Contributing to EU’s cleaner air & climate mitigation efforts

The role of mineral fertilizers & targeted fertilisation

Tiffanie STEPHANI – Fertilizers Europe
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@StphaniT
@FertilizersEuro
Who we are?

Grupa Azoty SA
Poland

Amwil SA
Poland

NKF s.a.
Greece

Petro kemija Plc
Croatia

ICL Fertilizers Europe BV
The Netherlands

Yara International ASA
Norway

Nitrominövek Zrt
Hungary

BASF AG / Fertilizer BU Europe
Germany

AB Achema
Lithuania

PFIC LTD
Greece

OCI Nitrogen BV
The Netherlands

Borealis AG
Austria

Eurochem Antwerp
Belgium

Azomures SA
Romania

Levochemie as
Czech Republic

CF Industries
United Kingdom

Fertiliberia SA
Spain & Portugal

The European fertilizer industry at a glance

€10.9 BN*  
TURNOVER

€66.2M  
RESEARCH & DEVELOPMENT  
2015 MEMBERS ONLY

78.500  
EMPLOYEES*

€1.3 BN*  
INVESTMENT

* Average last 5 years

Source: Fertilizers Europe, 2018
1) The contribution of the mineral fertilizer industry to climate mitigation

2) Curbing ammonia emissions for cleaner air in Europe

3) Targeted fertilization: better yields, with less losses to the environment
The EU mineral fertilizer industry has reduced significantly CO₂ Emissions since 1990, beyond being covered by the European Emission Trading Scheme (ETS).

Source: Fertilizers Europe
Fertilizers Europe is a founding member of the Cool Farm Alliance, whose aim is to develop sustainability metrics.

The Cool Farm Tool is a sustainable agriculture assessment tool, with an online calculator for GHG, water and biodiversity.

More & more products covered: rice, potato, maize, wheat, beef, dairy, pig...

Example for a parcel of 2.5 ha

winter_wheat_2018

Other Crops = Winter Wheat = Finished product: 25 tonnes = Yield: 10 tonne / ha

Crop | Soil | Inputs | Fuel & Energy | Irrigation | Carbon | Transport

Source: Cool Farm Tool
### Latest reference values for fertilizer production for all regions of the world

<table>
<thead>
<tr>
<th>Fertiliser Application 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fertiliser type</strong></td>
<td>Calcium ammonium nitrate - 27% N</td>
</tr>
<tr>
<td><strong>Manufactured in</strong></td>
<td>Europe 2014</td>
</tr>
<tr>
<td><strong>Application rate</strong></td>
<td>800 kg/ha</td>
</tr>
<tr>
<td><strong>Total emissions</strong></td>
<td>(216.00 kg/ha N)</td>
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</table>

**OR**

<table>
<thead>
<tr>
<th>Fertiliser Application 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fertiliser type</strong></td>
<td>Urea - 46% N</td>
</tr>
<tr>
<td><strong>Manufactured in</strong></td>
<td>Europe 2014</td>
</tr>
<tr>
<td><strong>Application rate</strong></td>
<td>500 kg/ha</td>
</tr>
<tr>
<td><strong>Total emissions</strong></td>
<td>(230.00 kg/ha N)</td>
</tr>
</tbody>
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### Comparing practices for climate mitigation

Moving from urea to CAN decreases the total emissions of CO$_{2}$eq by 10%
2) Curbing ammonia emissions for cleaner air in Europe

What are we talking about?

Source: Fertilizers Europe from EEA 2018- EU emission inventory report 1990-2016 under the UNECE LRTAP
Different fertilisers, different impacts

Ammonia emissions from fertilizer application depend on the type of fertilizer used as well as weather and soil conditions.

- Ammonium-nitrate based fertilizers generate very little ammonia.
- Urea-based fertilizers, including urea, liquid urea, Ammonium Nitrate (AN) generate much higher ammonia.
- Higher temperatures lead to higher NH3 emissions.

Depending from weather and soil conditions, ammonia emissions can vary between 10 to 50% of the nitrogen applied as urea.

Take the initiative!

Source: Fertilizers Europe, Farming and Air Quality, 2019

Optimal use of mineral fertilizers 1/2

Use Ammonium-nitrate based fertilizers – these fertilizers ensure the lowest emissions.

If urea:
- **Immediate Incorporation** - Incorporation of urea into the soil immediately upon spreading reduces potential volatilization losses by up to 70%.
- **With inhibitors** - For site-specific farm conditions, urea containing inhibitors might remain an option as it reduces ammonia losses in average by 70 to 80%. Urea inhibitors thus can improve nitrogen use efficiency and reduce environmental impacts of this less favourable form of nitrogen.

Take the initiative!

Source: Fertilizers Europe, Farming and Air Quality, 2019
Consider weather conditions - humid soils improve diffusion, while cool weather conditions (< 15 °C) curb the formation of ammonia in the soil and subsequent volatilization losses from urea.

Consider soil conditions - Alkaline soils (pH > 7.5) result in higher volatilization losses. Ammonium based fertilizer cannot be used on alkaline soils.

Split application - spreading mineral fertilizers 2 or 3 times instead of 1 time only during the season reduces ammonia concentrations and volatilization risks.

**What can be achieved?**

Emission factors for ammonia emissions from different fertilizers

- CAN: Calcium Ammonium Nitrate
- AN: Ammonium Nitrate
- UAN: Urea Ammonium Nitrate

-63% ammonia emissions

Source: Calculation based on EMEP/EEA air pollutant emission inventory guidebook 2016

Source: Fertilizers Europe, Farming and Air Quality, 2019
3) Targeted fertilization: better yields with less losses to the environment
European fertilizer industry: the way forward

- Digital Tools to support decision of farmers
- Improve application to reduce losses
- New products to cope with challenges
- Increase Nitrogen Use Efficiency

Some examples of tools from our industry

- NutriGuide
- ImageIT
- Water Sensor
- farmster
- N-PILOT
- N-Sensor
- N-Prognos
• Legal framework can help implementation of precision farming practices.
• Environment and productivity can meet through policy.

Yara N-tester in France

No. of Yara N-Tester recommendations in France covering approx. 14% of the winter wheat area in 2016

Source: Yara

Benefits of Borealis N-Pilot®

A precise assessment of the nutritional status of the crops leading to a relevant recommendation of spreading or not spreading.

Yield: + 240 kg/ha
Fertilisation: - 8 kg N/ka
Profit: 42€/ha

Source: Borealis
<table>
<thead>
<tr>
<th>Concluding remarks</th>
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<tbody>
<tr>
<td>Developing an even more climate friendly way of producing to reduce overall climate footprint of farming</td>
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<tr>
<td>Providing to farmers tools to give just the right amount of nutrients crops need</td>
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<tr>
<td>Promoting the use of directly available Nitrogen fertilisers to reach cleaner air for all</td>
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<tr>
<td>Innovating to improve application and mineral fertilizers themselves to reduce losses to environment</td>
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For more information

[link to tiffanie@fertilizerseurope.com]

[@FertilizersEuro]
[@StphaniT]
[Fertilizers Europe]