

# FOCUS

## FERTILISERS



Fertilizer Association of Ireland

## INTRODUCTION

### Adapting fertiliser usage to a changing farming landscape

**M**aintaining food security at EU and international level has become increasingly challenging due to more erratic weather conditions, increasing energy prices and geo-political issues affecting global trade and the movement of goods.

However, these issues place an increased focus and responsibility on efficient food producing regions of the world, including countries like Ireland, to maintain food supply. It is also an imperative that we sustainably manage and conserve the planet's natural resources, including agricultural soils, for future generations.

Agriculture is a key part of the Irish landscape and the national economy enabled by our productive soils, humid climate and long growing season. Our agricultural systems will have to continue to evolve over the next number of decades and embrace new technologies to combat emerging challenges of changing weather patterns and to meet existing national targets for climate and water quality and future targets for biodiversity and soil health.

Since its formation in 1968, the Fertilizer Association of Ireland has promoted the efficient use of fertilisers to produce quality food in an economical and sustainable manner. As farmers and the wider agricultural industry rise to meet these challenges we need to be prudent to replenish and manage our soil resources in order to maintain their fertility and long term productivity.



**David Wall**  
president,  
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# Fertilizer Association of Ireland



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Nutrient management and fertiliser inputs have been central to increasing global food supply, and efficient use of fertiliser nutrient resources is a key component for achieving climate smart and sustainable food production.

Nutrients such as, N, P, K & S are utilised by plants in the largest quantities and are the main building blocks of food production.

Nutrient inputs represent a significant input cost of production on farms, especially in recent years where fertiliser costs have been relatively high. Grassland and crops rely on balanced nutrition from the soil to produce high yields and to maintain their health and nutritive quality.

However, the sustainable use of applied nutrients on farms is also essential to protect the environment and we must account for factors such as local weather conditions, soil type, and seasonal nutrient demand in deciding when to apply fertilisers and organic manures. Four key aspects need to be considered to help ensure that nutrients are applied and used efficiently are the 4 R's - right product applied at the right rate, right time and in the right place.

In Fertiliser Focus 2024, fertiliser strategies for grassland and tillage farms are discussed for the year ahead. The basics on fertiliser spreader calibration are explained as well as key learnings from recent fertiliser use trends and soil analysis results. The latest in the FAI technical bulletin series (No. 7) "Improving Farm Nitrogen Use Efficiency" is discussed and provides a timely update for farmers and the wider agricultural industry on how to maximise the efficient use of N on farms.

The key points from the technical papers presented at the Fertilizer Association of Ireland Spring Meeting are also discussed. Leading scientist on climate change mitigation in agriculture, Prof. Gary Lanigan discuss the how Irish agriculture can meet its climate change target obligations and



Total N usage per hectare has fallen significantly on SBLAS beef farms since 2020, likely attributed to the increased costs of fertiliser.

various management practices for reducing greenhouse gas emissions on farms as outlined in the Teagasc

Marginal Abatement Cost Curve (MACC). Peter Scott, President of the European Fertiliser Blenders Association, outlines the importance and benefits of achieving balanced crop nutrition for grassland and crop production. He discusses the use of prescription fertilisers tailored to the specific needs of the soil and crops and shares the initial results from this approach to crop nutrition and fertiliser management. Kevin Ahern, farm manager at Shinagh Dairy Farm, Co Cork shares his dairy farming experiences of managing the soils, grassland swards and animals on the farm and the

goal of achieving a carbon neutral farming system in future.

Kevin provides insights to managing soil fertility and organic and fertiliser application management on the farm in conjunction with his Teagasc advisor John McNamara. He discusses the establishment of red clover silage swards and the management of white clover with the grazing swards on the farm and how these have contributed to reduced reliance of chemical N fertiliser.

#### Advice

These experiences from practitioners and advice from experts demonstrate the where soils are maintained and man-

aged effectively, they function correctly and produce quality food in a sustainable manner. It's the Fertilizer Association of Ireland's mission to support farmers and the industry to do just that.

Finally can I remind readers that the Fertilizer Association of Ireland have many resources available to help make better decisions around fertiliser use this coming growing season.

This information is available on our website ([www.fertilizer-assoc.ie/](http://www.fertilizer-assoc.ie/)), follow us on Facebook to see our advice on fertiliser and nutrient use and also our P & K nutrient app, available for android and apple. I would also like to wish all readers the very best success for the year ahead.

## Examining the role of balanced nutrition in sustainable agriculture

Peter Scott, president of the European Fertilizer Blenders Association and technical director with Origin Fertilisers UK and Goulding Soil Nutrition, explains the need for balanced fertiliser nutrition

There is a compelling argument for the need for "balanced nutrition" when it comes to the use of fertilisers, particularly as we face into an era of reduced nitrogen allowances to meet our climate targets.

Balanced nutrition implies extending the focus beyond N, P and K through an integrated approach to nutrient management planning to determine the specific nutrient requirements at crop or individual field level, and then matching them through prescription fertiliser formulations.

Prescription nutrition is already well-established practice in the UK, the US, New Zealand

and throughout northern Europe. It is emerging in many more countries and is likely to continue to grow as more farmers and advisers realise the agronomic, economic and environmental benefits.

