Question 1
Can Pro Urea be applied after lime application?

Answer
- Initial trials indicate that Pro Urea reduces the risk of N loss through volatilization where lime has been recently applied.
- The urease inhibitor controls the pH spike around the urea granule during hydrolysis even in freshly limed soils.
- Further trials required.
- Leave minimum of 4 to 6 wks after applying lime before following with (straight) urea applications.
Question 2
How does Pro Urea work?

Answer

- The urease inhibitor stabilises the conversion of Urea to Ammonium (Urea $\rightarrow$ NH$_4$)
- It protects the N in urea from being lost through volatilization (as NH$_3$ gas)
- Protects the Urea-N from loss which typically happens during the first 3-5 days after application (period when the Urea granule is melting)
Question 3
Why use Pro Urea for 1st or 2nd round of fertiliser N applications in the spring time?

- In Exp measurements the highest ammonia losses were detected in March (hash, drying conditions)
- Reduces losses N (as NH$_3$ gas) through volatilization
- Safer form of N (Urea) in terms of leaching / denitrification
- No. 1 technology help Ireland reach ammonia targets
- Low cost and fully verifiable environmental mitigation option
Why Protected Urea? Emissions

Ammonia Emissions

- CAN: 5
- Protected urea: 5
- Urea: 25

Ammonia emissions are significantly lower for protected urea compared to Urea. Protected urea results in 78% lower ammonia emissions.

GHG emissions

- CAN: 1.6
- Protected urea: 1.4
- Urea: 0.2

GHG emissions are also lower for protected urea compared to Urea. Protected urea results in 71% lower GHG emissions.
## MACC – Agricultural GHG Abatement

### Mitigation Mt CO₂ Eq.  Cost €/t CO₂ Eq.

#### Soil and N management related mitigation options – immediate response

<table>
<thead>
<tr>
<th>Option</th>
<th>CO₂ Mitigation Potential</th>
<th>Cost €/t CO₂ Eq.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fertiliser N Type (switch 50% CAN to Protected Urea*)</td>
<td>0.52 Mt</td>
<td>€ + ~4/t CO₂e</td>
</tr>
<tr>
<td>total CO₂ mitigation potential 1</td>
<td>0.52 Mt</td>
<td>Av. total cost € ~4/t CO₂e</td>
</tr>
<tr>
<td>2. Draining wet mineral soils (1/3 poorly drained soils)</td>
<td>0.20 Mt</td>
<td>€ + 16/t CO₂e</td>
</tr>
<tr>
<td>3. Low-emission slurry spreading (trailing shoe)*</td>
<td>0.12 Mt</td>
<td>€ +187/t CO₂e</td>
</tr>
<tr>
<td>4. Nitrogen-use efficiency (Liming soils to pH 6.3)</td>
<td>0.10 Mt</td>
<td>€ - 85/t CO₂e</td>
</tr>
<tr>
<td>5. Extended grazing (20% grassland area: 250 dry &amp; 149 wet)</td>
<td>0.07 Mt</td>
<td>€ - 96/t CO₂e</td>
</tr>
<tr>
<td>6. Inclusion of Clover (25% beef area and 15% dairy area)</td>
<td>0.07 Mt</td>
<td>€ - 7/t CO₂e</td>
</tr>
<tr>
<td>7. Slurry amendments (20% slurry treated)</td>
<td>0.03 Mt</td>
<td>€ + 49/t CO₂e</td>
</tr>
<tr>
<td>total CO₂ mitigation potential 2-7</td>
<td>0.59 Mt</td>
<td>Av. total cost € 64/t CO₂e</td>
</tr>
</tbody>
</table>

#### Animal performance related mitigation options – somewhat slower to be realised

<table>
<thead>
<tr>
<th>Option</th>
<th>CO₂ Mitigation Potential</th>
<th>Cost €/t CO₂ Eq.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Dairy EBI (increase EBI to €180 per cow by 2025)</td>
<td>0.43 Mt</td>
<td>€ -200/t CO₂e</td>
</tr>
<tr>
<td>9. Improved animal health (20% reduction replacements)</td>
<td>0.10 Mt</td>
<td>€ - 46/t CO₂e</td>
</tr>
<tr>
<td>10. Improved Beef Maternal Traits (+€30/cow by 2030)</td>
<td>0.03 Mt</td>
<td>€ -602/t CO₂e</td>
</tr>
<tr>
<td>11. Beef Genetics: Optimised live-weight gain</td>
<td>0.06 Mt</td>
<td>€ -215/t CO₂e</td>
</tr>
<tr>
<td>total CO₂ mitigation potential 8-11</td>
<td>0.62 Mt</td>
<td>Av. total cost € -1063/t CO₂e</td>
</tr>
</tbody>
</table>

---

MACC = Teagasc Marginal Abatement Cost Curve for greenhouse gas
Question 4

Will protected urea work as fast as unprotected urea or CAN?

Answer

- In practical terms YES, why?
- Grass & other crops take up the N applied over several weeks (i.e. all the N is not taken up at once)
- When applied, once the Pro Urea melts, some of the urea will be converted to ammonium (NH$_4$) feeding the initial grass requirements
- Over time (typically within 10 days) all the Urea will be plant available
Question 5
Will there be a date stamp on protected urea?

