

FACTS On-line assessment themes for 2022/2023

Agriculture/Field vegetables

Nitrogen Use Efficiency (NUE) – to dovetail with FAR for livestock farms

(Training to standardise the approach – draft in confidence)

Concept of NUE

- Efficiency as a ratio/balance of nitrogen output in farm products to nitrogen input
- Nitrogen response curve: soil contribution, effect of nitrogen rate on NUE
- Need to take account of fertilizer and manure inputs

Benefits from improving NUE

- Economic: greater/optimum yield for given input
- Environmental: reduced GHG/ammonia emission, reduced risk/extent of nitrate leaching for farm and unit of production

Methods of calculation that have been used

- Amount of crop yield for a given amount of nitrogen input
- Amount of extra crop yield for a given amount of nitrogen input
- Preferred: Total nitrogen output divided by total nitrogen input

Calculating NUE for arable crops

- Calculation/estimation possible for individual crops
- Total nitrogen input: estimate of soil supply, fertiliser and manure applications
- Total nitrogen output: harvested yield, nitrogen/protein concentration in yield
- $NUE = \text{total output} / \text{total input}$

Calculating NUE for grassland/livestock units at enterprise/farm level

- Calculation possible at enterprise/farm level
- Total nitrogen input: estimate of soil supply, fertiliser and manure applications, nitrogen in imported feeds
- Total nitrogen output: output of milk, liveweight, eggs..
- $NUE = \text{total nitrogen output} / \text{total nitrogen input}$

Factors affecting NUE that cannot be managed

- Soil texture
- Climate

- Topography

Factors affecting NUE that can be managed

- Soil structure and health
- Soil pH and use of lime
- Supply of other nutrients
- Right rate, right fertiliser choice for situation
- Application timing and methods: incorporation, placement, injection, trailing shoe/hose
- Cultivations
- Crop protection
- Variety selection
- Add feed relevant factors

Using NUE as a benchmark to improve farm performance

- Need for a consistent simple method for calculating NUE
- Value of monitoring trends
- Value of proactively setting percent improvement in NUE to achieve for individual crops or for the livestock enterprise
- Importance of linking NUE to required production levels
- Difficulty of between-farm comparisons: non-manageable factors

Sources of information:

Nutrient Management Guide (RB209): Section 1 Principle of nutrient management and fertiliser use; Section 2 Organic materials; Section 3 Grass and forage crops; Section 4 Arable crops; Section 5 Potatoes; Section 6 Vegetables and bulbs.

N Use Efficiency (NUE)

This is the ratio/balance of N output in harvested crop to total N input from all sources. NUE is the best measure of how well N is being used but it is the most demanding to calculate.

N output is relatively easy but, for total N input, estimates must be made of N supply from the *soil and, where relevant, from any legumes grown.

$$N \text{ use efficiency (NUE)} = \frac{N \text{ removed in harvested crop (kg N)}}{N \text{ supply from all sources (kg N)}} \times 100$$

*estimated Soil Nitrogen Supply or measured

NUE can be calculated on a field, crop, enterprise or farm basis.