In Ireland, fewer than 100 different fertiliser analyses were available to the market with only five products accounting for almost 72% of all compound fertiliser sales nationally. This is in comparison to Britain where the number of different fertiliser analyses available to the market have grown from 250 in 2011 to nearly 18,000 in 2023.

Scott highlights the importance of the application of sulphur, sodium and selenium to

grass crops to optimise growth and yield response from grazing animals.

#### Improved forage quality

In 2019, the National University of Ireland, Galway, conducted a small-scale trial comparing standard and prescription fertilisers for grass yield and quality.

The trial, based on a two-cut system, analysed soil and compared commercially available 'standard' compounds with prescription blends (CAN-based and protected urea-based including sulphur, sodium and selenium).

While total dry matter yield showed no statistical differences, prescription compounds improved forage quality with higher levels of crude protein, energy and water-soluble carbohydrates.

Additional application of sulphur, sodium and selenium in prescription blends led to higher nutrient levels in forage.

### Improving growth rates and liveweight gain using less nitrogen fertiliser

In a 2021 on-farm trial in Northumberland, England, focusing on improving forage quality, a prescription fertiliser was compared with straight nitrogen for rearing lambs on grazed grass.

The prescription fertiliser included phosphorus, sulphur, sodium, selenium and zinc.

Despite a 15.8% reduction in nitrogen, the prescription fertiliser maintained higher grass cover and increased average nitrogen levels by 33.3%.

The lambs grazed on the prescription-treated block showed a 20.3% higher cumulative weight gain from birth to 16 weeks compared to those on straight nitrogen.

The trial suggests that balanced nutrition can offset reduced nitrogen application, potentially improving livestock efficiency.

“Despite a 15.8% reduction in nitrogen, the prescription fertiliser maintained higher grass cover and increased average nitrogen levels by 33.3%

The return on investment for the prescription fertiliser, considering fertiliser and lamb prices, was £4.86 for every £1 spent on fertiliser.

Scott finished by outlining a £3.3m on-farm trial

and research project that Origin Fertilisers is involved in, seeking to reduce the dependence of UK grassland farming on applied nitrogen fertilisers.

#### Trials

Origin Fertilisers will be conducting replicated and farm trials to identify the specific nutritional requirements of these new clover and legume varieties and evaluating whether metallo-catalyst fertiliser coatings can increase nitrogen fixation.

Although NUE-Leg is a UK-based project, it is anticipated the findings will be practically applicable across temperate grasslands in the northern and southern hemispheres.

# Taking advantage of lime spreading



Lime can be spread any day of the year provided soil and weather conditions are suitable. \ Houston Green

Eoin O'Carroll takes a look at the advantages of spreading lime throughout the year, while reminding farmers of the national liming programme deadline

**E**nsure you take advantage of the opportunities to spread lime as they present themselves throughout the year.

Lime can be spread any day of the year provided soil and weather conditions are suitable.

Waiting for October, November and December to apply lime can be a risky strategy as approximately 30% of our annual rainfall comes at that time of the year, resulting in less trafficable soil conditions and the opportunity to apply lime could be missed.

The following identifies a number of opportunities during the year to apply lime.

➤ **Grazing ground:** once fields have been grazed off, it is an ideal time to apply lime. Earmark blocks of land that need lime based on a recent soil test report, eg this could mean ordering a load of lime (25t) after each grazing rotation to correct soil pH. Aim to avoid applying lime on to heavier grass covers (= 750kg DM/ha) as this will reduce the time available for the lime to wash off the grass and into the soil.

“ Waiting for October, November and December to apply lime can be a risky strategy as approximately 30% of our annual rainfall comes at that time of the year

➤ **Silage fields:** ideally leave at least eight weeks between applying lime and closing for grass silage. If it gets too late to apply lime to silage fields this spring, plan to apply lime once the silage has been cut as fields will be bare and soil conditions should be good.

➤ **Lime and slurry or urea:** it is recommended to apply the slurry or urea first and then apply the lime seven to 10 days later, to avoid the risk of N loss. Where protected urea is used, early trial work indicates that it is safe to apply protected to fields that have received lime recently.

## Reminder of deadline for national liming programme

Wet weather over the summer and autumn of 2023 significantly diminished many farmers opportunities to spread lime before the national liming programme deadline and significant numbers of farmers opted to forward buy lime for delivery and spread in spring 2024.

Participants of the national liming programme are reminded to organise the delivery and spreading by 31 March 2024 of the lime they forward bought, if they have not already done so.



## Fertilizer Association of Ireland

# Reducing GHG emissions associated with use of fertiliser and manure

Prof Gary Lanigan and his Teagasc colleagues take a look at how fertiliser plays a part in reducing GHG emissions

**A** marginal abatement cost curve (MACC) is a graph that visualises the abatement potential of GHG mitigation measures, and the relative costs associated with each of these measures.

The Teagasc MACC identifies the most cost-effective pathway to reduce GHG emissions and enhance carbon sequestration in the agricultural, land use, land-use change and forestry sectors plus (bio) energy.

The MACC helps stakeholders to make informed decisions about how to allocate resources for emissions reductions. It provides insights into the cost-effectiveness of different abatement options and helps to identify the least costly ways to achieve a given emissions reduction target.

