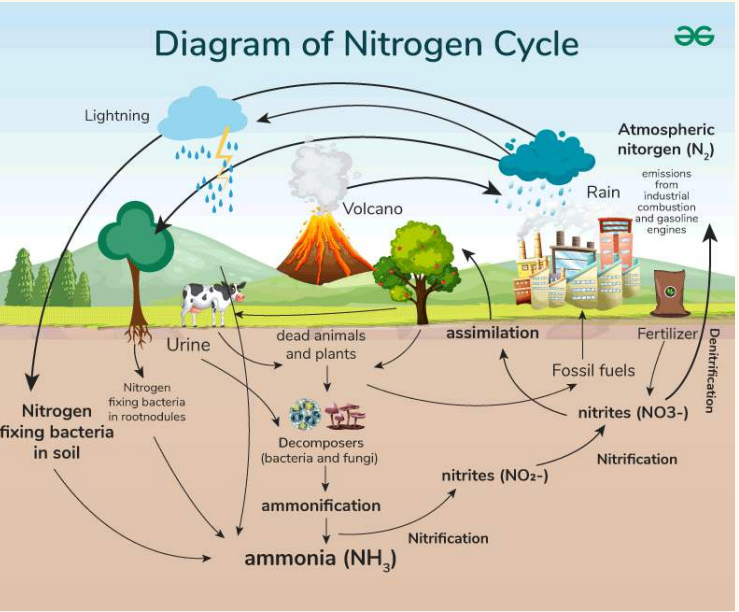
About nitrogen

The nitrogen cycle is the process by which nitrogen circulates between the atmosphere, the soil, and living organisms. Atmospheric nitrogen (N_2) is first adujsted by nitrogen-fixing bacteria in the soil or by lightning into ammonia (NH_3). Then, nitrifying bacteria convert the ammonia into nitrites (NO_2^-) and further into nitrates (NO_3^-), which plants can absorb and use to create proteins and other essential molecules.

When plants and animals die or produce waste, decomposing bacteria break down the organic matter, releasing ammonia again. Finally, denitrifying bacteria convert nitrates back into nitrogen gas, which returns to the atmosphere, completing the cycle.



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Circular nitrogen management

The nitrogen problem

Excessive use of nitrogen fertilizers can lead to runoff into water bodies, causing eutrophication, and harm aquatic life. Also, the application of nitrogen fertilizers contributes to the release of nitrous oxide (N_2O), a potent greenhouse gas that contributes to climate change.

Nitrogen fertilizer production is energy-intensive due to several factors related to its chemical process. High temperatures and pressures, as well as the need for large amounts of raw materials

Improving the efficiency with which crops utilize applied nitrogen is a challenge. Much of the applied nitrogen is not taken up by plants and is lost to the environment, reducing the benefits of fertilization.

Circular nutrient management contributes to increased self suffeincy in vital plant nutrients, and increased food security.

To cope with these challenges creating a market for recycled and locally found nutrients will be important

Methods & technologies

There are several technologies to choose between. What they have in common is that water is removed and nutrients are extracted and isloated. This way specilized nutrients are enabled, making circular environmental friendly fertilizer.

Steam is used to vapour out ammonia and capture it with acids

Output products are well defined fertilizer ingredients suitable for production of commercial fertilizer products. Excess heat (or renewable electricity), digestate, liquid manure can be used togheter with vacum evaporatiors and strongs acids to capture NH3.

This technology is suitable for farms with substantial amounts of manure, digestate or wastewater treatment plants, but has no designated use of soild fraction (P-rich fraction)

Technology: MKR Cleanwater

MKR Cleanwater is available at both industrial and farm scale

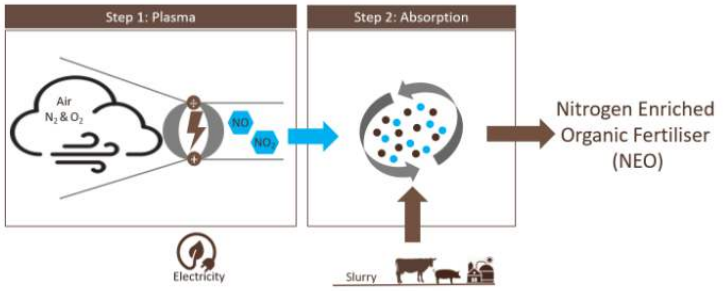
Renewable electricity is used to enrich liquid manure with plant avaliable nitrogen

MProducers with substantial amounts of manure, and access to renewable energy, can invest in technology that use electricity and nitrogen from the air to enrich manure with plant avaliable nitrogen.

This enables local and efficient use of farmes own manure resources and is especially suitable for manure-intenstive industries, such as dairy and meat producers.

Technology: N2-Applied

N2-Applied is available at farm scale



Thermal seperation where ammonia components are recovered and concentrated through destillation.

Suitable for livestock farmers, waste water treatment plants. Requires excess heat and liquid digestate.

Pros: Higher willingness to pay for end product, almost no chemical usage.

Cons: No designated use of solid fraction (p-rich fraction).

Technology: AgriFer Plus

AgriFer Plus is available at farm scale