ICL

nitrogen

loss reduction

eqo.x®

Sustainable innovation for controlled release fertilizers

ICL is proud to announce **eqo**.x®, its new biodegradable release technology that brings Controlled Release Fertilizers to a new era. This innovative technology for soil grown crops will help farmers to maximize their crops performance and reduce its footprint. **eqo**.x® reduces nutrient losses and increases nutrient use efficiency. It will be the release technology for our brands: Agrocote, Agromaster and Agroblen.

Biodegradable release technology for sustainable farming

- Increases Nutrient Use Efficiency up to 80%
- Reduces nutrient losses to environment up to 50%
- Provides higher or similar yields with reduced fertilizer rates
- Reduction in number of fertilizer applications
- Consistent and predictable nutrient release, steered by soil temperature

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Reducing nitrogen losses with controlled release fertilizers

Europe's Green Deal, that includes the Farm2Fork strategy, aims to minimize the environmental footprint in agriculture. Important pillars of the strategy are to reduce fertilizer losses by at least 50%, and reduce overall fertilizer use by at least 20% by 2030. The impact of this strategy has recently been investigated, with several studies demonstrating that reducing fertilizer application rates by 20% results in a decline in overall crop yield. One study* by Wageningen University & Research was conducted on 25 farms across Europe. Researchers looked at several scenarios in both annual and perennial crops. Though some crops were affected more than others, the study showed that implementation of the Farm2Fork strategy had a negative impact on overall crop yield and agricultural production, with an average production decline of 10-20%. To maintain production levels, extra farmland outside of the EU would need to be considered, but this will increase costs and severely influence the market.

** https://www.wur.nl/en/research-results/research-institutes/economic-research/show-wecr/green-deal-probably-leads-to-lower-agricultural-yields.htm*

How nitrogen can be lost

After application of nitrogen (N) fertilizer to the soil, some will be taken up by the crop, and a portion of the nitrogen will be lost through leaching into the soil, or as gas into the atmosphere.

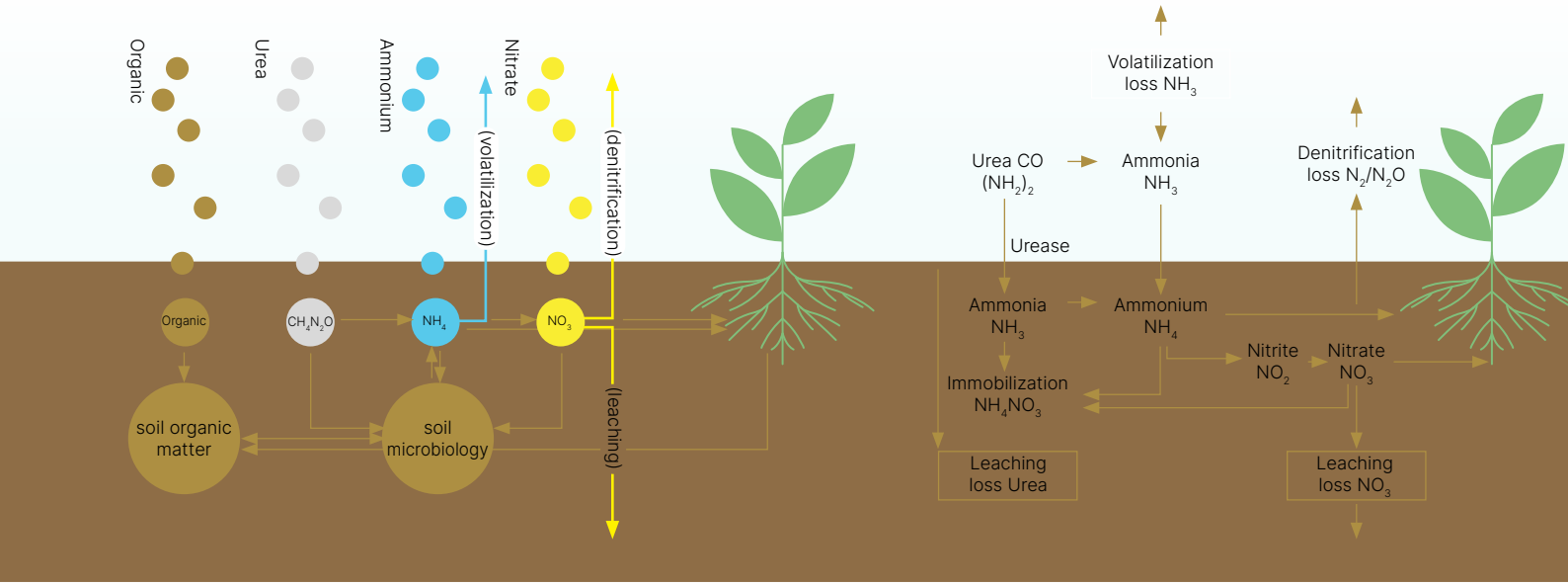
The most significant losses occur via the chemical process of ammonia (NH_3) volatilization, nitrate (NO_3) leaching into the soil, and through microbial denitrification producing nitrogen and nitrous oxide(N_2, N_2O). Gaseous losses of ammonia must be minimized to diminish eutrophication of nature areas. Nitrous oxide (N_2O) is an important greenhouse gas, which must be decreased. Diminishing nitrate leaching is a challenge throughout Europe.

