

Do environmental scientists behave more environmentally friendly with regard to nitrogen pollution?

Adrian Leip¹, Claudia Marques dos Santos Cordovil², Patrick Musinguzi³, Ina Körner⁴

¹ European Commission, Joint Research Centre, Institute for Environment and Sustainability, Via Fermi 2749, TP 266/040 I-21027 ISPRA (VA), Italy, <https://ec.europa.eu/jrc/en>, adrian.leip@jrc.ec.europa.eu

² Universidade de Lisboa, Instituto Superior de Agronomia, LEAF, Tapada da Ajuda, 1349-017 Lisboa, Portugal

³ Department of Agricultural Production, School of Agricultural Sciences, Makerere University, Kampala, Uganda

⁴ Hamburg University of Technology, Institute of Wastewater Management and Water Protection; Bioconversion and Emission Control Group, 21073 Hamburg, Germany

Abstract

Nitrogen neutrality is a novel concept that aims at reducing the N-footprint caused by an entity and offsetting the residual emission of reactive nitrogen (Nr). This concept had been applied to three conferences (6th International Nitrogen Conference in 2013 in Kampala, Uganda; 18th Nitrogen Workshop in 2014 in Lisbon, Portugal; 15th Ramiran Conference in Hamburg, Germany) with different concepts and different degree of willingness of the participants to contribute to the voluntary compensation fee. This paper analyses the results of surveys made among the participants of the conferences to understand their view on low-impact conferences, N-footprints, and the N-neutrality concept.

Key Words

Nitrogen pollution, environment, greenhouse gas emissions, environmental consciousness, food chain, behaviour,

Introduction

The effects of excess reactive nitrogen on ecosystem and human health are well documented. There is extensive literature on possible options to achieve a reduction of excess release of reactive N to the environment, in particular for emissions from the agro-food chain which is responsible for a majority of Nr releases. Those include best management practices to a more nitrogen efficient agricultural production, recycling of organic material, and reduction of food loss and food waste. However, agricultural production is not the only driver for N pollution. Energy, transports and human consumption also contribute to the release of reactive N into the environment. On the consumption side, many authors have suggested the adoption of different diets where animal products are restricted such as e.g. the demitarian diet (International Nitrogen Initiative, 2009).

To enable consumers to monitor their share of Nr releases to the environment, the concept of the N-footprints has been developed in recent years (see amongst others Galloway et al., 2014; Gu et al., 2013; Leach et al., 2012). The first N-footprint approach launched in 2012 by Leach et al. calculates the release of N into the environment as a result of personal food and energy consumption patterns. Later, a food N-footprint quantifies the total losses of N to the environment linked to the consumption of a meal, an average persons' year or a conference and the fate of consumed N (Garcia Ramirez et al., 2016; Leip et al., 2014b; Westhoek et al., 2015, 2014).

The concept of 'Nitrogen Neutrality' (Leip et al., 2014a) goes two steps further and suggests to care of the N footprint caused by the consumer or an entity in advance and steer the own consumption in a way to reduce excessive Nr and in addition to try to 'offset' the emissions which could not be avoided by helping to reduce Nr emissions somewhere else (see Box 1). The concept has been developed in analogy to the Carbon-Neutrality concept which is already well established, for example to compensate CO₂ emissions from air travel.

The concept towards N-neutrality has been applied so far at the 6th International Nitrogen Conference in 2013 in Kampala, Uganda, at the 18th Nitrogen Workshop in 2014 in Lisbon, Portugal, and at the 15th Ramiran Conference in Hamburg, Germany (Leip et al., 2015, 2014a). Each time, the goal was similar, demonstrating measures for Nr reductions. However, the approached differed due to the different settings of the conferences. Nitrogen is a multi-component, multi-threat and multi-scale pollutant and while even the definition of a 'footprint' is not always unambiguous – this is even more the case for the question how Nr

releases can be offset. Therefore, the selection of the offsetting project was done according to the focus and preferences of the conferences.

Box 1. Definition of N-neutrality according to Leip et al. (2014a)

- To achieve N-neutrality,
- (1) first decrease the release of reactive nitrogen (Nr) into the environment by
 - (a) reducing over-consumption of food and reducing food wastes and minimizing energy consumption, and
 - (b) choosing sustainable sources of energy and food,
 - (2) then, contribute to a measured compensation of the remaining Nr releases by a measured
 - (a) reduction of Nr releases elsewhere to balance the remaining releases,
 - (b) increased sustainability in the production of food where sustainable land management is not yet achieved.

