are required. A liming plan should be put in place to organise the delivery and application of lime when soil conditions are suitable over the coming weeks and months.

For example, correcting soil pH can help to release up to 70 kg N/ha/year and can unlock the stored P in soils and increase soil P fertility by up to one P Index (3 mg/l), thus reducing fertiliser P requirement by 10 to 20 kg/ha.

### Tailoring P and K applications according to soil analysis results

Information to interpret the soil P and K index system is shown in table 1. The soil index system 1 to 4 represents the availability of P and K in the soil for grass production during the growing season. For example, at soil P or K Index 1 there is very low nutrient supply and the application of fertiliser P or K, will lead to a definite increase in grass growth.

### Adjusting P & K applications in 2022

In 2022, with high compound fertiliser prices, it will be tempting to reduce fertiliser P and K applications to soils. However, such decisions should only be made on the back of soil analysis results being available for the different fields across the farm.

### Soil P & K Index 1

Index 1 soils have a very low supply of P and K and are classed as deficient. These soils typically give the highest response in grass growth to applied fertilisers. Additional P and

**Table 1.** Soil P and K Index, response to fertilisers and corresponding soil analysis P and K ranges.

| Soil P & K Index | Soil nutrient (P & K) supply | Grass growth response to applied fertilisers | Soil analysis P level (mg/l) | Soil analysis K level (mg/l) |
|---|---|---|---|---|
| 1 | Very low | Definite | 0 – 3.0 | 0 – 50 |
| 2 | Low | Likely | 3.1 – 5.0 | 51 – 100 |
| 3 | Adequate | Unlikely | 5.1 – 8.0 | 101 – 150 |
| 4 | Sufficient | None | >8.0 | >150 |

Source: Wall and Plunkett 2020, Major and micro nutrient advice for productive agricultural crops, Teagasc Johnstown Castle.


K is required to build soil fertility levels to the optimum soil index 3.

In 2022, due to high fertiliser costs, aim to supply at least maintenance levels of P and K on these fields to maintain short-term productivity. Target organic manures to these hungry Index 1 soils to fully utilise the P and K in slurry.

### Soil P & K Index 2

Index 2 soils have a low supply of P and K and grass response to applied nutrients is likely. These soils have a higher nutrient supply and will be able to sustain higher levels of grass production. On these soils apply at least the maintenance rate of P and K required to maximise grass growth during the season.

A lower level of additional P and K is also required to build up soil fertility for the future. For example, under a moderately stocked drystock system (beef, sheep, or dairy replacements), maintenance application rates of P and K on the grazing area could be applied for 2022 without compromising soil fertility.

### Soil P and K Index 3

Index 3 soils have an adequate supply of P and K to sustain grass growth over the season. The aim of nutrient management planning for these soils is to replace the P and K removed in the produce such as meat, milk or grass silage.

Grazing livestock typically return 60% of the P and 90% of the K in dung and urine. Therefore, relatively small quantities of P and K overall are required to maintain soil fertility on these Index 3 soils. However, these rates need to be adjusted for the production system type and stocking rate.

On intensively grazed farms (eg dairy farms), a higher maintenance rate of P and K is required and caution should be applied when limiting P and K inputs during 2022 so that soil fertility does not suffer.

On lowly stocked drystock farms where grass demand is lower, there is more scope to reduce (50%) or even to omit fertiliser P and K applications for one year only, in order to reduce the impact of high fertiliser prices on overall farm profitability.

However, it will be very important to re-sample these fields in 2023 to monitor the effects of reducing or omitting P and K applications.

### Soil P and K Index 4

Index 4 soils are very fertile, have a high nutrient supply and are not responsive to the application of P and K during the growing season. It may be prudent to make P and K savings on all fields with index 4 soils in 2022.

For P, omit applications for two to three years and then re-sample these soils to monitor changes in soil P levels.

For K omit for one year and revert to index 3 advice until soils are re-sampled. Apply straight N +S in the form of protected urea to balance crop N requirements.

# Getting started with clover

## There is growing interest in white clover on grassland farms.

**Michael Egan**
Teagasc Animal and Grassland Research and Innovation Programme, Moorepark

Farms that have established grass-clover swards (over 12 months old) and that have adequate clover content (over 20%) are in a position to reduce chemical N on individual paddocks from May onwards. Establishing a grass-clover sward across an entire farm can take a number of years using conventional reseeding, however.

Introducing clover into existing grass swards (over-sowing) is a simpler, more cost-effective option in the early part of the year, and should be done from early April to late May.

Success depends on weather conditions around sowing and post-sowing grazing management.

Choose paddocks that have a high perennial ryegrass content, low weed content and adequate soil fertility for oversowing this year. Paddocks that have a low perennial ryegrass content and/or high weed content are not suitable for over-sowing. A full reseed will be more suitable (full reseeds will be discussed in the next edition).

### Key steps involved when over-sowing white clover

•White clover seed can be broadcast onto the sward or stitched in using a suitable machine.

•If broadcasting with a fertiliser spreader, mix clover seed with 0:7:30 fertiliser and only add the clover to the spreader when you are in the field. This will help avoid clover settling at the base of the spreader.

•Do a maximum of 2ha at a time (to avoid seed settling), and spread in two directions across the field.

•Best practice is to over-sow directly after grazing (≤ 4cm post-grazing sward height or after cutting the paddock for surplus bales – ideally only over-sow three to four paddocks at a time.

•Control weeds before you consider over-sowing clover – remember, some herbicides have a residue of up to four months – always check the residual time on the label of the product or seek advice on a suitable weed control product.

•Use a slightly higher seeding rate (5kg/ha) for over-sowing compared to a full reseed, to overcome the issues with slugs and possibly a lower germination rate.

•Sow with a fertiliser that contains phosphorus, as this will favour establishment, particularly if soil fertility is low. One bag of 0:7:30 or 0:10:20 per acre. If possible, reduce N fertiliser post over-sowing.

•Roll paddocks post-sowing. Soil to seed contact is one of the most crucial factors effecting germination. Apply watery slurry (if available) – ideally at around 2,000 gallons/ac.

•Ideally, over-sow on well managed grassland – not suitable on old 'butty' swards with a low content of perennial ryegrass – if this is the case, a full reseed is a better option.

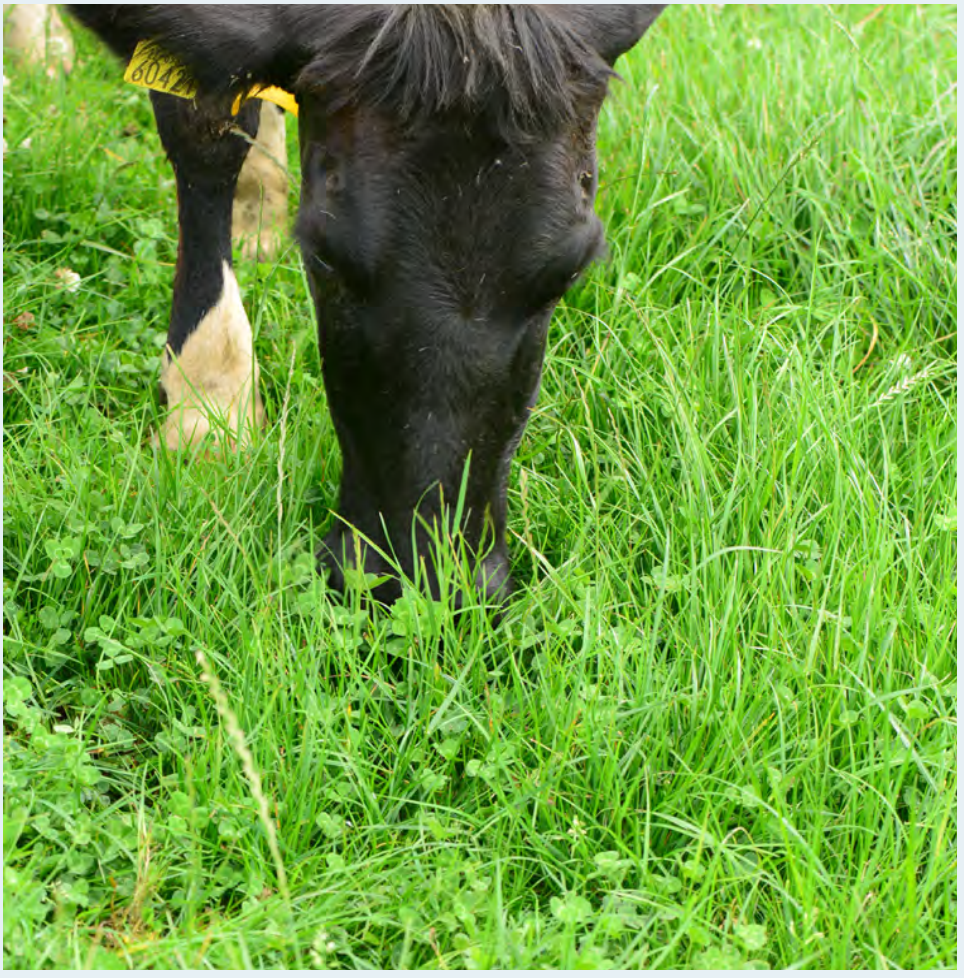
### Management of grass-clover swards after over-sowing

