Why you must use less bagged nitrogen

Improving soil fertility, using LESS and incorporating clover enables you to cut bagged nitrogen without losing yield. But if, in reality, you don't cut your bought-in fertiliser, there's little reduction in greenhouse emissions and no cash divided for you.

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How do steps taken on your farm affect the total greenhouse gas (GHG) emissions calculated for agriculture as a sector? To answer this question, we need to consider what counts towards agricultural GHG emissions and the proven GHG reduction technologies available to farmers.

How are greenhouse gas (GHG) emissions from agriculture calculated?

The 'national inventory', overseen by the Environmental Protection Agency (EPA), accounts for the total GHG emissions released within the borders of Ireland during any given year.

The EPA reports national GHG emissions for all sectors, one of which is agriculture.

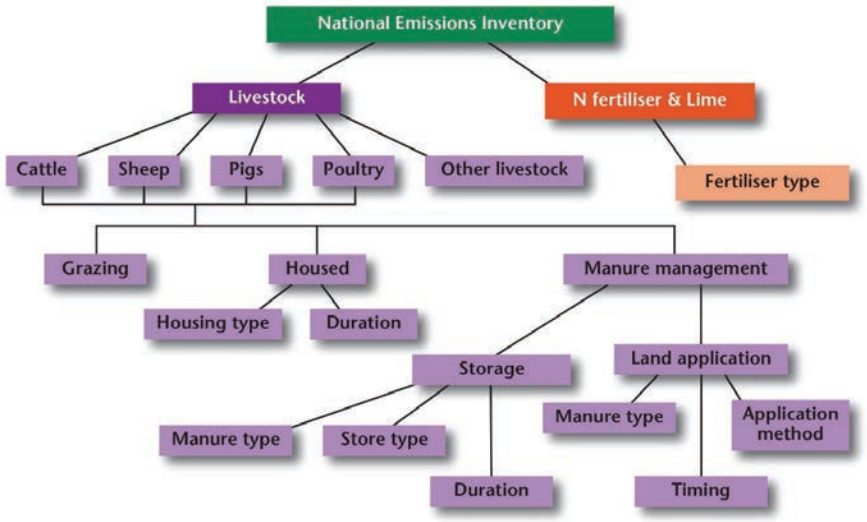
It's complicated by the fact that different industries produce different greenhouse gases. So, in contrast to other sectors which are focused on the GHG carbon dioxide, the agricultural sector concentrates on methane and nitrous oxide (N_2O). These two gases together contribute over 90% of total agricultural greenhouse gas emissions.

Figure 1 shows that livestock and chemical N fertiliser are the main sources of GHG emissions.

There is a major focus on reducing our reliance on chemical N fertiliser because we have a very robust suite of tools (LESS, protected urea, clover swards, etc) to replace it without compromising yield.

What are the main strategies to reduce emissions from nitrogen fertiliser?

Figure 1: Greenhouse gas emission sources from the agricultural sector (EPA, 2022).



1 Get soil fertility right. Moving from soil pH 5.5 to 6.3 can make up to 70kg N per ha per year available to the crop as well as reducing N_2O emissions per kg of N applied. Target Index 3 for P and K.

2 Apply slurry using LESS between February and May. Slurry nitrogen fertiliser replacement value can be increased (and ammonia emissions reduced) by between 25% and 50% through using dribble bar or trailing shoe technology.

3 Use clover or multispecies swards. Clover can fix 80kg to 120kg N per ha per year depending on underlying soil fertility and sward management. Multispecies swards also offer extra benefits in terms of drought resistance and animal health.

4 Include legumes such as beans in a tillage rotation; grow over-winter cover crops to reduce N leaching; and incorporate organic manures.

5 Replace CAN and urea with protected urea. For the chemical N used on the farm, replace CAN and urea with protected urea. Protected urea is 30% cheaper than CAN/urea, delivers the same grass yield, and can be used throughout the growing season within the regulated spreading period. Most importantly, it reduces GHG emissions by 71%.