### New Teagasc MACC needed

It is important to note that a MACC can-

not be static or definitive: the potential for GHG abatement, as well as the associated costs/benefits will change over time as ongoing research programmes deliver new mitigation measures, or as socio-economic conditions evolve.

New agriculture GHG mitigation measures have been added to the current MACC. Additionally, the Russo-Ukrainian war has added considerable volatility in terms of energy and commodity prices.

### Changes in climate change policy

The Paris Agreement in 2015 sets out a global framework to avoid dangerous climate change by limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C. The following EU policy developments have occurred:

Ireland has committed to achieving the following:

- ☞ A reduction of 51% in overall GHG emis-



sions from 2021 to 2030 based on 2018 levels and achieving climate neutrality no later than 2050. These legally binding objectives are set out in the Climate Action and Low Carbon Development Act 2021.

- ☞ In 2022, a 25% reduction in GHG emission relative to 2018 was set for the Irish agriculture sector by 2030.
- ☞ The finalisation of the sectoral emissions ceiling for the Land Use, Land-Use Change and Forestry (LULUCF) sector was deferred for 18 months (Q4 2023) to allow for the completion of the Land-Use Strategy.

### Differences from previous MACC

There are a number of key differences to the previous MACC. These include:

- ☞ The FAPRI Ireland model has been used to update the animal number projections to 2030. This projects a small decline in the overall bovine herd size.
- ☞ The agricultural efficiency measures

(which reduce the carbon footprint but only reduce absolute emissions if the volume of farm output is not increasing) have been separated from those measures that will reduce the absolute emissions.

- ☞ New measures have been added, including age at finishing, feed additives, diversification, etc, and the contribution of some existing measures have been adjusted based on new science (particularly dairy EBI), which has emerged over the last five years and coupled it with forthcoming science.
- ☞ Two adoption pathway levels for measures have been established along three possible scenarios for how animal numbers might evolve.

### GHG emission projection

The 2030 GHG emissions are estimated to be 22.0 MtCO<sub>2</sub>e yr<sup>-1</sup> for scenario one, 21.2 MtCO<sub>2</sub>e yr<sup>-1</sup> for scenario two and 22.9 MtCO<sub>2</sub>e yr<sup>-1</sup> for scenario three.

## How has the potential reduction in greenhouse gases been calculated?

In order to assess the potential contribution of the Agriculture, Forestry and Other Land Use (AFOLU) sectors, four distinctive MACCs were developed:

- ☞ **Agricultural Mitigation MACC** - the reduction potential associated with measures that reduce the total GHG emissions associated with agriculture
- ☞ **Agricultural efficiency MACC** - the reduction potential associated with measures that reduce the carbon footprint of agricultural produce.
- ☞ **Land Use, Land-Use Change and Forestry (LULUCF) MACC** - the reduction potential associated with measures that reduce emissions and enhance sinks associated with Land Use, Land-Use Change and Forestry (LULUCF).

- ☞ **(Bio)Energy MACC** - the fossil fuel CO<sub>2</sub> offsetting potential associated with bioenergy or energy-saving measures in the agriculture and LULUCF sectors.

For the individual measures, the adoption level was assessed under two alternative levels of ambition. In contrast to previous MACC analyses, linear rate of uptake for all measures was not assumed. The rate of uptake was tailored for individual measures. Measures already being adopted, eg LESS, were assumed to be taken up more rapidly, while those still under development, eg animal feed additives, were assumed to start slowly and have accelerated rates of uptake in later years.



A reduction of 51% in overall GHG emissions from 2021 to 2030 is based on 2018 levels and achieving climate neutrality no later than 2050.

## What are the mitigation potentials associated with agriculture across the 2021-2030 period?

### Agriculture MACC- absolute reduction measures

- ⇒ Measures have the potential to reduce emissions associated with agriculture by between 2820 ktCO<sub>2</sub>e yr<sup>-1</sup> (pathway one) and 4857 ktCO<sub>2</sub>e yr<sup>-1</sup> (pathway two) by 2030.
- ⇒ Over the entire period (2021 to 2030), the cumulative emissions reductions potential for agriculture ranges from 13.1m tonnes CO<sub>2</sub>e to 21.1m tonnes CO<sub>2</sub>e when each year is summed together.

## What are the key measures?

### What should farmers and policymakers focus on first?

- ⇒ Management of and reductions in use of nitrogen fertilisers should be the first focus. This can be achieved through a combination of reduced N fertiliser application and altered fertiliser formulation (either protected urea or ammonium-based compound fertilisers).
- ⇒ Key technologies for achieving a reduction in fertiliser use include the greater use of white and red clover, achieving optimum soil pH and soil P/K fertility status in combination with enhanced use of legumes and multispecies swards and use of low emissions slurry spreading (LESS). These can reduce fertiliser use to between 322,590 tonnes N (P1) and 285,727 tonnes N by 2030 (P2).
- ⇒ Altering fertiliser formula-

- tion (switching from CAN to protected urea or an ammonium-based compound) will reduce emissions in 2030 by between 418 ktCO<sub>2</sub>e yr<sup>-1</sup> and 553 ktCO<sub>2</sub>e yr<sup>-1</sup>. Reduced crude protein in animal feed concentrates will also contribute to reduced nitrogen loading in soils.
- ⇒ Manure management, in terms of slurry additives, aeration but also digestate from biomethane facilities could reduce manure ammonia and methane emissions by between 423 ktCO<sub>2</sub>e yr<sup>-1</sup> and 879 ktCO<sub>2</sub>e yr<sup>-1</sup> by 2030.
- ⇒ Increased grassland carbon sequestration of between 310 and 555 ktCO<sub>2</sub>e yr<sup>-1</sup> was estimated to be associated with increased liming, multispecies swards and improved soil fertility.