Poor establishment occurs where grass gets too strong after over-sowing. This is the single biggest reason for failure that lies within the farmer's control.

The most important recommendation is for tight grazing for the first three grazings post-sowing – keep pre-grazing herbage mass over 1,200kg DM and grazing swards to ≤ 4cm. This allows light to penetrate to the base of the sward, which is essential for clover establishment.

Once clover is present in the swards, it is vital to use clover-safe herbicides. When over-sowing clover into existing grass swards, it may be better to control more established weeds before over-sowing white clover into the sward.

Over-sowing is just the first part of your strategy to grow more clover and use less N fertiliser. We'll revisit clover agronomy in the March-April edition.



# Alternatives to CAN on crops

Consider the pros and cons before changing to another fertiliser type.

**Richie Hackett**
Teagasc Crops Environment and Land Use Programme, Oak Park

High N prices may stimulate growers to look at alternatives, if available, to the traditional CAN type products, the main alternatives being urea (protected or unprotected) and UAN.

Unprotected urea is usually a cheaper source of N than CAN, but there are two points to remember. Firstly, urea has a lower bulk density that CAN, which means that it is more challenging to spread evenly over wider bout widths (see pages 26-27).

The second point is that N in urea form is susceptible to loss as a result of ammonia volatilisation into the air. When this happens, the amount of N available to the crop is reduced.

Unprotected urea can give similar yields to CAN in many situations, but where N is lost to the air, yields can be reduced compared to similar amounts of CAN-type products.

This phenomenon will be most likely where unprotected urea is applied to drying soils and in high pH situations such as areas where lime has been recently applied.

That said, the advent of protected urea, where a substance called a urease inhibitor that slows down the breakdown of the urea in the soil is coated onto the urea granule, has largely eliminated this issue.

This was demonstrated by a spring barley trial in Teagasc Oak Park protected urea and CAN gave similar yields, while unprotected urea gave a lower yield. This means that protected urea is a suitable N source for arable crops, but keep in mind it has the same application challenges as normal urea.

Protected urea can also reduce greenhouse gas emissions but the effect on arable land will be much more modest than on grassland. A list of protected urea products is available on the Teagasc website.

Urea (left), CAN (top) and protected urea (right).

Urea ammonium nitrate (UAN) or liquid N is also gaining some popularity. It is a mixture of urea and ammonium nitrate in solution, which is applied using a sprayer equipped with special nozzles or dribble bars.

Because it is applied with a sprayer, it allows for very uniform application, even over very wide bout widths. A particular advantage is that it allows even application of the full fertiliser rate to the edge of the sown area without getting fertiliser into hedgerows etc.

It also allows a more even application on the ins and outs, particularly where GPS-controlled sprayers are used.

It is less affected by weather conditions such as wind, allowing greater flexibility in spreading dates.

However, because it contains 50% of N in the form of urea, N can be lost to the air. If this happens, liquid N can give lower yields than the same rate of N applied as CAN. This problem can be alleviated by the addition of urease inhibitors to the spray tank where necessary.

While liquid N can be applied with a normal sprayer, it should not be applied with 'normal' spray nozzles, so there will be cost involved with equipping the sprayer with the required dribble bars/liquid N nozzles.

Like all fertilisers, liquid N is corrosive and great care needs to be taken in washing down the sprayer after use.

In summary, while there are alternatives to CAN available which may offer cost savings, growers should familiarise themselves with the pros and cons before changing to these fertilisers.

# Urea: even spread is essential

**Dermot Forristal**
Teagasc Crops, Environment and Land Use Programme.

**Francis Quigley**
Farm Machinery Specialist
Teagasc Kildalton

Accurate and even spreading is more important with urea products, as they typically have 80% of the density of other fertilisers.

While we often think of accuracy as achieving the correct application rate of fertiliser in kg/ha, of more importance is spreading that fertiliser evenly in the field.

All of today's spreaders are broadcast spreaders, which rely on having an overlapped spread pattern to ensure they spread evenly across the chosen bout widths (8m-30m)

This is more challenging with the lower density of urea requiring different settings – perhaps a more limited bout width and more care in windy conditions.

You must take into account:

- Type of spreader and its spreading ability.
- Physical quality of the fertiliser.
- Setting for the correct rate.
- Setting to spread evenly and bout width limitation.
- Use in the field.

## Type of spreader

Twin disc type spreaders dominate the market, as spout types are limited to 8-12m bouts and single disc machines have a one-sided spread pattern that is difficult to match up.

However, machines within these categories have different spreading characteristics impacting on bout widths and evenness. Even different spreader models from the same manufacturer can have very different spread patterns.

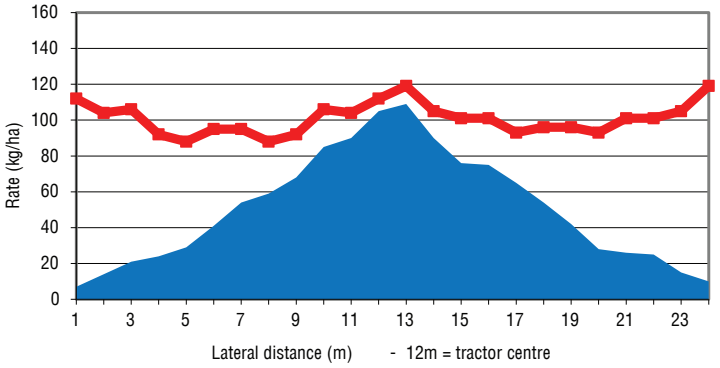
The design of the discs, vanes and hopper outlet will determine the spread pattern. Good spreaders will have a wide spread pattern, spreading the most behind the tractor and tapering smoothly towards the sides across the bout (Figure 1).

If the pattern is more shouldered, it will be less even and will be more affected by wind and fertiliser quality (Figure 2).

When selecting a spreader, always request test reports – preferably independent tests – and look for a low coefficient of variation (<10% but preferably <5%) for the products being used. It is particularly important to ask for these test results for urea products.

Critically, the spreader manufacturer should have a comprehensive database of spreading test results for a broad range of fertilisers, including urea, that will allow the spreader to be set correctly.

**Figure 1:** Good shaped fertiliser spread pattern resulting in a COV of 8%. (Blue indicates the basic pattern; the red line is the overlapped pattern)




## Fertiliser quality

Fertiliser particle size, shape, density and strength will all influence the evenness of spread. Urea, at about 80% of the density of other fertilisers, is more difficult to throw and can be more impacted by wind.

Larger particles are generally easier to spread. So, look for 'granular' urea with a large particle size. At a minimum, 80% of the particles should be between 2mm and 4mm diameter, with most greater than 3.2mm.