In each of these conferences, the participants received information on their N-footprint during the conference and were asked to contribute with a ‘fee’ to compensate for the Nr losses during the event, through sponsoring a chosen project. However, response was mixed. Therefore, a survey was launched in 2014/15 to investigate the reason for the relatively scarce participation to the N-neutrality exercise at the 18th Nitrogen Workshop.

The objective of this paper get an understanding how future implementations of the N-neutrality concept should be done, and – more generally – how we can move from the understanding of the central role of nitrogen for the environment to a responsible engagement of the society.

Methods

Implementation of the N-neutrality concept

Table 1 shows an overview of the implementation of N-neutrality at the three conferences

Table 1. Overview of conferences where the N-neutrality concept was implemented so far – main differences

Aspect	N2013	18NW	RAMIRAN
Conference Location	Kampala, Uganda	Lisbon, Portugal	Hamburg, Germany
Compensation project	UN-Millennium Village, Kampala	ReFood, Lisbon	Urban gardening in Indonesia
Compensation fee requested	US\$ 50 (also in €)	20 Euro	30 Euro
Share of people participating	38%	13%	9%
Participants	160	207	231

The survey

A survey was sent out to 18NW participants to understand "How can the scientific community convince society (and policy makers) to do something about nitrogen if they are not ready themselves to do something about it?" (Cordovil and Leip, 2014). The survey consisted of a few question asking those participants on the reason why they did not contribute to the N-neutrality concept and all participants on their view on the N-neutrality concept and the selected compensation project (see detailed question of the survey on the link provided below).

The satisfaction questionnaire on the RAMIRAN conference contained a number of questions on the N-neutrality programme: general view on the programme and on specific measures undertaken to reduce the N-footprint, raise awareness, and the demonstration project.

Results

95 participants at the 18 NW conference answered the survey, out of a total of 207 participants. 27 participants contributed to the N-neutrality project. 28% of the respondents said that they did contribute to N-neutrality, thus the responses were somewhat biased towards a positive view on the concept, as only 13% of the participants actually contributed. For those who did not contribute, insufficient communication (34%)

and financial reasons (31%) were the main arguments brought forward, while the N-neutrality concept itself and the selected REFOOD project were mentioned less frequently (15% and 20% of answers, respectively). Selected results of the survey are given in Figure 1.

From 231 participants at the RAMIRAN conference, between 49 people completed the questionnaire. From those, 18% had contributed to the N-neutrality project, and 20% intended to still do so. 57% of respondents evaluated the N-neutrality approach good or very good versus 10% bad or very bad. Positive feedback was even stronger with regard to asking nutrition behaviour (mixed, vegetarian, vegan and special diets) during registration (77%), displaying N footprints and related info of the menus (73%) and reducing the N-footprint by prior evaluation and menu selection (67%). Other information (posters, nitrogen game) were also evaluated positively, but ‘no comment’ was given by the majority of respondents.

