

NUTRAMON

GREEN AND SAFE

OCI  **NUTRAMON**

OCI

NUTRAMON IS A SAFE FERTILIZER

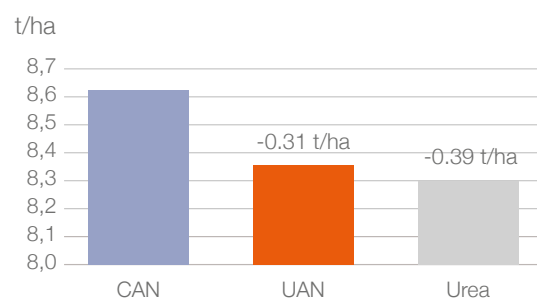
- Nutramon is a unique, safe and efficient Calcium Ammonium Nitrate (CAN) fertilizer with 27% N.
- CAN is a globally accepted non-hazardous product.
- Designed as a safe nitrogen fertilizer with characteristics that make it incapable of accidental explosion in a fire scenario when following normal good handling procedures.
- Nutramon is a homogeneous mixture of granulated ammonium nitrate (AN) and dolomite.
- The safety and agronomic advantages have resulted in providing a more favourable regulatory treatment of Nutramon in many countries (i.e. Germany, The Netherlands, Spain and Ireland).



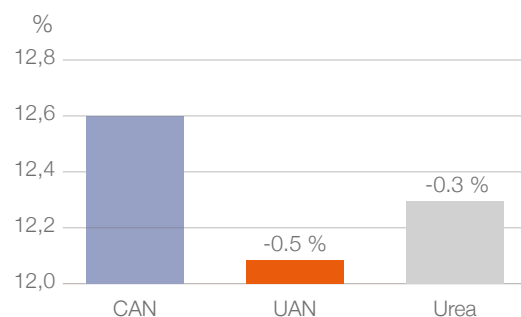
NUTRAMON IS A SUPERIOR TOOL FOR FARMERS

- UK government's department Defra performed the most extensive study comparing different forms of N-fertilizers.
- AN-based fertilizers proved far better at identical rates than other fertilizers offering substantial gains in yields and protein content.
- Nutramon is an AN-based fertilizer, so provides superior agronomical results over alternative fertilizer products.
- Moreover, secondary nutrients such as calcium (Ca) and magnesium (Mg) are present.

Yield at identical N rate



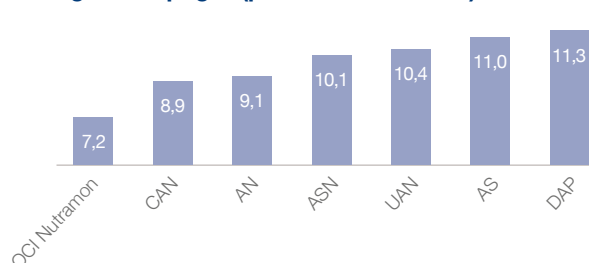
Protein content at identical N rate



NUTRAMON: ONLY 2 KG CO₂/KG N IN PRODUCTION

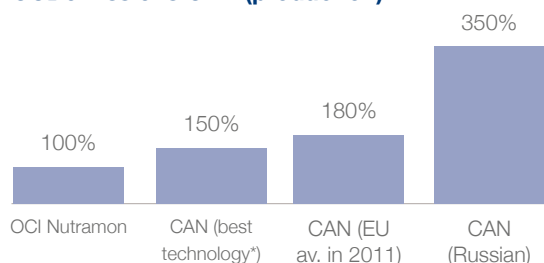
(7 KG IN PRODUCTION AND USE)

kg CO₂ eq/kg N (production and use)



Source: Fertilizers Europe carbon footprint reference values 2011.

CO₂ emissions CAN (production)



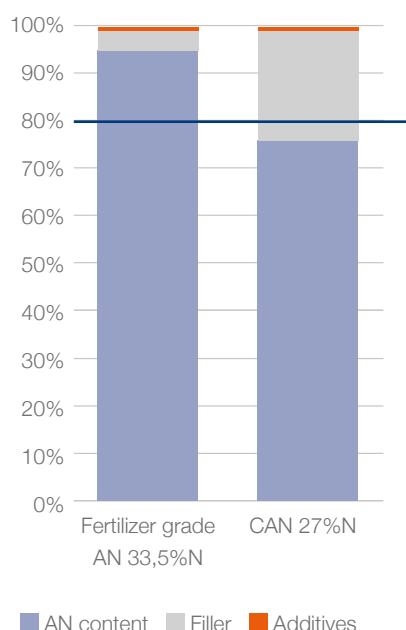
* Best available techniques designed for general use in production of CAN in EU.