Strong particles will not be easily broken when spreading, so good manufacturing and dry storage are important. Ask the supplier for strength and size details and test the product with hand-held sieve boxes and strength testers.

Protected urea is only as good as the base urea product it's based on. Ensure it has a larger particle size, good strength and is stored well. Excessive build-up of deposits on spreader vanes indicates poor physical quality and will result in uneven spreading.

Blends of urea with higher density P, K and S products can result in uneven spreading. Suppliers should provide proof of their spreadability with specific spreader models.

## Setting the spreader to spread evenly

The spreading elements of fertiliser spreaders need to be set for the appropriate bout width and the fertiliser being used. Urea will usually require very different settings than CAN. It is

South Kilkenny dairy farmer John Robinson with his Teagasc advisor Nigel Kennington.

essential that spreader manufacturers have a large database of detailed spreading test results, using a huge range of fertilisers, to identify the adjustments needed to combinations of disc height over crop, spreader angle, disc type and speed, vane type and position and fertiliser drop point on the disc.

This information is available in manuals, but increasingly on websites or smartphone apps. Firstly, a fertiliser must be matched to a product in the database, typically by entering particle size distribution, particle strength, particle shape and density.

The database will indicate the bout width that can be achieved and the appropriate spreader settings.

With urea, the bout widths achievable may be less; different vanes or discs may be required and the pattern will be more impacted by wind. Many manufacturers suggest a simple field test with four to eight trays or mats to validate the setting.

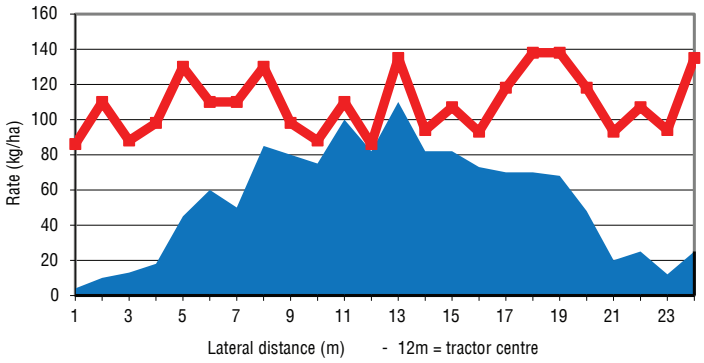
### Rate setting/calibration

Getting the correct rate of fertiliser out (kg/ha) is also important and while manufacturers can give an initial setting from their database, some level of field calibration is usually needed.

Any high-spec spreaders can have on-board weighing systems that allow automatic calibration – just input the desired application rate and the controller will adjust the rate automatically.

A full calibration requires the fertiliser to be run-through the spreader and flow rate to be calculated, typically with a disc removed. Forward speed needs to be measured accurately too. Some manufacturers have very useful setting aids, such as calibrated flow bags, that guide settings without full calibration.

**Figure 2:** Poorly shaped fertiliser pattern with a COV of 17%.





### Headland spreading and GPS control

Recent Teagasc Oak Park research suggests that fertiliser distribution in the headland areas of fields is quite uneven compared to the in-field area, contributing to yield loss.

There are two challenges; spreading to the boundary and merging the in-field runs with the headland runs.

To spread evenly to the field margin, manufacturers offer different adjustments such as deflectors, altered disc speed and fertiliser drop point, to alter the headland pattern, but these must be set very carefully.

Merging the in-field runs with the headland runs requires the spreader to be turned on and off at a precise distance from the headland. This can be very difficult with spreaders that throw fertiliser considerable distances.

Accurate GPS systems can automatically control the on/off point, making this more easily achieved and avoiding fertiliser waste. GPS control systems can also identify narrower bouts and adjust the application rate and spread pattern automatically.

## Key points

- Even and accurate spreading of fertiliser is essential.
- Urea products are less dense and more difficult to spread wide.
- Urea may limit the bout width a spreader is capable of.
- Spreader manufacturers resources must have urea products in their database.
- Use the machine carefully in the field, particularly on the headlands and be conscious of the impact of wind on urea at wider bout widths.

# Innovative technology using protected urea

**Seamus Kearney**
Teagasc, Signpost Programme.

**Seamus Nolan**
Teagasc Roscommon
Longford

**Martina Harrington**
Teagasc Future Beef Programme

### Why change to protected urea now?

As part of the Climate Action Plan for 2021, the agricultural sector has been set a target of reducing greenhouse gas (GHG) emissions by between 22% and 30% by 2030.

To reach this target without cutting stock numbers, new technologies will have to be adopted by farmers. Protected urea is the technology that has the potential to give the largest and quickest reductions in GHG and ammonia emissions within agriculture.

### What is protected urea?

Protected urea is a urea nitrogen (N) fertiliser made safe from ammonia loss through the addition of a urease inhibitor. There are over 20 protected urea products available from at least six companies. There are straight N options, N and sulfur (S) options as well as N, K and S options. If in doubt, check https://www.teagasc.ie/crops/soil--soil-fertility.

### When do you use protected urea?

The major advantage of protected urea is that farmers can use it from late January to early September.

It will work as effectively as urea in spring in damp conditions and, due to the use of the urease inhibitor, it releases N slower and more effectively than CAN in the summer.

### How does it affect grass growth?

While the quantity of grass grown by using CAN, protected urea and urea was similar across all fertiliser types in short-term Teagasc trials, in a long-term trial at Johnstown Castle, the grass grown by the fertiliser (i.e net of the zero N control) for protected urea was greater than straight urea in six out of seven years, 2018 being the exception due to drought when water was the limiting factor not nitrogen.

Protected urea grew 13% more grass on average compared to straight urea.

### How much does it cost?

Protected urea is cheaper than CAN per kg of N, and, while it may appear slightly more expensive than straight urea, it will give the same effective N for the plant as straight urea, at a 12.0% lower application rate.

For example, assuming a rate of 50kg N/ha spread as protected urea, or 50kg N/ha spread as CAN in March 2022, the equivalent quantity of N as straight urea that would need to be spread is 57kg/ha, allowing for the extra losses from straight urea.

If we assume costs of urea are €950/t, protected urea are €1,000/t and CAN are €750/t, Table 1 highlights the difference in cost, with protected urea being the cheapest option.

The value of retaining N (in protected urea) that had previously been lost as ammonia has increased dramatically in line with the increased fertiliser cost.

Also, in a situation where N application rate is limited, it makes sense to use less of a more effective product.

### What does it do for farm emissions?

By switching to 100% protected urea, a dairy farm's total emissions have the potential to be reduced by 7-8%, at a spreading rate of between 200-250kg N/ha. The equivalent savings on total emissions on suckler farms is 1-2%, at a spreading rate of 60-80kg N / ha.

Straight P and K fertilisers or blends such as 0-7-30 or 0-10-20 would be needed to achieve a 100% switch. Alternatively, the use of a split or two of high P/K products such as 18-6-12 and S, based on nutrient need, opens the opportunity for more straight N slots where protected urea, with or without S, is a good fit.