Table 1: 2030 projected activity data and emissions

	2022	S1	S2	S3
	000 head	000 head	000 head	000 head
Total cattle	7132	6785	6541	7015
Dairy cows	1568	1692	1627	1756
Suckler cows	887	632	504	748
Total sheep	5223	4656	4664	4649
Total pigs	1676	1629	1629	1630
Total poultry	19765	20911	20912	20910
Total mineral N fertiliser tonnes N	343,200	399,156	369,806	420,989
Total GHG emissions Mt CO <sub>2</sub> e		22.5	21.7	23.4

## What are the key take-home messages?

- ⇒ The sectoral target for agriculture can be achieved while maintaining relatively stable agricultural activity levels (scenario one) via an ambitious rate of adoption (pathway two) of identified mitigation measures, and through new science that expands the set of mitigation measures available to farmers
- ⇒ Already, nitrogen sales have dropped by 31% since 2021 to 280,569 t N. In terms of the straight nitro-

- gen fertiliser component, 29% was in the form of unprotected urea, 22% was protected urea and 49% was calcium ammonium nitrate (CAN).
- ⇒ Advisory and extension services will be key to helping guide farmers and landowners on the path to reduced GHG emissions in 2030 and towards climate neutrality.
- ⇒ Continuing research and development of emission mitigation technologies re-

- mains a priority to expand and/or enhance the set of mitigation measures available to farmers.
- ⇒ The amount of GHG emissions reduction achieved through the adoption of the identified mitigation measures is dependent on both the rate and extent of adoption of the various measures by farmers. The Signpost Programme has launched the 12 Steps to Reduce Farm Greenhouse Gas emissions.



## Fertilizer Association of Ireland

# Irish farmers embracing fertiliser bag recycling

Paul O'Brien, IFA, and Eva Ross, Yara, look at how fertiliser bag recycling has increased in recent years

**T**he number of fertiliser bags recycled has doubled in the last five years, to the current 1,000/ year level.

Fertiliser bags were collected at over 200 bring-centres in 2022, operated by Farm Plastics Recycling CLG, which is a sister company of IFFPG the national farm plastics recycling scheme. Farmers were charged at the rate of €10 for each half tonne-sized bag filled with fertiliser bag waste delivered to bring-centres, with almost 20,000 bags of waste collected.

There is an estimated recycling rate of 30-35% currently being achieved for this waste stream. The present level of recycling is in line with the current national plastics packaging recycling rate of 34%.

Recent progress can be attributed to a number of factors. They include the relative convenience (the average farmer is six miles from local bring-centre), and cost effectiveness of the bring-centre service, as well as growing environmental awareness among farmers.

In addition, Repak which is the national packaging recycling scheme, is making more funding available for plastic packaging recycling to ensure that a challenging 50% recycling target is met by 2025. Fertiliser suppliers in Ireland currently



Padraig Ahern and Eoghan O'Sullivan of FWR Ltd, unloading some of the plastic delivered by farmers during the IFFPG farm plastic collection day at Cahir mart, Co Tipperary. \ Donal O'Leary

meet their obligations through Repak membership. This involves paying fees to Repak for every tonne of packaging placed on the Irish market.

In turn, Repak uses this funding to stimulate recycling by subsidising the collection and recycling of plastic packaging. In the case of fertiliser bag recycling, additional Repak funding has been largely used to further increase awareness of the service among farmers.

Key to the success of fertiliser bag recycling is the correct presentation of fertiliser bag plastics at bring-centres. This involves farmers having to segregate the different plastic types into different bags. As bulk fertiliser bags are comprised of

two different plastic types, the outer part of the bag (polypropylene) must be separated from the inside line (polyethylene) before presentation at bring-centres.

The small fertiliser bags, which are made of the same plastic as the liners of the bulk fertiliser bags can be presented mixed together at bring-centres.

The manager of IFFPG, Liam Moloney said that "feedback from recyclers confirms that the quality of presentation of fertiliser bag at bring-centres is improving year-on-year and critical to the recycling success of this waste stream".

All fertiliser bags collected are sent for recycling into a range of new products, including new bags, crates and car parts.

In the case of one Irish recycler, IFF Plastics, which is located in west Clare, fertiliser bags are recycled into fence posts, which are sold back to Irish farmers – an excellent example of the circular economy at work.

IFFPG had another exceptionally successful year in 2022 across the range of farm plastic wastes that the scheme manages. In the case of silage wrap and sheeting waste, which accounts for over 95% of all collections, almost 37,000t of waste were recycled and an 88% recycling rate was achieved (equivalent to plastic from 18m bales), while over 1,100t of netting and twine waste were also collected for recovery.



