

Table 2. Nitrogen availability – time and method of application

Method	Spring	Summer
Splash plate	0.9kg Nitrogen per m <sup>3</sup> (8 units N/1000 gallons)	0.7 kg Nitrogen per m <sup>3</sup> (6 units N/1000 gallons)
Dribble bar/trailing shoe	1.0 kg Nitrogen per m <sup>3</sup> (9 units N/1000 gallons)	0.8 kg Nitrogen per m <sup>3</sup> (7 units N/1000 gallons)

## Slurry application rates

Some modern tankers have positive displacement pumps that can be metered, allowing the operator better control over application rates. Contractors with umbilical systems may have flow meters and GPS for more accurate spreading.

Farmers and contractors can work out the required forward speed of a tractor when spreading slurry for a set application rate:

The variables to be considered when calculating the required forward speed are the desired application rate, the capacity of the tanker, the width of the spread and the estimated time to empty the tanker.

An example of this calculation is as follows:

- 3,000 gallon (13.5m<sup>3</sup>) tanker
- Application rate 3,000 gal/acre (33m<sup>3</sup>/ha)
- Spread width 7.5m
- Time to empty 4 minutes

### Step 1

How many loads/ha: (application rate divided by tanker size) - 33m<sup>3</sup> divided by 13.5 = 2.44 loads/ha

### Step 2

Area per load: 1ha/2.44 loads/ha = 0.41ha covered per load

### Step 3

Distance per load: Area 0.41 ha multiplied by 10,000 to convert hectares to in m<sup>2</sup> divided by spread width (7.5m) = 545 metres travelled per load

### Step 4

Speed of travel: Metres travelled per load/ time to spread (545m/240sec) = 2.27m/s or 8.2km/hr

## Summary

1. Ammonia is a major challenge for agriculture: it is bad for the environment and nitrogen losses cost farmers money.
2. LESSE equipment reduces ammonia losses during slurry spreading, whilst saving on chemical fertiliser requirements.
3. Organic and inorganic fertiliser should be applied following the development of a Nutrient Management Plan to include: soil analysis of each field, crop requirement, manure quantity and type applied.

# Low Emission Slurry Spreading Equipment (LESSE)

Manure nitrogen (N) is in two forms: slowly available organic N and readily available ammonium N. Approximately 50% of the total N is in the form of ammonium N and this can be easily lost as ammonia gas to the atmosphere from sheds, stores and following slurry application. Spreading slurry using LESSE is a proven way to reduce the loss of ammonia to air, whilst increasing the amount of available N for crop growth from slurry applications.

## What is LESSE?

Low Emission Slurry Spreading Equipment is based on the principle of surface area to volume ratio. Reducing the surface area of the applied slurry decreases the amount of ammonia emission potential from land application of slurries.

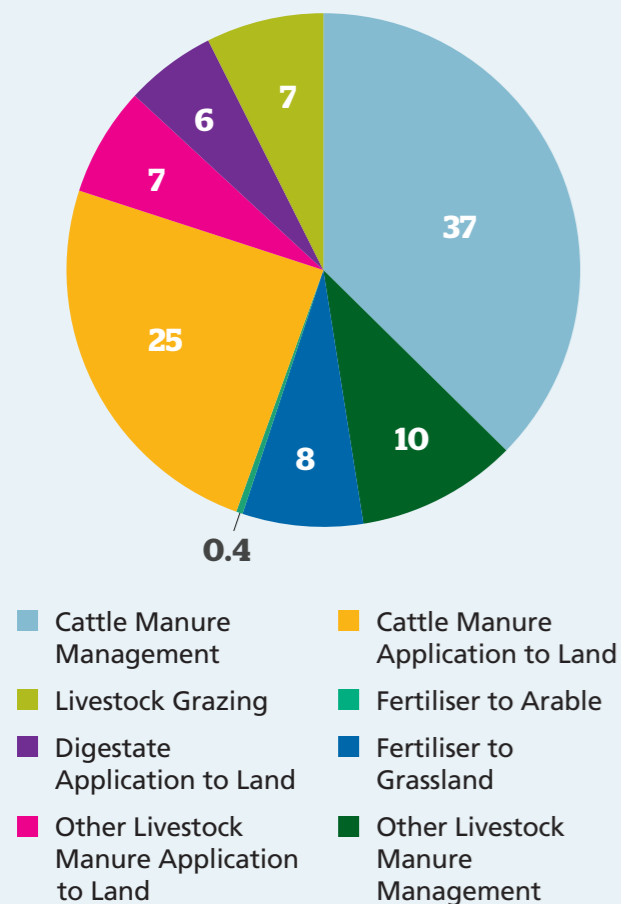
## Why use it?