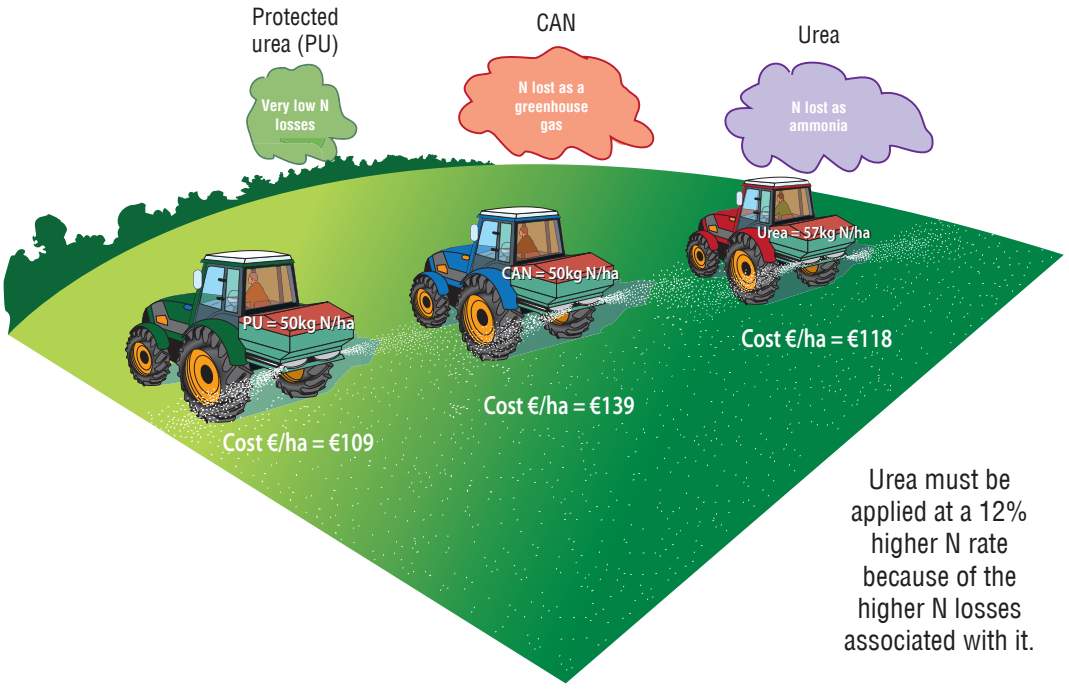
**Table 1:** The relative cost of applying N from different fertiliser N sources.

| | CAN | NBPT Protected urea | Urea |
|---|---|---|---|
| kg N/ha | 50kg | 50kg | 57kg |
| €/tonne | €750 | €1,000 | €950 |
| Cost of the application | €139 | €109 | €118 |

## Summary

| | Protected urea | CAN | Urea |
|---|---|---|---|
| Grass grown | √ | √ | |
| Lowest ammonia emissions | √ | √ | |
| Lowest GHG emissions | √ | | √ |
| Lowest GHG and ammonia emissions | √ | | |
| Lowest cost € / kg of nitrogen | | | √ |
| Lowest cost € / kg of effective N | √ | | |

## Protected urea delivers lower emissions at a lower cost




Urea must be applied at a 12% higher N rate because of the higher N losses associated with it.

## Field experience

"I used the Goulding protected urea product (KAN)," says Sam Pierce of Bannow, Co Wexford.

"I spread a lot of my straight N this way in 2020. It was probably one of the easiest fertilisers to calibrate in the spreader, and that is taking into account that my machine can be hard to get right.

"I got a lot further with a spreader-full. I have a 2t spreader. If I was spreading 20 units, I could spread almost 80ac in one go with 38% KAN, as opposed to 50ac using CAN, which as we know is only 27% N. When you are working mostly on your own, this is a huge saving in time.

"It is also cheaper per unit of nitrogen than CAN. In 2020, a tonne of CAN was costing me €287 and it has 270kg of N per tonne, so that is a cost of 1.06c per kg of nitrogen.

"The KAN cost €370 per tonne with 380kg of N per tonne and so it cost me 0.97c per kg of nitrogen. That difference is even bigger for 2022.

"I didn't do a tray test, but I had no stripes in grass or tillage crops (spread at 18m tramlines).

"I knew the protected urea had less GHG emissions associated with it than CAN, but only recently realised it has 71% less. This seems worthwhile to me."

Cathal and Des McHugh

**Cathal and Des McHugh** milk 110 cows near Strokestown in Co Roscommon. They are focus farmers under the Teagasc/Aurivo joint dairy programme and participants in the Signpost programme.

"In 2021, 45% of all chemical N we spread was in the form of protected urea," says Cathal.

"The remaining 55% of nitrogen was applied in the form of NPK compounds.

"After hearing about protected urea at discussion group meetings, we decided to try it out and we have been happy with the results."

As recorders of grass covers, they say there was no obvious difference between protected urea and CAN in relation to grass growth.

One thing Cathal did observe was its tendency to readily absorb moisture from the atmosphere and they avoid leaving product in the spreader for any extended period.

"A tonne of protected urea (46% N) contains 920 units of N, whereas a tonne of CAN (27% N) only contains 540 units of N," says Cathal.

"A unit of each will grow the same amount of grass, so it's important that products are compared on a cost per unit basis."

Switching to 100% protected urea has the potential to reduce total GHG emissions by 7% on the farm and every tonne purchased counts towards the national GHG inventory for agriculture.

"Protected urea, LESS and reducing chemical N use are the low hanging fruit when it comes to GHG emissions," says Cathal.

"These tools are a great initial step in reducing our carbon footprint as an industry."

# Be careful on the (yield) curve

## Nitrogen recommendations for cereal crops

**Shay Phelan**
Tillage specialist, Teagasc Crops, Environment and Land Use Programme.

The dramatic increase in fertiliser costs, particularly nitrogen, has led many farmers and advisors to rethink how we use nitrogen on cereal crops. While the increase in grain prices is welcome, it is unlikely to fully cover the increased fertiliser costs, especially if yields are less than optimum.

So, when you are developing a fertiliser plan for your crops this year, there are three key questions that need to be answered when it comes to nitrogen use;

• Firstly, how much should I apply to my cereal crop? This might sound simple, but it is actually quite complex, as it depends on a number of factors like the crop itself, the rotation and the potential yield.

The nitrogen fertiliser recommendations in Table 1 are derived from the Teagasc Green Book and the current Nitrates Directive. The data shows the nitrogen index rate based on the cropping history and the recommended rates for the different cereal crops. Index 1 areas have low soil nitrogen, while index 4 soils are considered to have high levels of available soil nitrogen.

Where average yields for the farm are higher than the reference yields, an extra 20kg/ha of nitrogen per additional tonne of yield is normally justified. However, be aware that these rates are based on optimum agronomic performance and not optimum economic performance in the current climate.

With the cost of nitrogen now in excess of €2.50/kg, the economic return from applying extra nitrogen has to come into question. We know that the yield response to additional nitrogen increases rapidly at lower rates, but as we reach the optimum rate for the crop, this rate of increase decreases. Eventually, there is no yield response to additional nitrogen and you may risk crop lodging.

As the rate of yield response to additional nitrogen decreases, then at some point, the extra yield achieved doesn't cover the cost of the nitrogen, which is called the Break Even Ratio (BER) i.e the point at which the extra yield stops covering the cost of the additional nitrogen.

In a normal year, we would expect 3.5kg of grain to pay for 1kg of nitrogen. It now takes approximately 12kg of grain to pay for 1kg of nitrogen.

Based on the current grain price compared to the cost of nitrogen, the rates shown in the table should be adjusted downwards by 20-30kg/ha for wheat and barley.

There is little yield response in spring barley over, on average, 150kg/ha. Applying extra nitrogen above this level is not economic. Most of the yield is achieved when up to approximately 120-125kg N/ha is applied.

The level of yield increase from approximately 125-150kg/ha is lower, but is economically justified in years when fertiliser prices are lower.

Therefore, the current rate of nitrogen to give the best financial margin for spring barley on an index 1 site is somewhere between 120-130kg/ha.

If you are trying to achieve a 7.5t per hectare crop based on Table 1 (135kg + 20 kg (bonus yield) – 30 kg), this may reduce yield by 0.2-0.5 t/ha.

However, if you are normally applying 125-130 kg of nitrogen to your crop e.g malting barley, then reducing the rate of nitrogen applied further could lead to larger decreases in yield.

• Secondly, how can I reduce the cost of the nitrogen? Simply applying less will reduce the cost, however, as mentioned, we have to be careful that there may be a yield penalty if we decrease the rate too much unless there are other factors to consider.

