NMP Online – User Update 3 – 20th June 2016

Nitrogen

Nitrogen (N)

There is, as yet, no useful Irish laboratory test for N in soils. Therefore, the nutrient N advice for grassland systems (grazing and conservation) depends mainly on land use and farming system, and particularly on the stocking rate.

For crops requiring cultivation, the available soil N can be deduced from the previous cropping and manurial history, and the type of soil. Thus, N fertiliser advice is determined by the soil N supply status. This depends in turn on the previous cropping history. The supply status is categorised into an index system for grass establishment and tillage crops. Account is also taken of previous applications of chemical and organic manures, the requirement of the crop and the likely crop yield.

Tables 2 and 3 show how the N Index takes into account the past farm management history and reflects the likely rate of release of N from the soil.

In continuous tillage it is usually only necessary to consider the last crop grown to estimate N Index (Table 2). However, where long leys or permanent pasture occur in the rotation, it is necessary to consider the field history for longer than one year (Table 3). Previous applications of animal manures must also be taken into account.

Table 2: N Index for tillage crops that short leys or tillage. This table can also be used for grass establishment.			
Previous crop			
Index 1	**Index 2**	**Index 3**	**Index 4**
Cereals, Maize (no animal manures)	Sugar beet, Fodder beet, Potatoes, Mangels, Kale, Peas, Beans, Oilseed Rape		
	Swedes removed	Swedes grazed *in situ*	
	Leys (1-4 years) grazed or cut and grazed		
	Any crop receiving dressings of organic fertiliser		
Vegetables receiving less than 200 kg N/ha	Vegetables receiving more than 200 kg N/ha		

Table 3: N Index for pasture establishment or tillage crops that follow long leys (5 years or more) or permanent pasture			
Previous crop			
Index 1	**Index 2**	**Index 3**	**Index 4**
Any crop sown as the 5th tillage crop following long leys or permanent pasture.	Any crop sown as the 3rd or 4th tillage crop following long leys or permanent pasture. If original long ley or permanent pasture was cut only use Index 1.	Any crop sown as the 1st or 2nd tillage crop following long leys or permanent pasture (see also Index 4). If original long ley or permanent pasture was cut only use Index 2.	Any crop sown as the 1st or 2nd tillage crop following very good long leys or permanent pasture which was grazed only.

Nitrogen Fertilisers

Artificial Nitrogen Fertilisers can be in either of three forms or indeed in combinations of more than one form:
• Nitrate Nitrogen
• Ammoniacal Nitrogen
• Ureic Nitrogen.

Nitrate Nitrogen is the most readily available form of artificial nitrogen fertiliser for plant roots. The other types have to be converted to this form by soil acting bacteria before they can be utilised by crops. Nitrate N is very easily washed out of the soil. Because they are quick acting, fertilisers containing nitrate nitrogen are often used as top dressings on growing crops.

http://www.teagasc.ie/soil/docs/Spring-Fertiliser-Advice-2016.pdf

Calcium Ammonium Nitrate (C.A.N.) contains 26-27% nitrogen - half of it as nitrate nitrogen and half as ammoniacal nitrogen. This means that half the nitrogen is readily available while the other half is slow acting. This makes it a suitable fertiliser for grass, especially for spring grazing. It is suitable for any crop or soil and may be applied at sowing time or preferably as a top dressing.

Ammoniacal Nitrogen is a form of nitrogen based on ammonia, which is a nitrogen rich substance. It is slower acting than the nitrate form. It must be converted by soil acting bacteria to nitrate nitrogen before it can be absorbed by plant roots. It is not as easily lost from the soil by leaching. NH4 ----------> NO3 ----------> Plants (Ammonium) (Nitrate)

It can take from 3-5 weeks for the ammonium nitrogen to be converted to nitrate nitrogen by soil bacteria depending on soil moisture and temperature. Urea converts to nitrate N in 2 to 4 days depending on soil conditions.