- Ammonia is a major issue facing Northern Ireland agriculture with 32% of emissions associated with the spreading of manures from cattle and other livestock. Approximately 30% of all ammonia losses occur in the first hour after manure spreading, with 80% being lost within 12 hours. Ammonia emissions from slurry can be reduced with the use of low emission spreading equipment compared to the traditional splash-plate spreading method.
- Slurry management and how farmers develop their future nutrient management plans will have a big influence on a number of key sustainability challenges. These challenges include phosphorus, nitrates, ammonia and carbon.
- Where phosphorus is concerned, the issue is very much focussed on run-off into water courses and diffuse pollution from overloaded soils. The same principle holds when it comes to reducing the level of nitrate ending up in our rivers and lakes.
- Correct use of LESSE reduces the risks around phosphorus and nitrate, reduces emissions of ammonia and overall greenhouse gas emissions associated with spreading slurry.

## A switch to LESSE from splash-plate has the following benefits:

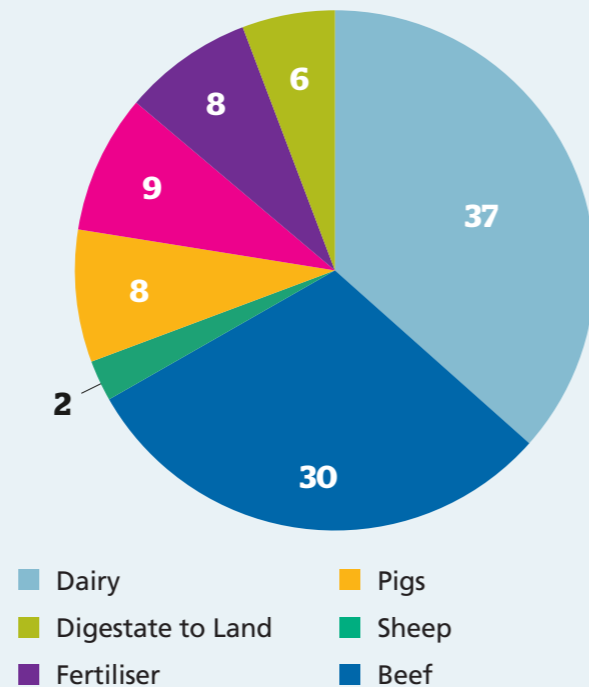
- Reduces ammonia emissions.
- Reduces phosphorus run-off.
- Reduces the need for chemical fertiliser.
- Presents opportunities to utilise slurry in grazing systems without cattle subsequently rejecting the grazing sward. (Ideally slurry should only be applied to grazing swards if soil analysis indicates a requirement for P).

Figure 1 (data shown as %) Northern Ireland agricultural ammonia emissions (2021) by activity category.



Source: Rothamsted Research, 2023

Figure 2 (data shown as %) Northern Ireland agricultural ammonia emissions (2021) by livestock and fertiliser category.



Source: Rothamsted Research, 2023

## How does LESSE work?

- Band spreader/dribble bar/trailing hose slurry is deposited in bands at or near ground level, depending on crop cover.
- Trailing shoe slurry is deposited directly on the soil surface.
- Shallow injection: slurry is deposited just below soil surface, typically 4-6 cm deep in narrow slots cut into the soil 25-30 cm apart.
- Deep injection: should only be used when the soil is sufficiently dry and not on land with a drainage system shallower than 70 cm depth in order to prevent water pollution. Deep injectors cut slots 10-30 cm deep and are spaced 50 cm apart.

## Effectiveness and benefits of using LESSE: Impact at farm level

- Retain more N on farm to grow grass, which will reduce fertiliser N requirements and expense.
- 21% increase in grass yield by using trailing shoe over splash plate.
- 19% increase in grass yield by using dribble bar over splash plate.
- LESSE reduces the surface area spread and so reduces the amount of slurry exposed to the air.

Table 1: Impact of slurry spreading method

	Splash plate	Dribble bar	Trailing shoe	Shallow injection	Deep injection
Ammonia reduction (%)	0	30	60	70	90
Dry matter of slurry that can be spread (%)	Up to 12	Up to 9	Up to 6	Up to 6	Up to 6
Crop damage	Moderate	Low	Low	Moderate	High
Odour	High	Moderate	Low	Low	Very low

## Things to be aware of:

- Farmers will need to ensure they have a tractor with adequate horsepower for the tanker size and type. A 2,000 gallon tanker requires approximately 130hp tractor, while a 3,000 gallon tanker will need up to 200hp.
- With LESSE equipment such as a dribble bar or trailing shoe, slurry flows from the tanker at a faster rate than with a traditional splash plate tanker, therefore the speed of the tractor needs to be increased for the same application rate.
- A dribble bar weighs ~0.5 tonnes, while a trailing shoe is over 1 tonne.
- Lower dry matter slurry will be easier to handle through LESSE equipment and will also result in lower ammonia emissions.
- Application rate should be calculated as part of your Nutrient Management Plan.
- Consider the amount of vegetative cover at the time of spreading. Always try to minimise sward contamination by spreading with as little crop cover as possible.
- Always consider current and forecast weather conditions – heavy rain during or after spreading will cause significant run off to water courses.
- Take account of ground conditions, do not spread on saturated soils regardless of the method used.
- When creating your Nutrient Management Plan it is important to consider application method as this will determine applied nutrient availability (Table 2).