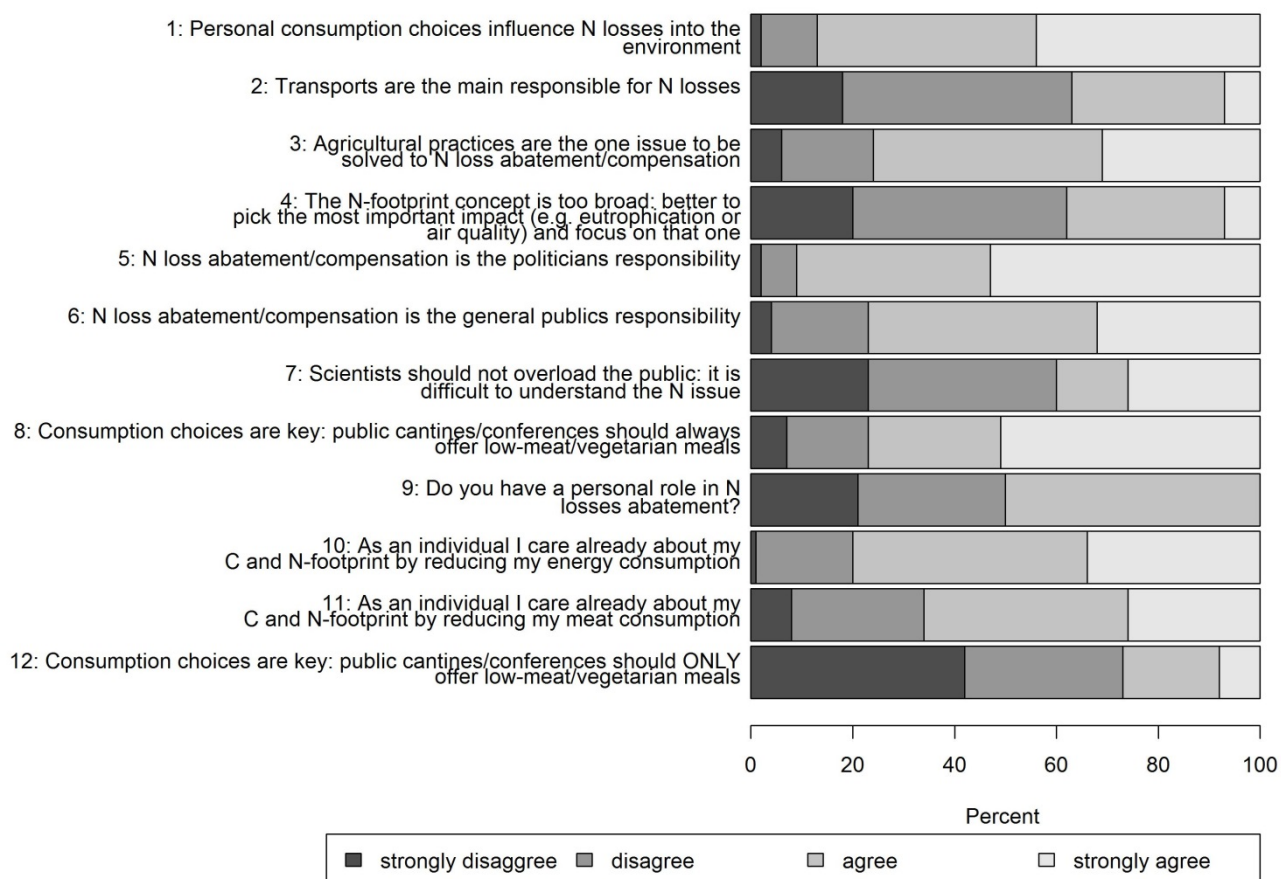


Figure 1. Survey responses with respect to the general evaluation of the “N problem

Discussion

Nitrogen neutrality appears to be a difficult concept, in particular the idea that N_r emissions to the environment can be ‘compensated’ by sponsoring nitrogen-smart projects. The nature of the nitrogen cascade suggests to select ‘holistic’ offsetting projects, however, some participants missed the link between the project and specific problems caused by excess nitrogen – with different threats being perceived as most important. But there are also more fundamental concerns about the concept. A greater participation in the N2013 can reflect a greater sensitivity of the participants towards the project located in a poorer region. First of all, the danger of ‘greenwashing’ environmentally damaging behaviour must be taken very seriously and might be a consequence of insufficient (or maybe insufficient communication of) efforts to reduce the N-footprint at the event itself. Many also question the possibility or legitimacy of ‘offsetting’ personal emissions per se (also with regard to the more established C-offsetting). Personal financial reasons have also been pointed out but somehow contradict the contribution at N2013 which had a higher associated fee (Table 1) (Leip et al., 2014a). Most participants however appreciate efforts made to reduce the N-footprint of a conference, in particular by querying nutrition preferences to target food supply and reduce waste, and to

select low-footprint menus and to provide quantified N-footprints for the food offered. Therefore, a focus for future conferences could be based collection of information and on methods and experiences to reduce N footprint.

Conclusion

The N-neutrality concept is still in its infancy. It is challenging to provide an event-specific quantification of the N-footprint and reduce it to a minimum – but this is the basis before one can start thinking about compensation. The ‘nitrogen problem’ and the importance of integrated approaches in a resource efficient and sustainable society is slowly gaining more attention. Environmental scientists have substantial interest what the Nr emissions is they cause and many showed willingness in actively reducing the N-footprint. Communication of the N-neutrality concept to the (scientific and non-scientific) audience however is still difficult and needs to be effectively separated from a concept of charity initiative. Currently, N-neutrality is still experimenting with different ‘designs’ ... but the range of possible designs is far from explored; more experiences are required to better explore its potential and limitations.

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