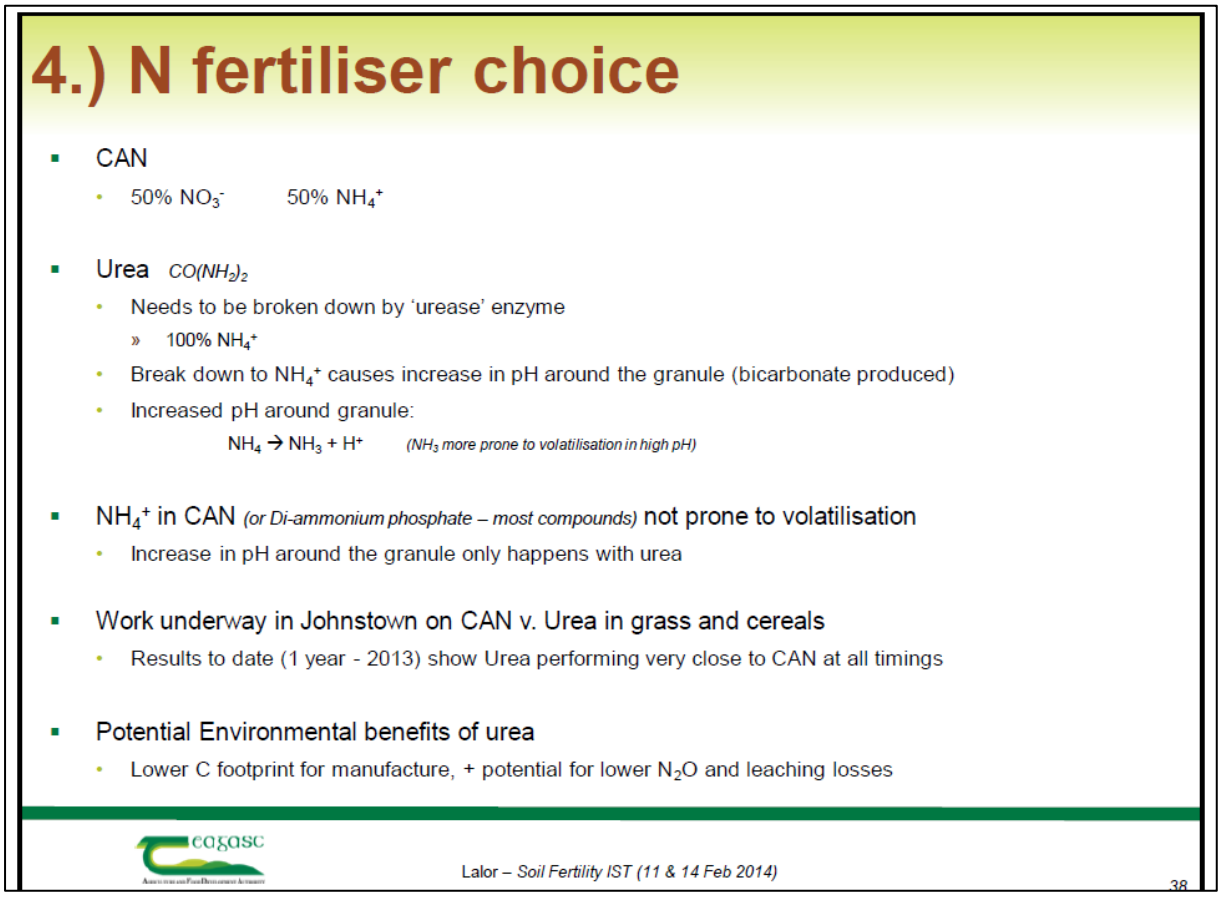
Sulphate of Ammonia contains 21% nitrogen. Its nitrogen is in the ammonium form and hence is slower acting than C.A.N. It is useful in areas of low soil sulphur content. Ammonium sulphate nitrate (ASN) contains 2^% N and 14% S. This is a mixture of ammonium nitrate and ammonium sulphate. The ammonium nitrate converts rapidly to nitrate N and the sulphur is also in a plant available form and immediately available to the plant.