There is scope to decrease the amount needed if the cereal crop is following a break crop like oilseed rape or beans, for example, as outlined in the table. Crops following beans, ie soil index 2, typically need 30kg/ha of nitrogen less than those after a cereal crop.

Where organic manures are available, not only are they a source of P and K, they are also a source of nitrogen, with poultry manure having the highest levels. Farmyard manure has the lowest nitrogen level.

In order to capture as much of the nitrogen as possible, manures must be incorporated soon after application, ideally within four hours. So, there is a logistical hurdle that needs to be dealt with in using organic manures.

Another option to reduce the cost of the nitrogen is to look at the different nitrogen sources other than CAN, often the most expensive. Urea, if available, is generally 20% cheaper per unit of nitrogen than CAN and is certainly an option on winter crops. It will be riskier to spread in dry

**Table 1:** Recommended nitrogen rates at different soil indices.

| Crop | Reference yields (t/ha) | Nitrogen index | | | |
|---|---|---|---|---|---|
| | | 1 (kg/ha) | 2 (kg/ha) | 3 (kg/ha) | 4 (kg/ha) |
| Winter wheat | 9.0 | 210 | 180 | 120 | 80 |
| Spring wheat | 7.5 | 160 | 130 | 95 | 60 |
| Winter barley | 8.5 | 180 | 155 | 120 | 80 |
| Spring barley | 6.5 | 135 | 100 | 75 | 40 |
| Winter oats | 7.5 | 145 | 120 | 85 | 45 |
| Spring oats | 6.5 | 110 | 90 | 60 | 30 |

weather on crops like spring barley.

It is slightly more difficult to spread at wider tramline widths (see also article by Dermot Forristal and Francis Quigley), but up to 24m there should be no issues. Also, as the product contains 46% nitrogen, you need less actual kilos of product than you do with CAN. So there is a small saving on fuel when using urea-based products rather than CAN.

Protected urea products generally cost the same as CAN. The product can be safer to use than normal urea and there is a small saving in the cost of fuel for applying it over CAN.

Farmers are increasingly interested in using liquid forms of nitrogen that can be applied using the sprayer. This is more accurate and again, in theory, should reduce costs. This is especially the case on headlands or short ground, especially if using GPS-enabled sprayers with automatic shutoff on the booms.

The actual cost of the product, the cost of additional nozzles, the cost of storage tanks and possible extra passes through the crop, all need to be taken into account to establish if this is indeed a cheaper way of applying nitrogen.

• Thirdly can I use my nitrogen more efficiently? As I mentioned previously, the marginal yield response to nitrogen decreases as the rates applied get higher. Therefore, in theory, if we used slightly less than the recommended rates, we may increase the efficiency of the product used.

Here are a few more tips to get the most from your nitrogen:

•**Apply lime** – where pH is low, fertiliser use efficiency will be lower than if the soil pH is in the optimum range.

•**Spreader set up** – make sure that the fertiliser spreader is serviced and set properly for the fertiliser being used i.e CAN, urea and protected urea each require different settings.

•**GPS** – where GPS-enabled spreaders are available, they will help to apply the nitrogen more accurately and ensure maximum efficiency by reducing overlap, etc.

•**Conditions** – only apply nitrogen fertilisers when conditions are suitable e.g soil temperatures should be over 5°C, no heavy rain is forecast and there is some growth for the plant to take up the nitrogen.

•**Trace elements** – where there are known trace element deficiencies, correct these before nitrogen is applied. This will help to increase nitrogen use efficiency.

•**Stress** – don't apply nitrogen if crops are stressed, as they are unlikely to use nitrogen efficiently.

•**Yield potential** – not all fields have the same yield potential (consult your memory or records). Avoid over-applying on fields or areas where the known yield potential is low.

# How much P and K is required for cereals?

**Mark Plunkett**
Teagasc Crops Environment and Land Use Programme, Johnstown Castle.

Completing a farm fertiliser plan based on recent soil analysis is the first step in calculating crop P and K requirements for 2022. This task is essential if you aim to protect your cereal margins.

## Soil fertility

Up-to-date soil analysis, at the modest cost of €0.50c/ac (pH, LR, P and K), provides the basis for your P and K strategy for cereal crops.

The next step is to maximise the availability of soil major nutrients and your return on investment from expensive P and K by making sure soils are at pH 6.5-6.8.

For spring crops, apply lime as per the soil test report to correct soil pH levels to pH 6.5.

## Role of P and K

Phosphorus (P) and potassium (K) have many roles in cereal crop nutrition, from rooting to facilitating N use efficiency.

To maximise the return from applied N, it is very important to ensure the crop has a balanced supply of major (P, K and S) and minor nutrients (Cu, Mn and Zn).

For example, P is very important for rooting and tillering (see Figure 1), especially in spring cereals, while K is very important for straw strength and plant resistance to diseases such as powdery mildew.

## Soil P and K index strategy in 2022

It will be very tempting to reduce or omit P and K in 2022 to control production costs. It would instead be prudent to tailor P and K rates based on soil test results. The soil P and K index (1 to 4) shows the soil's ability to supply P and K during the growing season – see Table 1.

Soils with higher indexes (3 or 4) will have a greater nutrient supply and produce higher grain yields.

Soils at index 1 and 2 will be the most responsive to applied P and K, as they have only a very low to low P and K supply. These soils will have higher P and K requirements as the supply from the soil will be lower.

For spring cereals, where possible, combine drill P at sowing time to increase the efficiency of applied P fertiliser. It will be important to fertilise these soils to their expected grain yield potential.

But, in order to control fertiliser costs, omit P and K applications aimed at building up soil levels. We can build up soil P and K levels in years when fertiliser is more affordable.

Soils at index 3 have a good nutrient supply. Aim to replace P and K removed at harvest time to maintain soil fertility in the optimum range (index 3).

Again, it is important to crop yield potential to maintain soil fertility levels. These crops will use N most efficiently and produce the largest grain yields annually.

Omitting P and K will result in soil P and K levels declining, thus reducing grain yield potential in the years ahead.

For higher-yielding crops such as



**The impact of combine drilling P on index 1 soils (very low P supply) on crop root and tiller development.**

**Table 1:** Soil nutrient index, response and soil test range for P and K.

| Index | Nutrient response | P (mg/l) | K (mg/l) |
|---|---|---|---|
| 1 | Definite | 0 – 3.0 | 0 – 50 |
| 2 | Likely | 3.1 – 6.0 | 51 – 100 |
| 3 | Unlikely/tenous | 6.1 – 10 | 101 – 150 |
| 4 | None | >10 | >150 |

winter wheat, maintaining higher soil indexes produces higher grain yields. Soils at index 4 are very fertile and have a good supply of P and K to meet crop requirements during the growing season.

Up-to-date soil analysis will help identify these soils on the farm. This is useful information, as these fields don't need P and K.

The Teagasc soils database shows that 31% of tillage soils sampled were at index 4 for P and K in 2020 offering a major potential saving on P and K applications in 2022.

**Table 2:** P and K offtakes per tonne of grain yield (t/ha).

| Crop Type | P (kg/t) | K (kg/t) | How to calculate P and K req. e.g spring barley |
|---|---|---|---|
| Winter wheat | 3.8 | 10 | Grain yield 7.5t/ha |
| Winter barley | 3.8 | 10 | |
| Winter oats | 3.8 | 14.4 | **P -** 7.5 x 3.8 = 29kg P/ha |
| Spring barley | 3.8 | 11.4 | |
| Spring wheat | 3.8 | 11.4 | **K -** 7.5 x 11.4 = 86kg/ha |
| Spring oats | 3.8 | 14.4 | kg/ha x 0.8 = units/ac |

## P and K advice

Over recent years, soil fertility levels have improved on tillage farms resulting in higher grain yields. To maintain profitable grain yields and hold soil fertility levels at their current levels, we recommend that you fertilise crops to their grain yield potential.

For example, take the average yield over the last three years to form the basis for calculating P and K requirements in 2022.

