Environmental assessment of N fertilizer management practices

Lammel, J. and Brentrup, F.
Centre for Plant Nutrition Hanninghof, Yara International ASA, Hanninghof 35, D-48249 Duelmen, Germany

Email: Joachim.lammel@yara.com

Nitrogen (N) fertilizer use contributes to different environmental impacts like eutrophication, acidification, and global warming. At the same time, N fertilizer use creates environmental benefits in terms of enhanced CO2 fixation and biomass production. The negative and positive environmental effects are interrelated with each other, i.e. to improve on one side may increase the environmental impact of another effect. Therefore, a holistic approach is necessary in order to simultaneously consider the complete range of potential impacts of N fertilizer use. A holistic approach allows the proper assessment of the environmental consequences of different N fertilizer management practices.

Life Cycle Assessment (LCA) is a methodology that has been developed and designed for such a holistic evaluation of all environmental effects related to a defined product during its entire life cycle (i.e. including production, transportation, use, and disposal/recycling). LCA is a stepwise approach starting with a descriptive inventory of emissions and resource use, followed by an aggregation of the inventory results into environmental indicators and it is completed by a final weighting and assessment of these indicators.

From existing LCA studies it is for instance known that cereal production at high fertilizing intensity emits more greenhouse gases than at lower intensities. Intensive cereal production however, needs less land to produce the same amount of grain than less intensive production. Improved productivity can therefore save land e.g. for nature conservation or biodiversity. In order to finally evaluate the “right” intensity of cereal production seen from an environmental point of view, a weighting procedure for the environmental impacts is inevitable. The weighting procedure is based on a so-called “distance-to-target” approach. It compares target values for environmental effects with their actual status.

The LCA methodology can be regionally adopted because the same emission may have different impacts according to the sensitivity of the place of deposition or emissions may be more relevant in regions where agriculture is a major contributor to environmental problems. In addition the environmental targets of the weighting methodology “distance-to-target” shall be valid for the region of application.