CAN has the lowest CO₂ footprint of all fertilizers

Nutramon has the lowest CO₂ footprint of all CAN (ISO 14040-44 certified)

Nutramon lowest CO₂ footprint worldwide, superior in agronomy, and safe: **the best fertilizer**

Chemical Composition



Safety features of Nutramon in comparison to AN

- **Reduced explosive reaction potential.**
 - Nutramon is a mixture of AN with dolomite (calcium magnesium carbonate).
 - Dolomite dilutes AN and neutralizes the acidity of molten AN.
 - Neutralization multiplies the simple dilution effect, as the decomposition works via a strong endothermic reaction.
 - Decomposition kinetics are limited & slowed.
 - 29 times slower than AN at high temperatures.
- **Reduced fire reaction.**
 - Nutramon can not burn.
 - Exposure to fire may cause decomposition and toxic fumes.
 - CAN never exploded during fires.

80% AN: maximum allowed content for CAN

CAN IS SAFE DUE TO NEUTRALIZING EFFECT FILLER

When AN or CAN is exposed to severe heat

- Will start melting at 170 Celsius.
- Melting needs heat from the environment.
- Top layer of a fertilizer heap will melt and flow away.
- Being a good insulator the product inside the heap will remain at constant temperature.

AN starts decomposing when in molten state

- Starting with an endothermic dissociation reaction into it's original components NH_3 and HNO_3 .
- Melt will acidify.
- Different irreversible decomposition reactions occur, catalysed by acidic condition, and are exothermic, so create heat.
- Generation of several non condensable gases such as NO , NO_2 , N_2 .

AN will continue to decompose until the heat is removed. When not, AN has caused explosions.

CAN starts decomposing when in molten state

- Starting with an endothermic dissociation reaction into it's original components NH_3 and HNO_3 .
- The carbonate filler will neutralize the CAN melt immediately and reduce heat (by endothermic reaction and by evaporation of water).
$$\text{CaCO}_3 + 2 \text{HNO}_3 \Rightarrow \text{Ca}(\text{NO}_3)_2 + \text{CO}_2 + \text{H}_2\text{O}$$
$$\text{MgO} + 2 \text{HNO}_3 \Rightarrow \text{Mg}(\text{NO}_3)_2 + \text{H}_2\text{O}.$$
- Decomposition reactions of CAN will be hampered, as catalytic process requires acidity, while CAN melt is pH-buffered and cooled down at the same time.

Decomposition of CAN differs drastically from AN, as kinetics are limited & slowed. CAN has never exploded as a result of fire.

CAN is flawless on safety in contrast to AN

- **No history of fertilizer explosions involving CAN.**
 - Even when CAN will be exposed to a very large external shock to initiate, it will not propagate a shock wave and will quickly die out.
- **Regular reported incidents with AN with thousands of fatalities in total history.**
 - In case of uncontrolled fire, 15% likelihood of fatalities.

Texas, 2013
15 fatalities

Tianjin, 2015
173 fatalities

Beirut, 2020
191 fatalities

GLOBAL SAFETY RECOGNITION OF CAN

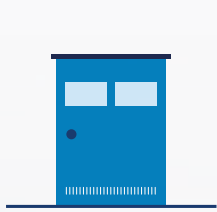
- CAN is a reference, base straight N fertilizer, being produced worldwide at an annual volume of more than 15 million tons.
- CAN shows excellent historical safety records: no record has been found of an accidental explosion involving CAN.
- Current international transport and storage legislation reflect this safety feature.
 - **Transport legislation:** According to UN Model regulations on The Transport of Dangerous Goods (so called Orange Book), CAN is not classified as hazardous material, also adopted by specific ADR/IMDG/IMSBC legislation.
 - **Storage legislation:** European “Seveso” legislation excludes CAN from dangerous substances: see “Directive 2012/ 18/ EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances”.

NUTRAMON GREEN AND SAFE

- **Nutramon is the best possible CAN 27%.**
 - Delivers higher yield and protein content than other fertilizers.
 - Provides Calcium and Magnesium nutrients in addition to Nitrogen.
 - Fertilizer with the lowest CO₂ footprint worldwide.
- **CAN is a globally recognized safe nitrogen fertilizer created to prevent accidental detonation.**
 - Uniform product designation creates consistency of product and enhances monitoring capacity.
 - 20% dolomite addition means that AN content can be up to 80%.
 - CAN is rendered safe as recognized by UN test protocols.
- **CAN is globally recognized as a non-hazardous good and with non-oxidizer status.**
 - Supported by research & scientific testing review.
 - Supported by regulatory review.
- **CAN has the best possible safety record.**
 - No historical reports of accidental CAN explosion in 90+ year history of safe handling.
 - Testing/research proves CAN does not detonate using same standardized test protocol as for AN.

BEST PRACTICES STORAGE/HANDLING MUST BE RESPECTED

- The safety information in this document is relevant for Nutramon.
Misuse of Nutramon can reduce its safety. Consult the Nutramon SDS for more information.
- Best practices for storage and handling must be followed.
- When handling fertilizers correctly, most of the requirements for product quality and safety will be met automatically.



Keep doors closed



Keep storage
location clean



Separate stores
of different bulk
fertilizers



OCI  NUTRAMON

For more information

T +31 46 7020203
info.agro@ocinitrogen.com