Table 2 shows the P and K offtakes for a range of cereal crops. Note the P removed is similar for all cereals, while the K levels differ depending on crop type.

See the example above showing how to calculate the P and K removed for a crop of spring barley.

Table 3 below shows the P and K advice for different cereal crops, based on average expected grain yields. In addition, suggested fertiliser products and rates are shown, which will deliver sufficient P and K.

**Table 3:** P and K requirements based on cereal crop grain yield (t/ha) for a range of cereal crops.

| Crop Type | Grain yield (t/ha) | P kg/ha (units/ac) | K kg/ha (units/ac) | Suggested fertiliser product and rate (kg/ha) (bags/ac) |
|---|---|---|---|---|
| Winter wheat | 11 | 42 (34) | 110 (88) | 495kg/ha (4 bags/ac 12-8-20) |
| Winter barley | 10 | 38 (30) | 100 (80) | 460kg/ha (3.75 bags/ac 12-8-20) |
| Winter oats | 9 | 34 (27) | 130 (104) | 495kg/ha (4 bags/ac 10-7-25) |
| Spring barley | 7.5 | 29 (23) | 86 (69) | 425 kg 13-6-20 (3.5 bag/ac) |
| Spring wheat | 8.5 | 32 (26) | 97 (78) | 495 kg 13-6-20 (4 bag/ac) |
| Spring oats | 7.5 | 29 (23) | 108 (86) | 495 kg 13-6-20 (4 bag/ac) |

# Nitrogen and malting barley

## Reducing fertiliser to increase margin

**Eoin Lyons**
Tillage advisor, Teagasc/ Boortmalt Programme.

The demand for malting barley has been increasing steadily to the point where Boortmalt alone will be seeking 180,000 tonnes of malting barley for harvest 2022. Driving this increase is the demand for distilling barley.

Traditionally, the vast majority of malting barley grown for Boortmalt was destined for the brewing market, however the market is now at the point where close to half of the malting barley grown will be required for distilling.

Distilling barley is more valuable than brewing, with the potential for growers to add an additional €70/ha in profit to an average yielding crop of malting barley.

However, meeting distilling grade will require an even lower grain protein than for brewing barley, so it can be difficult to achieve. This is due to factors out of the grower's control such as soil type, weather and location, which can have a major impact on grain protein.

Nitrogen fertiliser strategy is entirely in the grower's control. Table 1 outlines nitrogen application rates for brewing and distilling barley and timings based on Teagasc trials.

Clearly, there is an opportunity to significantly decrease nitrogen applications compared to spring feeding barley, while potentially accessing a premium market for grain.

Field selection is important when deciding on where to sow distilling crops. Avoid fields where there may be a possibility of high levels of excess nitrogen present in the soil – examples include areas where

**Figure 1:** Results from nitrogen application trial on winter barley indicating optimum N rate to maximise yield and grain protein.

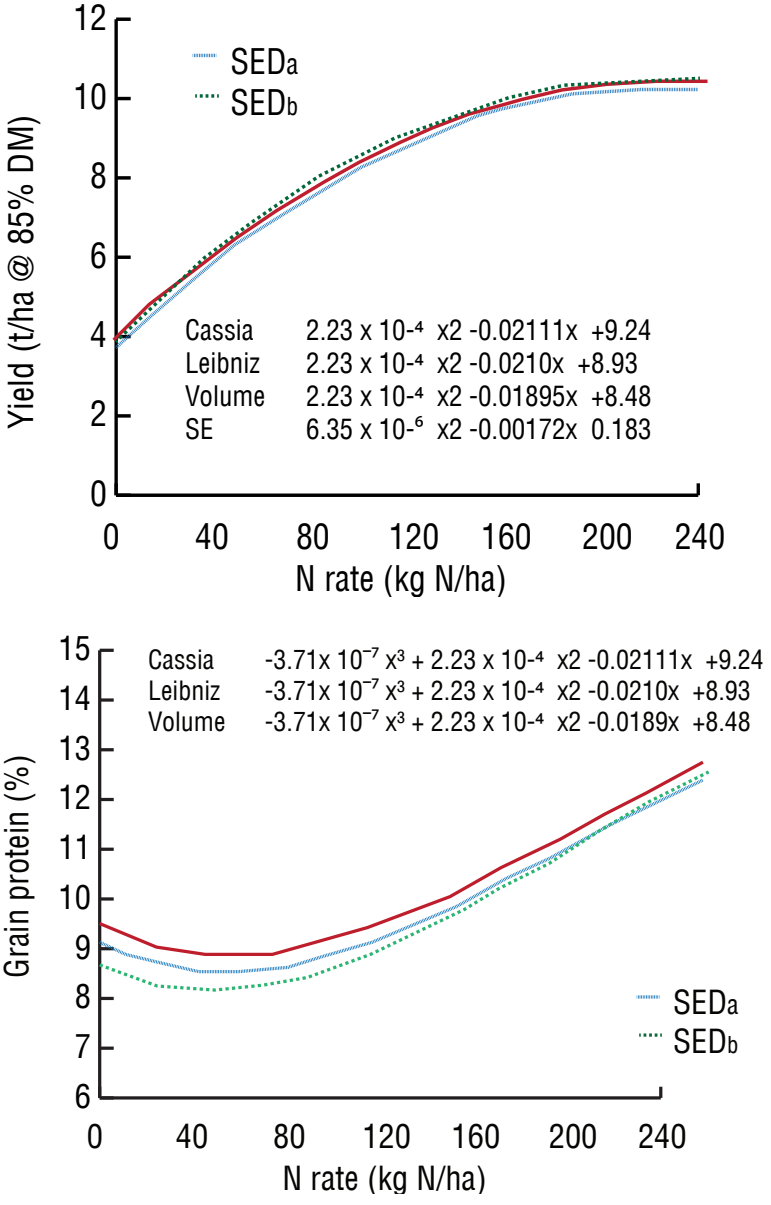



**Table 1:** Example nitrogen application strategy for brewing and distilling barley.

| Crop | Total N | Seedbed | 1-2 leaf stage |
|---|---|---|---|
| Brewing | 135 kg/ha (108 units/ac) | 40 kg/ha (32 units/ac) | 95 kg/ha (76 units/ac) |
| Distilling | 110 kg/ha (88 units/ac) | 30 kg/ha (24 units/ac) | 80 kg/ha (64 units/ac) |

organic manures have been recently applied or where catch crops have been grazed by livestock.

### Winter malt

As mentioned previously, the quantity of malting barley required by Boortmalt has increased substantially in recent years. Obtaining this quantity from spring malting barley alone could be difficult, especially in a poor spring barley growing year.

With the aim of boosting supply, and to give growers an alternative cropping option, Boortmalt turned to true winter malting barley varieties.

The first crops were drilled on a trial basis in autumn 2018. Only small quantities were grown in order to determine the performance of the crop in the field and also to assess the crop's malting quality.

After the results of year one, winter malt proved to be a success in both the field and the maltings, with the area increasing each year. A total of 1,100ha of winter malt was drilled this autumn. The variety Craft makes up the majority of this area. Boortmalt is committed to further increasing the area of winter malt.

As this is a relatively new crop, the level of agronomic knowledge is low. A trial has been established in Teagasc Oak Park as part of the Teagasc/Boortmalt joint programme.

The aim of the trial is firstly to evaluate the performance of existing and potential winter malt varieties and secondly to determine optimum nitrogen application rate in order maximise yield while obtaining the desired grain protein.

This trial commenced in autumn 2020 and therefore there is only one year's harvest results from the trial and it is too early to draw any major conclusions. However, research examining nitrogen rate and protein on winter barley has been completed by Dr Richie Hackett in Teagasc Oak Park in the past.

This trial was conducted using winter feed varieties, as no malt varieties were available at the time. The trial gives an indication of the optimum N rate for winter malt barley. The graphs in Figure 1 outline the results from the trial.

The results show that an application rate of 160kg/ha/N (128 units/ac) gave an average yield of 9.7t/ha with a grain protein of 10.2%.