## Fertilizer Association of Ireland technical publication

The Fertilizer Association of Ireland (FAI) produces its technical publications annually, since its foundation back in 1968. The annual publications are generated and then presented at the FAI spring meetings which are held in February each year, where typically three papers are presented.

In the past, these papers were presented at a winter meeting held in the agricultural faculty in UCD, with the assistance of FAI Council, fertiliser companies, advisory services of AFT/ACOT/Teagasc, UCD, DAFM and oversees research institutions.

On the 50th anniversary of the FAI back in 2018, the council embarked on collect-

ing a full set of scientific publications.

This was completed to the extent of over 95%, with the assistance of past and present FAI members and libraries in UCD and National University of Ireland.

There is now a complete hard copy set of publication in the UCD Library in Belfield.

These papers have also recently been digitised and are fully available at [www.fertiliser-assoc.ie/publications/](http://www.fertiliser-assoc.ie/publications/). This is an enormous source of information to students of agriculture, going back over 56 years, and is used extensively for that purpose. As new publications come to hand, they will also be added to the website.

### Technical bulletin series

This year the FAI will launch the 7th publication in their Technical Bulletin Series. This publication entitled *Improving Farm Nitrogen Use Efficiency*, details a range of steps a farmer can adopt to make the nitrogen they apply go further. This is critically important for the industry as nitrogen fertiliser use has been curtailed and set to be further limited in the future in the Governments Climate Action Plan. By adopting and implementing the measures in the bulletin, farmers can ensure that they maximise the use of the nitrogen that they apply, ensure that productivity will not be impacted, improve the economics and ensure the long term sustainability of the farm. Printed copies of the bulletin will be available by contacting the Fertilizer Association or by downloading a copy from the website. Link to technical bulletin QR code attached.



# Improving farm N use efficiency in Shinagh

**Kevin Ahern**, farm manager at Shinagh Estates, and **John McNamara**, Teagasc, give an insight into N use efficiency

**K**evin Ahern manages Shinagh dairy farm, milking 250 cows in a spring-calving system. The farm is part of the Farm Zero Climate (FZC) programme run by Biorbic, Carbery and Teagasc and funded by Science Foundation Ireland (SFI). It was set up in 2011 by converting a beef farm to dairy. It is leased from Shinagh Estates Limited, which is owned by the west Cork co-ops, Bandon, Barryroe, Drinagh and Lisavaird. It achieved its initial objectives to make a return on all the factors involved: land lease, labour and loan repayments.

Over the last number of years, there has been a major focus on the farm to improve farm sustainability and reduce farm emissions without compromising on profit. A number of areas have been addressed, from optimising soil fertility, to making better use of slurry and reducing overall farm chemical N use through increased N fixation by clover.

#### The farm

The farm consists of 102ha in total, including leased ground. There is 84ha available to graze by the milking herd; the rest is outside ground used for silage and grazing with dry cows and in-calf heifers in the autumn. There were 242 cows milked in 2023. The herd is mostly cross-bred, Friesian x Jersey cows, with some Norwegian Red influence too. Its EBI is 257. Kevin Ahern is the farm manager and main labour, assisted by a second-in-command Eoghan Ahern, with student labour in spring for the calving season.

#### Grass and fertiliser

In 2023, 12.15t of grass dry matter were grown using 114kg/ha of artificial nitrogen (N), 20 kg/ha of artificial phosphorous (P), and 62kg/ha of artificial potassium (K). The farm organic stocking rate was 224kg/ha, and the herd is in band two for nitrates directive regulations (92kg of organic nitrogen per cow). That is an overall farm stocking rate of 2.5cows/ha and a milking platform stocking rate of 2.9 cows/ha.

#### Calving and breeding

It is a spring-calving herd with an EBI of €257. The planned start of calving is 7 February and 90% of the herd was calved in six weeks in 2023. Half the herd was calved by 21 February. It is a fertile herd, with a calving interval of 362 days last year. There was a 98% submission rate in the first three weeks of breeding and just 9.2% of the cows were not in-calf after 11 weeks of breeding. The cows have movement monitors on them and these are used for heat detection.

All breeding is now by AI, with no stock bulls used on the cows. The replacement heifers are contract-reared by a local farmer, leave the farm at two weeks of age and return as in-calf heifers in November, prior to calving the following February. All heifers calve down between 22 and 24 months of age.

#### Herd performance

The herd supplied 5,264l of milk to Bandon co-op in 2023, at 4.68% fat and 3.76% protein. This is 458kg of milk solids supplied per cow. Average somatic cell count

(SCC) was 171,000 and TBC was 9,000; 876kg of ration was fed per cow.

#### Farm soil fertility

Building soil fertility has been a key priority over the last number of years. Since 2021, the farm has moved to annual soil-sampling to monitor soil fertility chang-

es; the farm nutrient management plan is updated each year to reflect new soil test results.

#### Soil pH and lime

In 2021, soil test results showed that 66% of soils had a lime requirement, with 59% of soils at pH 6.2. Lime was applied over

the last two years and soil pH levels show that 97% of soils are optimum (>pH 6.3). Correcting soil pH is the first thing to get right at a very low cost and will increase



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Over the last number of years, there has been a major focus on the farm to improve farm sustainability and reduce farm emissions without compromising on profit



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the recycling of soil N supply throughout the growing season. It will provide the optimum soil conditions to make best use of applied nutrients in either the organic or chemical form.