- All fertiliser is date coded but no blenders are willing to date stamp openly.
- Currently all fertilisers have a batch code which refers to:
  - Year of bagging
  - Day of bagging
  - Product ingredients
  - See example of Batch No.
Question 6
Should PPE be worn when handling fertilisers?

Answer
In general, suitable PPE should be worn when handling all fertilisers.

Guidelines for the safe handling of fertilisers

- It is advisable to take precautions when handling fertilisers.
- A tray test is advisable.
- Contact your machinery manufacturer for advice on resetting.
- Appropriate eye protection is also advisable.

- When spreading protected urea:
  - Protected urea has a different bulk density than CAN or other fertilisers.
  - It is important to recalibrate your spreader for spreading protected urea.
  - Safe handling of fertilisers:
    - When handling fertilisers, avoid contact with the skin.
    - It is advisable to wear gloves and a face mask when using fertiliser.

Issued by The Irish Fertilizer Manufacturers and Blenders Association.
Question 7
What factors do I need to consider when spreading Pro Urea?

Answer
1. Density – Urea less dense / lighter (won’t travel as far from the spreading disc/veins)
2. More affected by windy conditions
3. 80% of granules 2 to 4 mm in size
4. Important to calibrate your fertiliser spreader
5. Spread up to 18 to 24 meters depending on conditions
Question 8
Why is Pro Urea not stored for long in bulk?

Answer
- Urea is hygroscopic and draws in moisture
- It goes soft with a hard crust in a damp atmosphere etc.
- Urea is treated & bagged relatively quickly after a bulk shipment arrives in Ireland
- Pro Urea will not be available in bulk
Question 9
What is the shelf life of Pro Urea?

Answer
- Similar to other products, NBPT has a shelf life and will degrade over time once in storage.

- Pro Urea (urea + NBPT) shelf life of 6 to 12 months depending on straight v blended products (see next Q).

- LIMUS (NBPT & NPPT) claims to have a shelf life up to 18 months.

- Min. Reg. req. 414 g/tonne.
Question 10

How stable is the urease inhibitor when mixed with nutrients such as P, K & S?

- **Answer**

Pro Urea is most stable when bagged as a straight N product.

Its stability in storage may differ when bagged with other nutrients as follows:

- **P**: Not stable / breaks down in days (residual acidity from the P breaks down the urease inhibitor quickly)

- **S**: Stable but depends on the quality of the ammonium sulphate (if dusty!)

- **K**: Stable / little impact on urease inhibitor

Urea products containing **P** will only give similar performance to unprotected urea.
Question 11
Is Pro Urea available in Co-ops?

- All fertiliser suppliers have a product range on the market.
- Most Co-Op’s and Agri merchants sell Pro Urea fertiliser products (ask sales person)
- In some cases the merchant may need to order the Pro Urea for the farmer (should be available within a few days)
- See latest list of Pro Urea’s on Teagasc website
Question 12

Some products claiming to be Pro Urea are not on the Teagasc list?
– Do they work & will Ireland get credit?

**Answer**

- Products on the Teagasc list have been evaluated by Teagasc research or have published scientific backing.
- Only use products on Pro Urea list.
- These products will be counted by the DAFM for reaching National Ammonia & GHG targets set for Ireland (i.e. Irish agriculture will get credit for these products)
**Question 13**

Will Pro Urea impact soil microbes?

- **Answer**
  - Initial trial work conducted at Johnstown Castle indicate no negative impact on soil microbes (grassland plots that have received Pro Urea for >6 yrs)
  - Trials show positive impacts on soil biological communities compared to controls
Question 14
Will Pro Urea (urease inhibitor) effect water quality or could it transfer to water?

- **Answer**
  - No,
  - Pro Urea is less likely to be leached through soil compared with CAN
  - The urease inhibitor NBPT breaks down very quickly in soil (<<10 days) i.e. low persistency
Question 15
Is there a risk of NBPT entering the food chain?

Answer
- International studies indicate no risk
- Further work being conducted by Teagasc (DAFM funded project 2018-2022) to test soil/grass/milk/meat samples from long term protected urea experiments/farms in Ireland
**Question 16**

Is NBPT regulated?

**Answer**

- By EU - REACH process
- EU Fertiliser Regulations
- Irish Fertiliser Regulations (DAFM)
- Minimum Urease inhibitor inclusion rates set

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**Table: Urease inhibitors**

<table>
<thead>
<tr>
<th>No</th>
<th>Type designation and composition of the urease inhibitor</th>
<th>Minimum and maximum inhibitor content as a percentage by mass of the total nitrogen present as urea nitrogen</th>
<th>EC fertiliser types for which the inhibitor may not be used</th>
<th>Description of urease inhibitors with which mixtures are allowed Data on permitted ratio</th>
</tr>
</thead>
</table>
| 1  | N-(n-butyl) thiophosphonic triamide (NBPT) ELINCS No 435-740-7 | Minimum 0.09  
Maximum 0.20 |  |  |

Question 17

How quickly will NBPT degrade in the soil?

Answer

Yes, and quickly see Engel et al., 2013

[Graph showing NBPT degradation over time]
For Further Information log onto:

www.teagasc.ie/protected-urea