

Name:

Nitrogen balance

Definition:

Based on the IRENA 18 indicator (Gross nitrogen balance) it reflects the possible excess of nitrogen in agricultural land. It is estimated by calculating the difference between nitrogen intake and nitrogen loss/outputs. It counts all inputs and outputs including residual nitrogen emissions into the soil, water and air. Therefore, it includes volatilization of ammonia. The main inputs include nutrient volumes such as inorganic fertilizer, livestock manure, nitrogen fixation per crops and atmospheric deposition per hectare. The main products include the amount of nutrients extracted from harvested crops and the grass / forage eaten by the livestock per hectare.

Calculation method:

This indicator is calculated by estimating the average balance in each of the plots / crops.

$$\text{Indicator} = \frac{\sum_i (BN_i \times A_i)}{A_T}$$

Where:

Indicator: Total nitrogen balance (kg N per ha per year)

NB_i: The nitrogen balance of crop *i* (kg N per ha)

A_i: Area for the crop *i* (ha)

A_T: Total area considered (ha)

The balance of each crop / plot is calculated as a difference between N inputs into the system and N losses from the system:

Inputs: nitrogen applied through organic and inorganic fertilizers, and legumes. Irrigation water.

Outputs: existing nitrogen in harvested agricultural products.

Interpretation:

The higher the balance, the greater the amount of nitrogen in the soil and therefore the greater the risk of contamination.

Using the values of this indicator, another two indicators can be calculated giving information on the management of fertilization:

- Nitrogen use efficiency, which is the ratio between the amount of fertilizer N removed from the field by the crop and the amount of fertilizer N applied.
- Nitrogen productivity, which represents the kg of crop per kg of N applied.

Information source:

Crop area, applied inputs and yields of the different crops are taken from the survey. The values of extractions of nitrogen by the crops and the fixation by legumes are taken from the attached bibliography.

Bibliography and references:

IRENA 18 – Gross nitrogen balance. OECD / Eurostat Nitrogen handbooks (2007)

Ministerio de Medio Ambiente y Medio Rural y Marino (2010). Guía práctica de la fertilización racional de los cultivos en España.

Ministerio de Agricultura, Alimentación y Medio Ambiente (2015). Balance del nitrógeno en la agricultura española, año 2013. Metodología y resultados.