The form in which nitrogen is lost depends on the type of fertilizer applied, the soil to which the fertilizer is added, and the weather conditions. The challenge is to maximize the nitrogen use efficiency of fertilizers and minimize the risk of environmentally problematic losses.

Generally, urea containing fertilizers are more vulnerable to ammonia volatilization than ammonium nitrate or ammonium sulphate-based fertilizers, whereas ammonium nitrate-based fertilizers are more vulnerable to leaching losses.

One route to minimize losses is through the use of Enhanced Efficiency Fertilizers, such as Controlled Release Fertilizers (CRF).

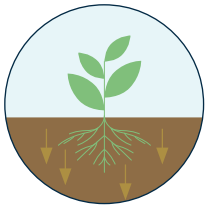
Fertilizer inputs



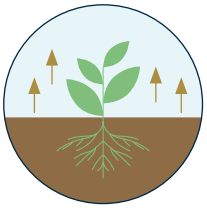
Controlled Release Fertilizers limit the environmental impact and improve nutrient use efficiency

Based on the latest trial results, 40-50% of the total nitrogen applied with conventional urea can be lost, while CRFs limit these losses to just 16%.

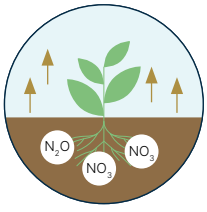
When compared to conventional urea, controlled release fertilizers reduce nitrogen losses and improve nutrient use efficiency. In summary, controlled release fertilizers can provide:



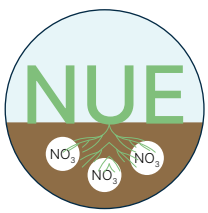
54%-61%
reduction
in leaching



32%-54%
reduction
in ammonia
volatilization



11%
less
denitrification



83%
higher
Nitrogen Use
Efficiency

In one of our latest laboratory trials, performed by NMI (Nutrient Management Institute B.V.), we evaluated the environmental impact in respect to nitrogen losses by leaching, volatilization, and denitrification, comparing regular urea to controlled release nitrogen fertilizer based on our new biodegradable release technology, **eqo**.x.

Trial details

A replicated pot trial was established, growing red beet (*Beta vulgaris subsp. vulgaris*) in a sandy loamy soil.

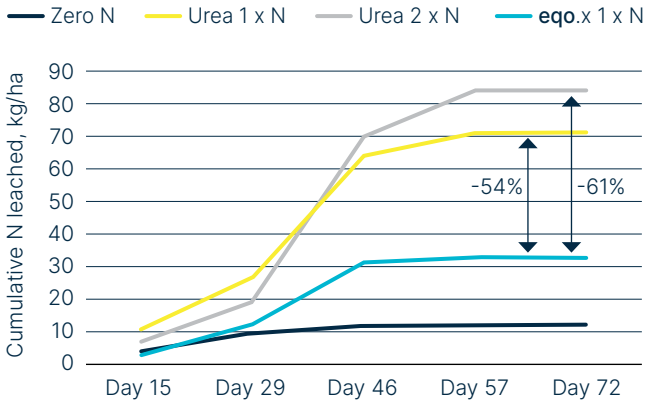
Treatments

The treatments consisted of a control, with no nitrogen fertilizer, and 3 nitrogen fertilizer treatments where the total nitrogen application rate was equivalent to 150 kg/ha.

- **Zero N** (control)
- **Urea | 1 x N:** 46%N applied as a single, full N rate base fertilizer
- **Urea | 2 x N**: 46%N split between 50% as base fertilizer, and 50% as a top dress application
- **eqo**.x **| 1 x N**: 40%N applied as a single full N rate base fertilizer of coated urea using the new biodegradable coating - **eqo**.x