## Soil P and K

Soil P and K levels were relatively good, as there is a low percentage of soils testing at P and K index 1 and 2. While the majority of soils are testing at index 3 and 4. Over the last two years soils at P index have reduced from 53% to 31%, which is positive and shows the value of soil tests on nutrient distribution around the farm. Today there is 50% of farm at the agronomic optimum P index 3.

There is a low percentage of soils testing at K index 1 and 2, which is very typical of many Irish soil types. The majority of soils are testing at K index 3 and 4, with a different trend than P, where soils at K index 4 have increased from 31% to 61% over the last two years. This is an asset especially on the grazing parts of the farm and shows that nutrients in cattle slurry can be diverted to other areas of the farm, for example soils at K index 2 to ensure a better farm nutrient balance.

## Optimum soil fertility on the farm

Since 2021 soil fertility has improved from 18% to 60% from the correction of soil pH through targeted lime applications. Correcting soil pH will increase the soil supply/efficiency of both P and K, especially P, and effective management of these nutrients during this period brought much savings in the purchase of these two major plant nutrients.

Optimising soil fertility levels delivers many benefits from improving farm N use efficiency to providing the basis for clover establishment and productivity. The target in the Signpost programme is to optimise 85% of soils to optimum soil fertility. Soil sampling will continue on an annual basis to monitor soil fertility levels and ensure optimum use of applied nutrients as either organic manures or fertilisers.

## P and K fertiliser management

In 2024, the aim will be to correct any remaining soils at P and K index 1 or 2 through targeted application of nutrients, as per the nutrient plan. Soils at index 3 will be maintained through appropriate nutrient applications. Soils at P and K index 4 will only receive N and S, and further draw down soil P and K reserves. Index 3 is the sustainable P and K index for both productivity and environmental quality. This shows the value of soil testing on a regular basis to optimise soil fertility levels, depending on soil type around the farm.

## Farm N use efficiency

Farm data would show that over the last number of years, soil N use efficiency has increased from 31.5% in 2021 to 51.6% in 2022. Good soil fertility would be the foundation to improving farm N use efficiency, in combination with the rate of N applied. Increased incorporation of clover reduces farm chemical N requirements, thus improving farm N use efficiency.



The herd grazing at Shinagh.



Kevin Ahearn.

## Reducing chemical N use by 45%

All farmers are being asked to reduce their reliance on chemical N and switch from using CAN and straight urea to protected urea. Kevin was reluctant in engaging with part one of this objective. He was very nervous about cutting N by 30%+, while at the same time maintaining grass grown on the farm and not having to resort to buying in additional feed to make up a potential shortfall in grass grown.

But this has been a good news story. Chemical N has been reduced by 45%, or from 207kg N/ha, in 2020 to 114kg N/ha in 2023. While at the same time, grass grown in 2023 is 12.2t DM/ha, down just slightly on 13.4t DM/ha grown in 2020.

Growth was lower in 2022 at 11.7t DM due to a severe drought. Farm data shows that over the last number of years, soil N use efficiency has increase from 31.5% in 2021 to 51.6% in 2022.

## Multi-species swards

Each year since 2020 a paddock has been reseeded using a multi-species mixture. This mixture consisted of perennial ryegrass, clover, plantain and chicory. They have performed very well and are some of the highest-yielding paddocks on the farm. These are also the paddocks with the highest clover content. Clover has thrived in these low nitrogen application paddocks. The plantain and chicory has decreased in content each year.

## Clover

Clover is the main driver of the reduction in chemical N use on this farm. They started with trying out clover on some paddocks and got confidence in it when they could see what it could do in terms of replacing artificial nitrogen. Kevin encouraged the clover by backing off applying N over the summer to these paddocks, so that he could see what the clover could do. They matched neighbouring paddocks that were getting their full complement of artificial nitrogen.

The clover paddocks did get soiled water during the season. Initially these paddocks got nitrogen in spring for the first two rounds until Mid-April. In 2022 one paddock got no nitrogen for the full year and in 2023 this was increased to three paddocks. The performance of these paddocks has given the farm the

confidence to try this approach on more paddocks in 2024.

Top seeding (oversowing) has about a 30% chance of being a success and very much depends on having the paddock well grazed off before applying the seed, damp weather afterwards to ensure the seed germinates, and then grazing the paddock for the next two to three times at very low grass cover in order to prevent the grass shading out the tiny clover plants. Full reseeding at a 2kg of clover bare seed per acre seeding rate is a surer way of getting a successful result. This has been employed on the low-yielding grass paddocks, as they require reseeding.

At this stage, 60% of the farm has a clover content of at least 15%. The silage ground that is not on the grazing block has been reseeded to a red clover and grass mixture. This only gets slurry and artificial P and K. It gets no chemical nitrogen.

Below is a table showing the different amounts of chemical nitrogen applied to paddocks in 2023 and their grass yield. The high clover paddocks tend to be the newer reseeded paddocks.