Ureic Nitrogen is obtained from the substance called Urea which is also a nitrogen rich compound. In order to be absorbed by plant roots this form must be converted firstly into the ammonium form and then to the nitrate form by soil acting bacteria. For this reason it is slow acting and can be affected by low soil temperatures and dry soil surface conditions. Water must be added to Ureic Nitrogen to convert it to Ammonium Nitrogen. This can only occur in moist soils. This explains why urea is used early in the season and is not used during the dry summer months.

Urea contains 46% nitrogen. It is commercially used on grassland and as a cereal top dressing. It is not safe to combine with seed as it can severely inhibit germination. It needs to

be applied on moist soil to be fully effective. It also gives best results when used in warm conditions. Urea should not be applied to soils which have been recently limed.

Urea is a cheap form of nitrogen. It is often found to be as good as C.A.N. but in some cases is found to be less efficient. Urea, like nitrate fertilisers, is easily leached when first applied to the soil. This would be a big disadvantage if heavy rain were to follow application. After application, urea is rapidly converted to ammonium carbonate, this may lead to losses at or near the surface of the soil or do damage to young roots or germinating seeds. This is the reason for caution about including urea in compound fertilisers.



Nitrogen Advice for Dairy: http://www.teagasc.ie/soil/grassland/index.asp

Nitrogen Advice for Beef: http://www.teagasc.ie/soil/grassland/beef.asp

Nitrogen Advice for Sheep: http://www.teagasc.ie/soil/grassland/sheep.asp

Nitrogen Advice for Hay/Silage: http://www.teagasc.ie/soil/grassland/grass-silage.asp

Commonly Asked Questions about Nitrogen:

Q. What is the difference between CAN (27% N) & Urea (46%N)?

CAN is a straight 27% N source which contains calcium. 50% of the N is in the nitrate form and 50% in the ammonium N form. Urea contains 46% N and all the N is in the ammonium form.

Q. How long should one leave between spreading fertiliser N and slurry?

Slurry applied on fertiliser N creates ideal conditions for dentifrication, i.e., anaerobic conditions and high carbon compounds. It is recommended to leave 4 to 7 days before or after slurry spreading for application.

Q. How long should one leave between spreading lime and urea?

Lime increases soil pH which increases rate of volatilisation of ammonia. Do not spread urea for 3-6 months after lime application.

Q. How long should one leave between spreading urea/ slurry and lime?

Where urea is spread in advance of lime it will eliminate the risk of N loss through volatilization. It is recommended to leave 10 days between applying urea and lime.

Q. How long should one leave between spreading slurry and fertiliser N?

Slurry is a carbon source and where fertiliser is spread directly after slurry application it will result in a loss in N. It is recommended to leave 4 to 7 days between the application of fertiliser N and slurry

Q. When should I start applying my 1st Nitrogen to my dairy grazing paddocks?

A. When soil temperatures reach 4 to 5℃ and weather is forecast to be mild then it would be suitable to apply 20 to 25 units N/ac (½ urea). Soil temperatures will vary depending on location so check soil temperatures with Met Eireann. Consider spreading slurry on bare paddock and apply fertilizer N in the next couple of weeks. http://www.teagasc.ie/soil/docs/Spring-Fertiliser-Advice-2016.pdf

Q. What fertiliser should I use for Newly Reseeded Leys?

http://www.teagasc.ie/soil/docs/Fertiliser-Advice-for-Newly-Reseeded-Leys-2016.pdf

Q. What fertiliser should I use for 1st cut Silage?

http://www.teagasc.ie/soil/docs/Fertilising-1st-Cut-Grass-Silage-2016.pdf

Q. What fertiliser should I use for Winter Cereals?

http://www.teagasc.ie/soil/docs/Winter-Cereals-N-Strategies-2016.pdf

More information on Nitrogen:

http://www.teagasc.ie/soil/

http://www.teagasc.ie/soil/fertilizer/

http://www.teagasc.ie/soil/fertilizer-types/

Teagasc publication: Major & Micro Nutrient Advice for Productive Agricultural Crops (Teagasc 'Green Book')

http://www.teagasc.ie/publications/2008/829/The-Green-Book.pdf

Contributors:

NMP Online Support Team & Mark Plunkett (Teagasc Oakpark Research Centre, Carlow)