The on-farm results of growing the crop over the past few seasons have shown that obtaining a grain protein within spec using an N application rate of 160kg/ha is achievable.

However, the average yield of the winter malt varieties is slightly lower compared to the trial results above, with most crops averaging 9t/ha.

While the current winter malting barley varieties, on average, are lower yielding than winter feed varieties, the crop can still offer an opportunity to growers to reduce nitrogen input costs considerably compared to winter feeding barley, while at the same time entering a premium market for grain.

## Farmer profile

Ivor and Philly O'Brien in a crop of Electrum winter barley.

Philly and Ivor O'Brien, who farm on the outskirts of Kilkenny city, grow both winter malting barley and distilling barley. The soil type on the farm is a very free draining Clonroche soil, which makes it ideal for the production of quality malting barley.

Winter malting barley was first drilled on the farm in autumn 2019 for the 2020 harvest, with the variety Craft being drilled, which has since been replaced by Electrum.

Autumn-drilled malting barley was grown on the farm prior to this, but this was a spring malting barley variety that was drilled in the autumn, a practice which some malting barley growers on very free draining soils follow.

Philly notes that the autumn-drilled spring barley did perform on the farm, but he made the decision to move towards true winter malting barley varieties when the opportunity arose.

"There was always the potential for autumn-drilled spring barley to fail because of high winter rainfall or hard frosts, whereas with the true winter malting barley, that problem has been reduced greatly," says Philly.

Management of the winter malting barley crops has been much the same as winter feed barley, with the exception being in relation to nitrogen. The winter malt crop receives considerably less applied nitrogen compared to a winter feeding barley.

Typically, Philly and Ivor apply 175kg/ha/N to their winter malting barley, with grain proteins averaging 10.1%. In relation to yields of winter malt on the farm, the average yield from the past two harvests has been 8.75t/ha, with both noting that they would like to have a slightly higher average yield than this.

But when the malting premium is factored in, it still leaves a greater margin compared to an average yielding feed variety. With the ongoing research being completed in Teagasc Oak Park, the aim is for higher output varieties to come on stream for malt growers.

# Time to move if forming a Registered Farm Partnership

Registered Farm Partnership (RFP) is an excellent arrangement to bring a young person into the family farm business without having to immediately sign over the land. Keep an eye on the February 11 deadline.

**Gordon Peppard**
Teagasc Rural Economy Development Programme, Collaborative Farming Specialist.

Pat and Mark Mulrooney with Gordon Peppard.

There are already more than 3,400 RFPs registered with the Department of Agriculture, Food and the Marine (DAFM). RFPs between family members (intra-family) are most common in Ireland, but there are also inter-farm RFPs, where non-family members come together to form a collaborative business arrangement.

RFPs provide a pathway for succession within a family; they give all members an input into day-to-day financial and physical management of the farm business; and they generate many social and financial benefits.

RFP applications can be submitted at any time during the calendar year. If you plan to submit an application to enter a RFP in 2022 and you wish to have a Registered Farm Partnership Number before the Basic Payment Scheme (BPS) application deadline of the 16 May 2022, then all applications and supporting documentation for the RFP must be submitted before 11 February 2022.

There are six key steps in completing an RFP application.

## 1 Obtain a tax reference number and form a capital account

Your accountant will need to register the partnership with Revenue to obtain a tax reference number and make an annual report to Revenue using the FIRMS 1 form. This is an important, but relatively straightforward, process. It is a good idea to begin the partnership in-line with the end of the previous tax year.

A capital account for the partnership, where the initial capital contribution (value of livestock, machinery and cash) of each partner is recorded, and updated on a yearly basis, will also be created by your accountant.

Without the capital account, there would be no record of the capital invested on the first day or over time. If there is a need to terminate the partnership, the capital account outlines what has been invested by each partner.

## 2 Setting up the Registered Farm Partnership bank account

A new RFP bank account to include all the names of the partners must be set up. All income and expenditure from the partnership should go through this bank account.

No farming transactions of the partnership should now take place through individual partners' own bank accounts. The setting up of this account can take time and early discussion with your bank is critical.

There is a one page form to be completed and stamped by the bank to verify that the bank account is set up and operational.

## 3 Establishing the herd number for use in the RFPs

RFPs can be a single herd number partnership or a multi herd partnership.

### Multi-herd number partnership

Where two individuals currently have their own herd numbers and have been farming in their own right prior to the establishment of the partnership, then this will be a 'multi-herd partnership'.

No changes are required to the herd number and partners can nominate a dominant herd number to use for animal registration, herd health management etc.

The BPS application will be made under one application form using the Registered Farm Partnership Number.

Within the BPS application form, both herd number tabs will appear and lands associated with each herd number should be declared under the respective herd numbers.

### Single herd number partnership

Single herd number partnerships generally arise in a family situation where a son or daughter (with a mini-

## A successful RFP in south Tipperary

Farming in Manganstown, 10km west of Carrick-on-Suir in south Tipperary, Pat and Angela Mulrooney having been running a successful organic dairy enterprise for many years.

They are currently in the process of establishing a Registered Farm Partnership (RFP) with their son Mark before the closing date deadline of 11 February 2022.

On meeting Pat and Mark on their farm, I asked them both what their main thoughts and considerations were behind forming a RFP.

Pat explained that as we all get older, "we can't cover as much ground in a day as we would have 20 years ago, so with an increasing workload, taking time away from the farm was becoming more difficult and work life balance was becoming an issue for myself and Angela."

Pat and Angela say they don't want to retire fully from farming, but are happy to step back and remain part of the business while giving their son Mark the opportunity to become involved. He will have a significant input into the physical and financial management running of the farm business.

"We feel the RFP will facilitate a natural succession pathway for the smooth transition of the farm from one generation to the next and the added financial

benefits, such as grants/schemes and the taxation incentives, greatly helped us to make the decision," adds Pat.

Having spent years working away from the farm, Mark has developed knowledge and experiences in a professional career outside the farm gate.

"I'm very glad I took the opportunity to work away from the family farm but now I'm ready to come home to the business," said Mark. All parties feel that the time is right to form the partnership.

To help the Mulrooneys decide if the RFP was the correct route to go, they first discussed it with their accountant.

The accountant plays a key role in establishing the RFP – they will register the new business with Revenue to obtain a tax reference number and compile a capital account and decide on a favourable profit sharing ratio for all members.

The accountant can also draft the farm partnership agreement and will complete end of year returns for the partners.

A discussion on the taxation implications of future farm transfer is also important to have with the accountant at this stage, so that there are no unexpected tax bills down the road.

Pat and Mark also spoke to their local Teagasc advisor Michael Freaney, who, along with myself, were able to advise on herd number changes, Basic Payment Scheme entitlements and other schemes/grants.

Over the last year, Mark completed his Green Certificate (Level 6 Agricultural Qualification) to qualify as a Category 2 partner (trained farmer) in the RFP.

Finally, Pat concludes: "To continue having young famers to take over family farms it is vital to create the conditions to allow them have an interest, input and responsibility in the business. Establishing the RFP is the key first step for us as a family."

mium Level 6 agricultural qualification) is returning home to farm in conjunction with their parent(s) in a Registered Farm Partnership.

Discussions should take place with the local District Veterinary Office (DVO) and agricultural advisor about adding the son/daughter to the existing herd number.

The son/daughter is added to the existing parent(s) herd number using an ER1.1 application submitted to the local DVO.

Where there are changes to the farm business structure/change of herd number, prior notification to the relevant sections of DAFM is essential if involved with any schemes. It is important to discuss this with an agricultural advisor/consultant.

### 4 Completing the on-farm and partnership agreements

These agreements are important documents and require consultation with accountants, solicitors and agricultural advisors for their completion.

The agreements form the basis of a successful RFP, where all workings of the agreement are clearly defined and should be very carefully drafted with expert independent advice.

All template agreements are general guidelines and should be amended to reflect each individual partnership agreement. Once the written agreement is completed and signed, it must be kept up-to-date.

