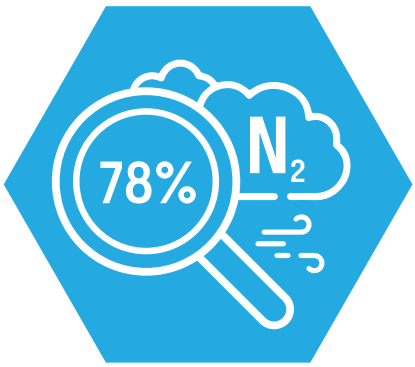
Why Nitrogen Matters in Livestock Production

This fact sheet highlights the roles different forms of nitrogen have, explains where losses occur from the nitrogen cycle and how we can best measure efficient nitrogen use. Informed by the key findings within the full report 'Why Nitrogen Matters in Livestock Production'.

Background

Nitrogen is essential in biology and importantly forms the building blocks of protein and DNA. Proteins are fundamental to all cellular processes, including enzyme production and converting DNA code to functional proteins. Proteins are also components of key structures and processes in plants and animals, including cell growth and repair.

Nitrogen is cycled through the air, soil, water and living organisms. Seventy-eight percent of air is made up of nitrogen gas, but plants and animals are unable to absorb nitrogen in this form. The cycle is important because it allows nitrogen gas to be converted into compounds which can be used by plants and animals in protein production.



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Nitrogen exists in two forms

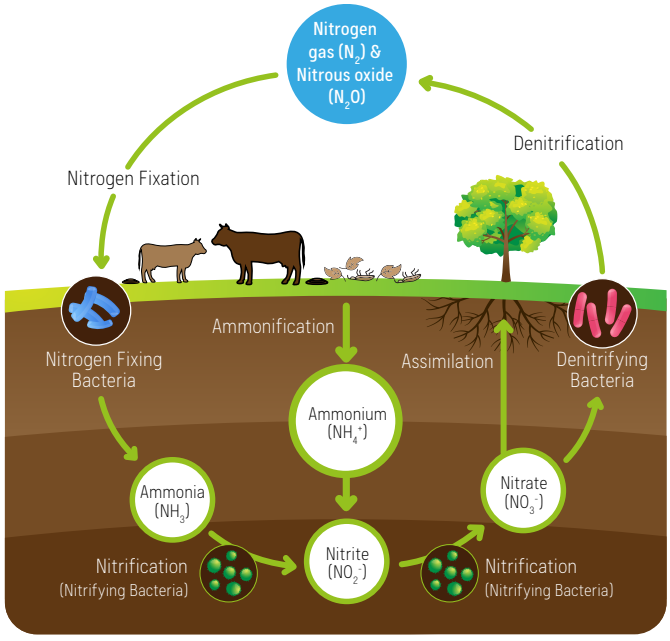
1 **Organic** - found in living organisms and cycles through them via the food chain.

AND

2 **Inorganic** - found in the environment including in soils, water and air.

The Nitrogen Cycle has the following steps:

- Nitrogen Fixation: Within root nodules of legume plants like peas and clover, nitrogen is converted to a form which can easily be absorbed
- Ammonification: When biological matter such as dead tissue decomposes, and bacteria convert organic nitrogen and release it into the soil as inorganic ammonium
- Nitrification: Ammonia in the soil is converted to nitrite and then nitrate by free-living nitrifying bacteria. This may then be absorbed by plants to aid protein production
- Denitrification: Nitrate is converted back into inert nitrogen gas by bacteria and returns to the atmosphere



How livestock farming shapes the Nitrogen Cycle

Nitrogen stimulates plant growth which underpins the productivity of modern agriculture. Nitrogen can have positive or negative impacts depending on its form and where that occurs in the agricultural system. For example, nitrate may be used as a crop fertiliser, but this must be carefully monitored to ensure excesses or unbound nitrogen is not released from soil into waterways. Nitrogen also may be lost from the cycle as a greenhouse gas, called nitrous oxide or an air pollutant such as ammonia which is normally released from livestock manure.

Ruminant livestock, such as cattle and sheep, play a key role in producing high-quality protein for human nutrition. Nitrogen is essential for this as ruminants can capture nitrogen for protein synthesis using bacteria which colonise their gut. Other animals are not able to do this, meaning they must obtain protein directly from their diet.

Livestock farming offers great potential to promote better environmental stewardship and sustainable agricultural practices, enhancing global food security. Nitrogen plays a key role in increasing the protein content of plants through transformation by livestock into highly nutritious protein foods readily digestible by humans.

While losses occur in the nitrogen cycle, nitrogen is also captured. Our aim should be to minimise losses and maximise capture in the form of protein for food or forms of nitrogen that can be circulated back into the food production system. Nitrogen loss on farms can be reduced with good livestock and land management. Farmers need access to reliable tools to measure their nitrogen use and monitor where nitrogen losses are occurring in order to reduce these to a minimum.

Practical steps which may improve the efficiency of nitrogen use:

- Developing on-farm technologies to capture or hold nitrogen, for example in livestock manure, and to make this available for enhancing growth of feed crops
- Quantifying nitrogen resources and monitoring how these change over time, to help inform proactive management
- Improved accuracy when measuring the amount of nitrogen in the farm environment, soils in particular

Download the full report here

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