What is meant by enabling actions?

Enabling actions are actions that a farmer can take which allow him/her to reduce the quantity of chemical N used on the farm, while maintaining yield. Enabling actions include liming, making better use of slurry and incorporating clover into grassland swards.

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Patrick O'Neill was able to save over €17,000 by reducing his use of bagged fertiliser in 2022. \ Mark Moore

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How are the enabling actions accounted for in the National Inventory of greenhouse gas emissions?

For the enabling actions (liming, LESS, clover, etc) to reduce GHG emissions, chemical N fertiliser application must be decreased by the amount of N that each measure saves; otherwise there is little or no GHG saving.

And you, the farmer are losing out as there is no cost saving from applying lime, using LESS or incorporating clover, etc. The National Inventory does not measure clover incorporation levels (remember that the National Inventory picks up the benefit of clover in reduce fertiliser usage).

It does measure lime application, which actually counts as a small increase in GHG emissions, but the savings from the reduced N fertiliser application due to liming are much greater.

In short, if chemical N doesn't decrease, agriculture won't get the credit for it in the inventory and you don't get the benefit in your pocket.

Harvesting the benefits of clover swards

Patrick O'Neill farms in partnership with his father Tom, 5km north of Edgeworthstown in Co Longford. They milk approximately 115 cows, supply Lakeland Dairies, and rear their own replacements. Patrick is a participant under the Ballyhaise Monitor Farm project. "The project was set up by Donal Patton to replicate some of the work being done at Ballyhaise College at commercial farm level," says Patrick. "This work revolved around establishing clover and reducing nitrogen inputs."

The O'Neills hosted a very successful event in April 2022 as part of a wider series farm walks promoting the use of clover at farm level.

Clover has been gradually built up on the farm over recent years. "Initially, our aim was to over-sow around three suitable paddocks per year, while also incorporating clover through any reseeding," says Patrick. "Reseeding was more successful than over-sowing and this seems to have been the experience of other farmers in the area too."

According to Patrick, "establishment of clover is one thing but management is equally important".

"We have followed the advice as best we can in relation to the management of these swards and have managed to reduce our chemical N use significantly while continuing to grow between 13t and 13.5t DM/ha across the farm."

Instead of the normal application of 20 units per acre of N only seven to eight units are applied on these swards from May onwards. A point emphasised by Patrick is that it is important to realise that you need sufficient clover in a paddock to apply the reduced N strategy.

Patrick and his Teagasc advisor Seamus Nolan. \Mark Moore

"There is little point reducing or eliminating N application in paddocks where there is only 5% clover present," confirms Patrick.

While no issues have arisen with bloat to date, Patrick is conscious that as the clover content increases on the farm this will be an area he may have to focus on more.The O'Neills have also invested in LESS technology.

"We have seen huge advantages in applying LESS technology on this farm," states Patrick. "Not alone does it allow more efficient use of the N in the slurry, it fits in well with clover sward management. "It's important to remember that clover swards have a low N demand but do still have a P and K requirement and the use of LESS allows me to apply a lot of these nutrients as slurry.

Importantly, Patrick has reduced chemical N use as a consequence of incorporating clover, making best use of slurry and improving soil fertility.

Patrick has seen a saving of €17,435 and a reduction in total GHG emissions of 2%, due to a reduction in chemical N use from 214kg N per ha in 2021 to 115kg N per ha in 2022. A reduction in yield was observed in 2022 due to drought. This is consistent with Pasturebase data.

Table 1: Impact of a reduction in chemical N use on key performance figures for Patrick O'Neill.

THE SIGNPOST PROGRAMME

	2021	2022
Chemical N use kg/ha	214	115
Chemical N saving kg/ha		99
Value per kg N		€2.38
Total farm saving		€17,435
Emissions reduction	Reducing by 99 kg N / ha	2%
Grass grown t DM / ha	14.4	13.3*
Clover levels on the farm	11% clover with 24% of the area under clover	18% clover with 35% of the area under clover