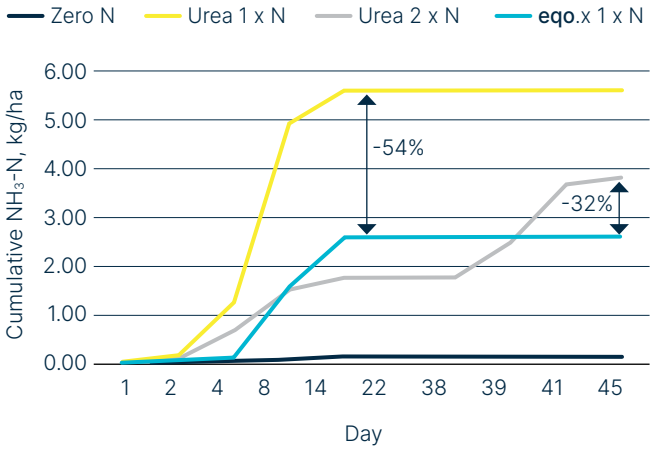
Results

Nitrogen losses by leaching



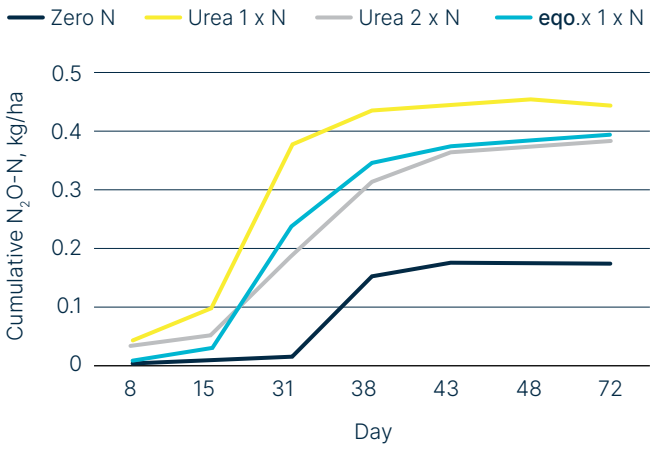
After 72 days, the coated urea with **eqo**.x technology demonstrated a 54-61% reduction in total N lost by leaching, compared to conventional urea.

Nitrogen losses by ammonia volatilization



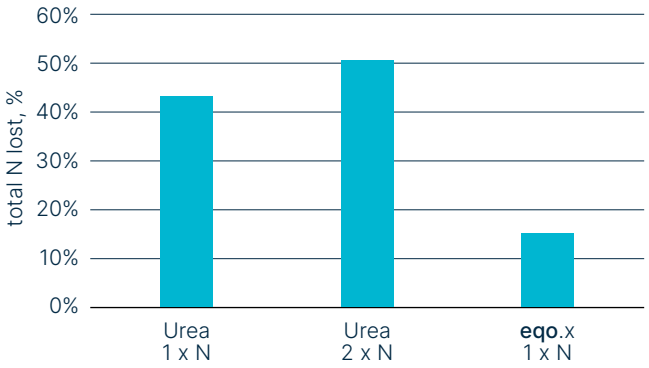
After 14 days, N losses to ammonia (NH_3) volatilization for the coated urea with **eqo**.x technology were significantly lower, 54%, compared to conventional urea applied at the same time and rate. When compared to the split urea application, the **eqo**.x coated urea produced a 32% reduction in ammonia volatilization after 45 days.

Nitrogen losses by N_2O emissions



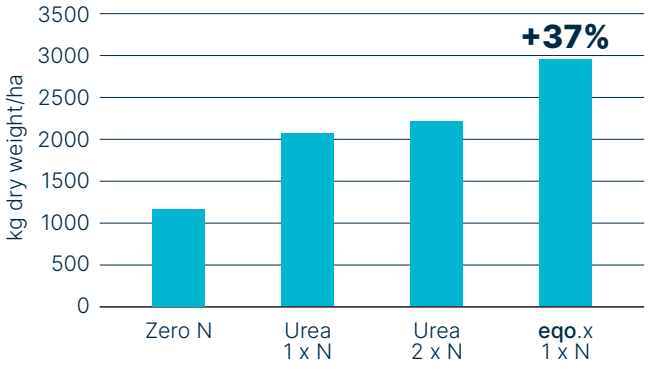
In the first 30-40 days, nitrogen losses as N_2O were significantly higher for conventional urea when applied at the same rate per ha as the **eqo**.x coated CRF. After 72 days, using **eqo**.x coated urea instead of conventional urea reduced N_2O losses by 11%.

Total N losses/N applied

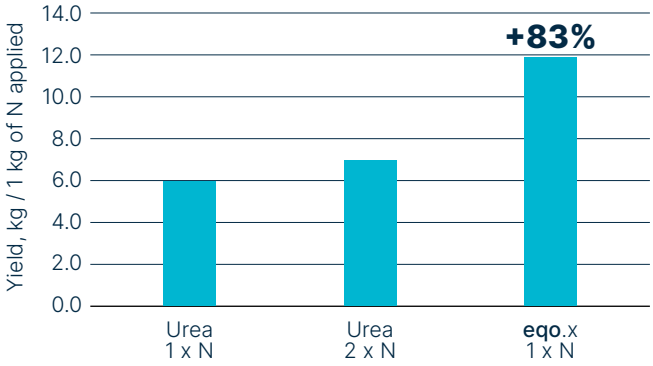


Using conventional urea, approximatively 40-50% of the nitrogen applied is lost to the environment. **eqo**.x coated urea limits these nitrogen losses to just 16% of total nitrogen applied.

Yield (leaves and roots)



Nitrogen Use Efficiency*



**Nitrogen Use Efficiency, calculated as Agronomy Efficiency = (Y–Y0)/F*
Y = Yield of harvested portion of crop when the said nutrient is applied
Y0 = Yield of harvested portion of crop when the said nutrient is not applied
F = Application rate of said nutrient

With **eqo**.x®, less means more

Limiting nitrogen losses means more nitrogen is available for the plant. This research shows that for the same nitrogen application rate, crop yield increases with **eqo**.x.

Coated urea with **eqo**.x increased yield by 37%, while increasing Nitrogen Use Efficiency by an average of 83%.

We are ready for a sustainable future

now