Conclusions are that swards with high clover levels and low bag nitrogen can match the grass grown on swards where ryegrass is supplemented with high levels of bag nitrogen.

## Red clover

Kevin reseeded the first of the outside silage ground to a red clover/grass mixture in September 2021. It struggled to compete with chickweed the first winter and spring. It was grazed in late autumn with in-calf heifers and again the following early spring, very carefully using on-off grazing with late-calving dry cows. The grazing solved the weed problem and this field has gone on to produce good yields of silage in 2022 and 2023. A further silage field was reseeded to red clover/grass mixture in 2023. These fields get no artificial nitrogen. They get the necessary amounts of P and K from slurry before and after each silage cut, and are topped up with straight P or K if neces-

sary. These fields are matching the yields of the conventional silage paddocks that get a full allowance of chemical nitrogen.

## Slurry

All slurry is applied to the land by a contractor using a low emission tanker (LESS). No slurry gets applied until February, when it will go on 25% of the grazing area. It is used on the paddocks that were first to be grazed in March. Then all silage ground will get an application before first cut silage. Kevin says they are getting to the point that there isn't enough slurry on the farm and he is minding the slurry to apply to the red clover after each cut. This means holding back some slurry to apply in September after the final silage cut. The farm has invested in extra tanks to make sure that valuable nutrients in the soiled water produced in November is stored and available for spreading in spring.

## Avoiding waste

All fertiliser on the Shinagh farm is spread by contractor. The contractor uses GPS equipment. There will be no overspreading just to empty the spreader, as the accuracy of the GPS equipment ensures this does not happen. Fertiliser manufacturers report a 10% savings in fertiliser use from GPS spreading.

## Protected urea

Protected urea has been used since 2018. Initially the reason was it was cheaper than CAN per unit of nitrogen. The farm has become more environmentally conscious and knows that is better for the environment than either CAN or straight urea. The cost of the protection is offset by the increased efficiency and one can use slightly less of it for the same grass growth. However, there is a need for more urea-based compounds with P and K. They have found themselves having to use straight super P (16% P) and muriate of potash (50% K). The only compound fertilisers used now are 10:10:20 for reseeding.

Clover content	Chemical N (kg/ha)	Grass grown (kg DM/ha)
High clover	0	12.44
High clover	21kg in spring only	11
High clover	62kg in spring only	11.76
Low to medium clover	182	12.55

# Fertiliser testing and spreading calibration equipment

John Carroll, Tirlán, takes a look at the variation of spreading patterns and spreader calibration

**A**chieving a good spread pattern when applying fertilisers is critical to ensure best return on investment and reduced impact on the environment.

Spread patterns with coefficient of variation (CV) values less than 10% are considered good, with little or no yield loss. A slight loss will occur when the CV value is in the range 10-15%, but at CV values of 20% or greater are where the effects begin to bite. When striping starts to become visible, yield losses are probably costing more than €30/ha. Losses increase rapidly as CV values rise, especially when quality effects, such as screenings or nitrogen content, come into play. A lodged crop of wheat could easily result in a reduced revenue of €250/ha because of poor spreading.

Below are six tips and tools for ensuring a good spread pattern.

## 1. Consult the book/app/chart on setting up the fertiliser spreader

In order to spread fertiliser accurately, you require the machinery instruction booklet for your specific make and model of spreader. Many spreader makes and models have apps that can be loaded to your phone, which also help.

## 2. Specific weight/bulk density of the fertiliser

The density of fertiliser particles will influence the spreading characteristics of a product. A heavier particle will generally travel further for a given size range. Increasing particle size, increases the distance that particles will travel for a given release speed. While most fertilisers will weigh close to 1kg/l, some will vary considerably. Urea-based fertilisers will weigh significantly less. Lighter, less dense fertilisers, such as urea, unless they have large grains, can be difficult to project across wide distances.

## 3. Size of granules

Information in relation to percentage of granules that fall into four different sizes is very often required when setting your spreader. The aim for a good blend will be for the careful matching of particle sizes, with similar particle size distribution, density and shape.

## 4. Hardness of the granules

The product needs to fit for the purpose for which it is intended. A number of quantifiable quality tests can be used to dem-

onstrate varying attributes of hardness. Granule crushing strength is a measurement of the pressure the particle can withstand before fracturing. If granules are soft, the veins on a fertiliser spreader can shatter the granules, and so the fertiliser will not travel the distance off the veins. PTO speeds need to be adjusted for softness of granules.

## 5. Fertiliser flow metre

Flow rate is checked with the particular fertiliser through the spreader that you are working, and different spreaders have different ways of measuring this.

## 6. Trays/mats for checking accuracy of spread

In order to check that your spreader set-

tings are accurate for the fertiliser you intend to spread, and that your fertiliser spreader is working well, you need to carry out a tray test periodically. This is where you lay out trays at various intervals/ distances.

Spread the fertiliser across these trays and measure the amount of fertiliser in the individual trays.

BELOW: Francis Quigley demonstrating how to calibrate a fertiliser spreader.





# Fertiliser and soil fertility trends

John Carroll, Tirlan, Mark Plunkett, Teagasc and Finbarr O'Regan, DAFM look at the trends for chemical fertiliser in previous years

Over the last two years, there has been major disruption to the normal trading fertiliser channels due to the unrest in western Europe. This has resulted in fertiliser nitrogen (N) prices hitting the highs of €1,000/tonne and phosphorus (P) and potassium (K) doubling in price.

