Melbourne Declaration on Responsible Nitrogen Management for a Sustainable Future

Acknowledging the great benefit of reactive nitrogen[1] to increase agricultural productivity and feed the fast growing world population;

Acknowledging the strong tie between food production and population growth that speaks to the need to increase food access for the poorest sectors of the globe;

Concerned by the cascading environmental effects of reactive nitrogen which leaks from many agricultural systems, is wasted through poor food utilization and is emitted by energy combustion;

Supporting the objectives of the International Nitrogen Initiative (INI) to provide the scientific foundation to optimize the benefits of reactive nitrogen creation, for food production and from energy combustion, and to minimize the impacts associated with its losses to the environment;

Recognizing that we are all part of the problem and also part of the solution, and that optimizing reactive nitrogen management requires engagement across all of society, including farmers, energy providers and consumers.

Reinforcing declarations made at previous international nitrogen conferences that encourage optimum nitrogen use for agricultural production and avoid loss of reactive nitrogen to the atmosphere, groundwater and surface water;

Acknowledging positive developments observed in recent years, e.g. reports of improved N use efficiency in some countries, and a large increase in fertilizer use in sub-Saharan Africa;

Recognizing that the management of reactive nitrogen is closely related to the UN Sustainable Development Goals, especially the goals in relation to zero hunger, clean water, climate, biodiversity and the marine ecosystem; to the Paris Agreement on Climate Change aiming at keeping global temperature rise below 2°C; and to the 2015 International Year of Soils that reaffirmed the urgent need for maintaining and improving the health of Earth's agricultural soils;

Welcoming the official launch of the project: "Towards an International Nitrogen Management System" (INMS) during the Melbourne conference;

Emphasizing the strategic importance of innovation and multi-stakeholder partnerships to address challenges and seize opportunities;

[1] 'reactive nitrogen' includes all forms of nitrogen other than the inert dinitrogen of the air. It includes, nitrate, nitrite, nitrogen oxides, nitrous oxide, ammonia, organic compounds such urea and as proteins, etc.

Noting that the INI conference takes place for the first time in Oceania, where there are unique challenges, such as conserving the fragile Great Barrier Reef, where excess reactive nitrogen (and phosphorus) exacerbates already strong effects of climate change and ocean acidification;

Noting that Melbourne INI conference delegates achieved a 60% reduction in dietary-N intake overall, through food choices as part of conscious awareness of the N footprint of this conference;

The 384 delegates representing 44 countries of the 7th INI Conference held on 4-8 December 2016 in Melbourne, Australia recommend the following:

Living standards for all people
All peoples of the world are entitled to adequate nutritional and living standards.

Reactive nitrogen from fertilizer and leguminous crops and pastures is essential for the secure supply of affordable and nutritious food.

Policy
Policy must be based on sound science.

National governments should not distort the prices of agricultural products and nitrogen fertilizer by subsidies that encourage inefficient use of fertilizer.

Smart, temporary fertilizer subsidies are justified where nitrogen fertilizer to crop price ratio is a disincentive for fertilizer use.

We call for governments at all levels to reconcile national policies so as to manage nitrogen fertilizer, manure from animal production, human waste and energy combustion in keeping with the UN Sustainable Development Goals.

Nitrogen performance indicators
Nitrogen use efficiency (NUE) is a useful term, but complementary performance indicators should be used across the value chain that reflect economic efficiency, product quality, environmental sustainability and the many societal and economic benefits of reactive nitrogen.

Performance indicators for responsible N management should include impact-based metrics and be adjusted to the scale at which they apply, for example from field to region. Methodologies for estimating nitrogen performance indicators need to be globally harmonised in this connection.

Substantial progress has been made in developing frameworks that incorporate a suite of performance indicators and the adoption of such frameworks should be encouraged.

Personal nitrogen footprint calculators are informative tools to connect the consumer with the impact of their resource consumption on nitrogen pollution.

Nitrogen performance indicators should be included in existing food sustainability standards, developed by business, NGOs and/or governments, and made available to consumers.

Stakeholders
Many people in the world consume protein, particularly animal-based protein, at levels above what is required for nutrition and healthy lives. Consuming protein at internationally recommended nutrition levels and choosing N-efficient protein can significantly reduce the loss of reactive N to the environment.

When in excess, reactive nitrogen can damage human health through impacts on the quality of air (smog and particulates associated with ammonia and nitrogen oxides) and water (toxins associated with harmful algal blooms). Better N management will improve quality of life and reduce health care costs worldwide.

Nitrogen overuse is aggravated by food losses and wastage, such as post-harvest losses in developing countries and consumer wastage in developed countries.

The environment is a crucial stakeholder in nitrogen management**.** For example, the biodiversity of coral reefs, estuaries, freshwaters and natural terrestrial systems, which provide necessary ecosystem services to society worldwide, are threatened or damaged by too much reactive nitrogen.

Capacity building is needed among national and regional institutions for integrated N assessment.

Science and technology

Sustained support for science and technology is needed to improve nitrogen management in agriculture and energy production. An increased focus on engineered and environmental management innovations is expected to help capture and reuse reactive nitrogen, with the potential for creating substantial economic gain and lower need for creation of new reactive nitrogen from the atmosphere.

Research is also needed to better quantify the amount of nitrogen fluxes embedded in international trade.

Development of region-specific agricultural practices should progress from single-factor technology to combinations of two or more independent factors that provide synergies to enhance nitrogen management. These could include genetic improvement of plants and animals (including biotechnology), the use of enhanced-efficiency fertilizers, further advances in crop and pasture agronomy and animal feed and manure management.

Research is needed for enhanced energy use efficiency in industry and transport. Research is also needed to develop more effective outreach tools to farmers and consumers.

Region-specific research is necessary to improve soil health. Nitrogen uptake by plants can be enhanced when it is balanced by other essential nutrients, and when soil organic matter and pH are close to optimum. There is a need for adequate long-term monitoring of soil health at a range of scales including analysis of global trends.

Sustained science and technology investment is essential to mitigate the threats of mining soil nitrogen without offsetting fertilizer input, particularly in the least-developed countries. There is also need for improved accessibility to inputs, including water, recycling N from organic wastes and wastewater, managing soil constraints, sustainable land use, aided by supportive policies and participatory research.

Overarching conclusion

Nitrogen management should strive to simultaneously improve the efficiency of nitrogen use, increase farm productivity, enhance soil health, conserve resources and reduce losses of reactive nitrogen to the environment.

Melbourne, Australia
8 December 2016.