Any change to the original circumstances on which the agreement was signed requires an amendment in the written agreement.

For example, in a partnership where the profit-share has been changed over the time, the written agreement must be amended each year to reflect this.

### 5 Providing supporting documentation

Please ensure the following documents are included with your application for a RFP.

- Completed application form.
- Completed bank details document verified by bank.
- A signed copy of the farm partnership agreement .
- Copy of on-farm agreement.
- Copy of folios and maps of all owned lands.
- Copy of leases and maps for all lands leased in.
- Stamp duty certificate from Revenue for all leased land.
- Evidence of agricultural qualifications (minimum Level 6) for Category 2 partners.
- Completed checklist.

### 6 Submission of the application

Entering into a RFP should not be rushed – take the time to seek good advice from a legal, accountancy and agricultural advisory perspective. This will allow you to carefully construct a partnership that is tailored to suit your own circumstances.

Completed applications with all supporting documentation should be emailed to farmpartnerships@agriculture.gov.ie before 11 February 2022 in order to have a RFP Number prior to the closing date for the BPS on 16 May 2022. For further information on forming a RFP, please consult the Teagasc website or contact your local Teagasc office for further information.

# Aiming for success in market gardening

John Mulhern profiles a student who is entering a second career in the fascinating world of horticulture.

**John Mulhern**
John Mulhern, principal at the Teagasc College of Amenity Horticulture at the National Botanic Gardens.

Peter Kelleher is a part-time student in the Teagasc College of Amenity Horticulture. He is studying for a degree in horticulture, which is delivered at the Teagasc Horticulture College sites in the National Botanic Gardens and at Teagasc Ashtown Food Research Centre.

"I served in the Defence Forces (DF) for 20 years and retired in 2019, aged 39, at the rank of commandant," Peter says. "I learned many life skills in the DF, not least the importance of continued education. I always had a love of plants and growing, so I knew it was a field I would pursue. The transition from soldier to gardener may not be as huge a change in mindset as it might seem!

"Another motivation for going into this sector was a sense of responsibility to my kids, to show them that there are ways to produce high-quality food with minimal impact on the environment."

Peter came to the Teagasc College in Glasnevin and enrolled on the Level 5 Certificate in Horticulture and followed up with an Advanced Cert in Horticulture the year after. This also qualifies Peter for a Green Cert.

He has decided to continue his studies to degree level, which can be achieved within the Teagasc College.

"I recently attended a National Organic Training Skillsnet conference called Biofarm 2021," says Peter.

"One of the speakers, Pat Cronin, spoke of the grower as a crucial and respected member of the community. He also spoke about being able to produce food profitably on sites of 1,000m$^2$. That resonated with me."

Peter aims to establish a profitable, sustainable market garden producing high-quality niche vegetables at a fair price for him and the consumer. He also hopes to pass on his knowledge.

"My ultimate goal is to develop a market garden operation at my home in Kilkerley outside Dundalk, Co Louth," says Peter.

Peter in the campus vegetable garden

"The holding consists of 2.2ac, which includes my garden and about 0.5ac under cobnut cultivation, so I am working with about 1.2ac for food production."

## Challenge

"This academic year has been difficult to manage, in terms of work-life balance. My wife works full-time, and we have three boys aged 12, 9 and 6. Managing them is a full-time job. Lecturers give us plenty of time to complete assignments, but it is often a scramble to get them in on time.

"I am conducting this year on a module basis, where I complete the degree over a longer time period, which means a more manageable time commitment.

"The biggest loss over the last two COVID years has been the reduction of on-campus time. I started a full-time Level 5 cert in 2019 and was lucky to be part of a wonderful group. Students were from across the age profile, including school leavers and retirees.

"There was a brilliant dynamic with the elder lemons in a mentoring role and the younger cohort full of energy and ideas. I made friends in all age groups. It led to us challenging our opinions and there was a strong practical component."

We are sure that Peter's Teagasc experiences and qualifications will help him achieve his goals.

More information on college courses in the Teagasc College of Horticulture are available on the Teagasc website at the Botanic Gardens page.

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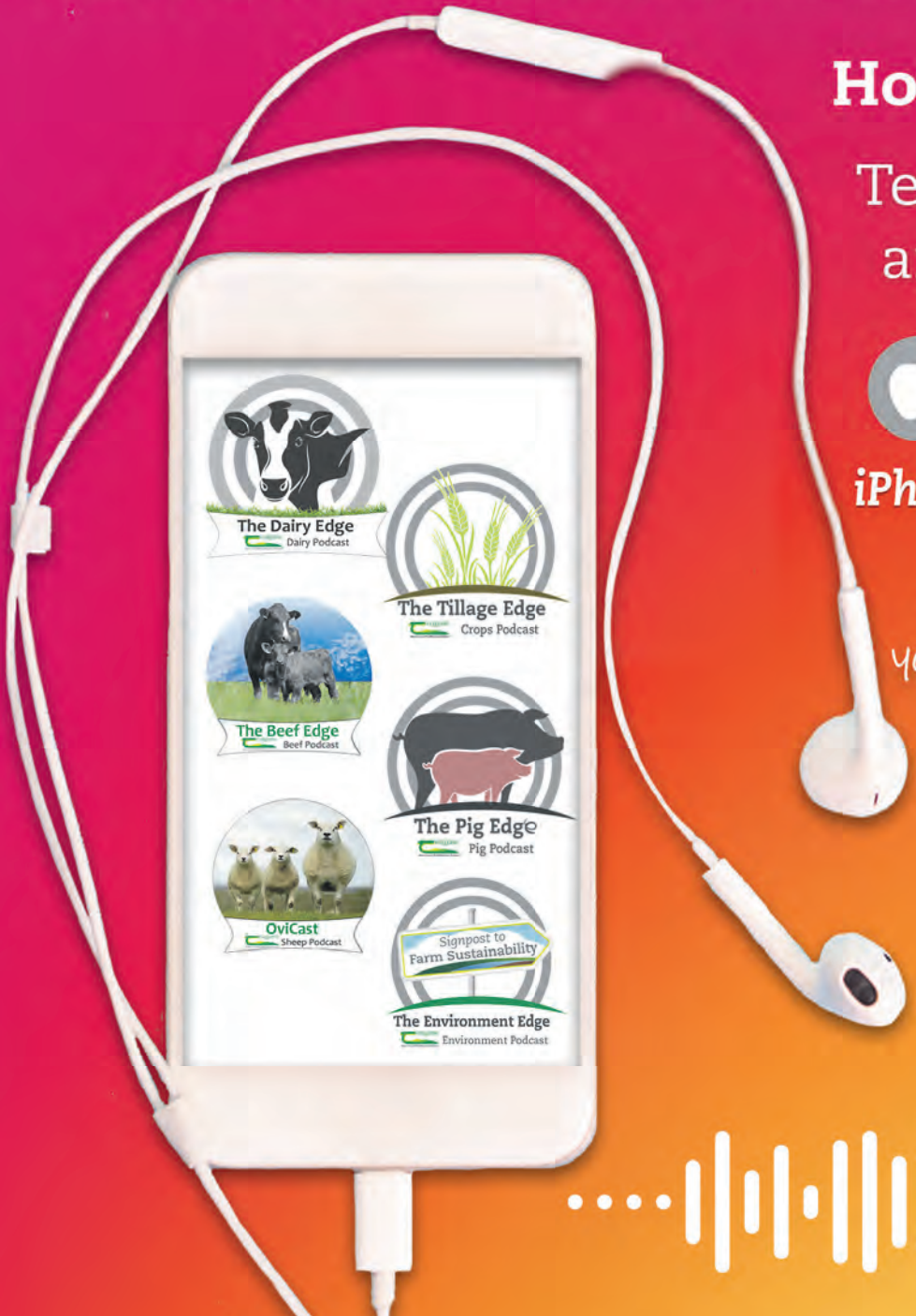


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