This has a dramatic impact on fertiliser N use, where fertiliser stats show that chemical N reduces by 25% compared to 2018. P and K use has also taken a dramatic drop over the last two years, with P and K usage reducing by 33% since 2021.

Also during these last two years, N use is averaging 311,881 tonnes (t), which is below the Government target of 330,000t by 2025 to stay within Climate Action Plan targets. To sustain lower N use in the years ahead, it's critical that sufficient P and K are applied to ensure soils are in the optimum index to drive N-use efficiency.

**Table 1: Chemical nitrogen trading trends in recent years**

Year	Chemical Nitrogen nutrient (tonnes)	Change on previous year
2018	408,495	115%
2019	367,364	-10%
2020	379,519	3%
2021	399,164	5%
2022	343,193	-14%
2023	280,569	-18%
2025 (target)	<330,000	-
2030 (target)	<300,000	-



These last two years, N use is averaging 311,881 tonnes, which is below the Government target

The use of compound fertilisers has reduced again significantly in 2023 – total tonnage of total compounds has reduced by 15% compared to 2022. For example, 18-6-12 has reduced for the second consecutive year by 20%. We estimate that reduced fertiliser use in 2023 has reduced carbon emissions by approximately 1.6%.

Another target in the Climate Action Plan 2023 targets 90% to 100% uptake of protected urea on grassland farms by 2030. This equates to 90% to 100% of



## Fertilizer Association of Ireland Soil Science Award

Every year at the UCD awards ceremony, the Fertilizer Association of Ireland award the Soil Science Award. The winner in November 2023 was James Higgins from Co Wexford. His father (above) received the award on his behalf, as he was on professional work experience in New Zealand.

all straight nitrogen spread as protected urea in 2030. Table 2 shows the use of CAN, urea and protected urea in 2023.

Overall urea use has reduced by 6% in 2023. Protected urea makes up 22% of all straight N used and we see use has increased by 15% (including compound N) in 2023.

Ordinary urea makes up 29% of all

straight N applied with a decrease of 16% in 2023. CAN-based straight N use reduced by 30% in 2023.

Protecting all the straight urea used by farmers would make a huge difference to meeting our national ammonia targets

now and into the future.

Urea and protected urea now make up a combined 51% share of the straight nitrogen market, and if all this was protected, farmers would be almost 57% of the way towards the 2030 Protected Urea Target.

**Table 2: Chemical nitrogen source in straight nitrogen fertilisers 2023**

Year	Chemical N nutrient (tonnes)	% straight chemical N
2023 straight urea chemical N	45,022	29%
2023 protected urea chemical N	34,000	22%
2023 CAN chemical N	77,230	49%
2023 chemical N as straight N fertilisers	156,342	100%
MACC 2023 Target	138,043	-

## Increased requirement for farmers to soil sampling

Soil sampling and analysis for phosphorus (P), organic matter (OM) and soil pH shall be done in accordance with requirements of the Department and as outlined in Schedule 1 of the Nitrates Directive GAP Regulations that came into effect in March 2022. The 5th Review of the GAP Regulations carries the following now-relevant changes:

➔ A) From 1 January 2023, all farmers with a previous year's grassland stocking rate (GSR) above 130 kg N/

ha, prior to the export of manure, must take soil samples.

➔ B) Where soil samples are not taken, for whatever reason, then it is assumed phosphorus Index 4 until soils are taken. Since March 2022, this applies to all farmers who have a previous year's GSR of and above 170kg N/ha prior to the export of livestock manure, and all farmers above GSR 130 kg N/ha, from 2023 on.

➔ C) From 1 January 2023, all arable land sown must be soil

tested and assumed Index 4 without soil samples.

➔ D) **OM determination:** from 2022, soils greater than 20% OM (as per Teagasc/EPA Indicative Soils map) are not required to carry out an OM determination. Unless a holding does not accept their soils have an OM content of 20% and above, then a soil test including OM determination must be taken. Soil test result determining OM content will be valid for 12 years following sampling.



Ordinary urea makes up 29% of all straight nitrogen

## FAQ on the National Fertiliser Database – Feb 2024

### Q1: Can I still register and declare closing stock?

A1: If you have not already made a return on the National Fertiliser Database, you can still register and declare your closing stock.

### Q2: What do I need to do if I have fertiliser that is going to be used by another farmer?

A2: If you wish to transfer fertiliser to be used by another farmer, you must also register

as a Fertiliser Economic Operator (by ticking a separate box) and enter details of the fertiliser that has been transferred.

### Q3: I import fertiliser onto my farm, what do I need to do?

A3: If you import fertiliser, you must register as a Fertiliser Economic Operator and then enter details of all fertiliser imports within 72 hours of the product arriving into the country.

### Q4: I want to buy fertiliser from my supplier, what do I need to do?

A4: Once you are registered, when you go to buy fertiliser, you will be asked for your herd number, which is your unique registration number. The co-op/agri-merchant will input details of the transaction onto the National Fertiliser Database and the transaction details will be registered against your herd number.