Urea and gaseous emissions

Greenhouse gas (GHG) emissions

➢ Urea and stabilised urea can reduce GHG emissions compared to CAN
➢ The EU has committed to reduce agricultural GHG emissions by 30% by 2030

Ammonia gas emissions

➢ Urea will increase ammonia emissions compared to CAN
➢ Urea can be stabilised with a urease inhibitor to minimise ammonia losses
➢ Ireland has committed to reduce ammonia emission by 5% by 2030

Major fertiliser N transformations and N loss pathways. Urease inhibitor (NBPT) reduces N loss by slowing urea hydrolysis.

Relative star rating of the different N fertilisers

<table>
<thead>
<tr>
<th></th>
<th>CAN</th>
<th>Urea</th>
<th>Urea + NBPT</th>
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</thead>
<tbody>
<tr>
<td>Cost of N</td>
<td>★★★</td>
<td>★★★★</td>
<td>★★★★</td>
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<tr>
<td>Yield</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
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<tr>
<td>N recovery efficiency</td>
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<tr>
<td>Greenhouse gas</td>
<td>★</td>
<td>★★★★</td>
<td>★★★★</td>
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<tr>
<td>Ammonia gas</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
</tr>
</tbody>
</table>
**Urea compared to calcium ammonium nitrate (CAN)**

- Urea is 46% Nitrogen (N)
- CAN is c. 27% N
- Urea is converted to ammonium and nitrate in soil (see below)

**Plants take up mainly nitrate and ammonium but can take up urea too**

**Yield**

Teagasc trials show that CAN, Urea and Urea stabilised with the urease inhibitor NBPT frequently give similar yields but Urea has the lowest N recovery.

**To minimise N (ammonia) loss from Urea**

- **Rainfall**: best ammonia reductions from rain shortly after application, 7-14mm gives large reductions but be cautious of leaching and N runoff loss
- **Avoid** applying to wet soil/grass followed by windy, sunny conditions
- Urea applied into a crop canopy is more protected from wind and direct sun
- The proportion of N loss as ammonia tends to increase with increasing N rate e.g. grazing N rates (typically <40 kg N/ha) are potentially less risky than silage N rates (typically >80 kg/ha)
- Urea can be riskier on soils with pH >7.1

**Urea fertiliser spreading considerations**

- Urea is less dense than CAN making it more difficult to spread evenly at wide bout widths
- Small prilled urea (50%<2mm) is particularly difficult to spread on bouts >10m. Larger particle sizes (80% 2-4mm) are available and suit wider bout widths
- Important to know size distribution, determine with hand-held sieve box
- Ensure the fertiliser spreader is set up correctly by consulting the spreader manufacturers recommendations for the specific product being spread

**Apply Urea before lime application (10 days)**

**Wait at least 3 months after liming before applying Urea**

**Wait 10 days after slurry application before applying Urea and vice versa**

**Incorporating** into soil will minimise ammonia losses but risk of toxicity to seedlings increases with rate, do not place urea with seed for this reason

**Use a urease inhibitor** (e.g. NBPT reduced ammonia N loss in Teagasc trials by c. 79% on average)

**Yield**

Teagasc trials show that CAN, Urea and Urea stabilised with the urease inhibitor NBPT frequently give similar yields but Urea has the lowest N recovery.