The International Nitrogen Initiative - From Noordwijkerhout to Costa do Sauipe: How Have Minds Evolved?

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International Fertilizer Industry Association (IFA)

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Background
## Reactive Nitrogen: What Is It?

<table>
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<tr>
<th>Examples of reactive forms of N (Nr)</th>
<th>Inorganic reduced forms</th>
<th>Ammonia (NH$_3$)</th>
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<td>Ammonium (NH$_4^+$)</td>
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<td>Inorganic oxidized forms</td>
<td>Nitrite (NO$_2^-$)</td>
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<td>Nitrate (NO$_3^-$)</td>
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<td>Nitrous oxide (N$_2$O)</td>
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<td>Nitric oxide (NO)</td>
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<td>Nitrogen dioxide (NO$_2$)</td>
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<td>Organic compounds</td>
<td>Urea</td>
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Reactive Nitrogen: The Issue

Global rates of reactive nitrogen creation by people

Source: Galloway et al
Reactive Nitrogen: The Issue

Source: Sutton et al
Reactive Nitrogen: The Issue

Fertilizer N Use Efficiency ($PFP_N$) Trend for US Corn

Source: Fixen and West
Reactive Nitrogen: The Issue

Fertilizer N Use Efficiency ($PFP_N$) Trend for Cereal Production in Asia

Calculated using FAO and IFA data
Reactive Nitrogen: The Challenge

- Further improve N use efficiency in developed countries
- Revert the declining N use efficiency (PFP$_N$) trend in developing countries
- Not to the detriment of crop yields

Credit:: Yin Kedong
Credit:: Paul Seward
Credit:: Mark Sutton
From the 1st to the 4th International Nitrogen Conference
Where Is Noordwijkerhout Located?
And...Where Is Costa do Sauípe Located?
From Noordwijkerhout to Costa do Sauipe
From Noordwijkert to Costa do Sauipe
Milestones on Nitrogen Fertilizer

- 2001: 2nd Int’l N Conference, USA
- 2002: Establishment of the International N Initiative (INI)
- 2003: UNEP’s Global Environment Outlook Yearbook focuses on nitrogen
- 2004: SCOPE workshop on fertilizer N, Uganda
- 2004: 3rd Int’l N Conference, China
  
  Adoption of the “Nanjing Declaration”, which is submitted to UNEP
- 2006: UNEP/Woods Hole workshop on policy responses, France
- 2007: 4th Int’l N Conference, Brazil
Focus on effects of increased cycling of N from local to global scales

Key messages:
- N fluxes in the atmosphere and biosphere increase in all parts of the globe
- N has a range of well understood beneficial and detrimental consequences for people and the environment
- Scientists and decision makers need to work together to solve N-related problems

Was recommended to organize a second conference in the USA
Focus on North America and Europe

Key goals:

- Increase scientific knowledge about N sources and effects
- Stimulate communication among leaders in N production and consumption
- Explore policy strategies to increase food and energy production and decrease environmental impacts

Was recommended:

- To organize a third conference in China
- To create the International Nitrogen Initiative
The International Nitrogen Initiative

- Established in 2002
- A 3-step approach to move from science to the implementation of the right responses
  - Assessment of knowledge (N fertilizer, denitrification…)
  - Identification of solutions
  - Implementation of solutions
- Works through regional centers: North America, Latin America, Europe, Asia, Africa
- IFA and IPNI representatives invited as advisors

www.initrogen.org
SCOPE Nitrogen Fertilizer Assessment Project

2004, Uganda

- Organized by SCOPE and sponsored by IFA
- Focus on N fertilizer use (too much and too little)
- Key issues:
  - Crop, environmental and management factors affecting N use efficiency
  - Emerging technologies to increase use efficiency of fertilizer N
  - Pathways of N losses and their impacts on human health and the environment
  - Societal responses for balancing food production and environmental concerns
- Proceedings were released for the 3rd Int’l N Conference
Context Prior to the 3rd International Nitrogen Conference

- UNEP raises public interest through a chapter on the “N cascade” in its 2003 GEO Yearbook and a press release on “dead zones”

- High focus on negative impacts of misuse or overuse of N fertilizer

- Attempts to call for an international binding protocol on reactive N
Focus on Asia

Key goals:

- Exchange and integrate scientific knowledge on sources, fates and consequences of N at different scales
- Explore balanced strategies to increase food and energy production while protecting environmental quality and natural resources
- Suggest an action plan

Side-events organized by the industry

Was recommended to organize a fourth conference in Brazil

The “Nanjing Declaration” on N management was adopted
The “Nanjing Declaration”

It calls upon governments to optimize N management at different scales by:

- Further assessment of the N cycle
- Increasing N use efficiency and effectiveness in agricultural production and energy use
- Developing solutions to reactive N problems (due to both excess and lack)
- Developing and promoting:
  - A code of good agricultural practices
  - Strategies for sustainable energy use
  - Application of emission reduction technologies
Brought together policy makers, scientists and industry

Key objectives:
- Determine specific challenges posed by reactive N
- Assess effectiveness of existing policy instruments
- Explore a possible comprehensive approach to managing reactive N

Key conclusions:
- There are no and should not be N policies per se
- Policies should look at specific issues (climate change, eutrophication…) and be tailored to local conditions
The 4th International Nitrogen Conference
2007, Brazil

✦ First conf. entirely organized under the auspices of INI
✦ Focus on Latin America
✦ First conference looking at both “too little” and “too much” N
✦ First conference with full session dedicated to the industry
✦ Some of the main issues addressed:
  o Biofuel production and N₂O emissions
  o Animal production and alterations of the N cycle
  o Indirect impacts on human health of reactive N losses
  o N fertilizer use and poverty alleviation
  o Policy responses (assessment needs, policy instruments)
What Has Happened on the Industry Side?

- 2003: IFA established a task force on enhanced-efficiency fertilizers → workshop in Germany in 2005
- 2004: IFA established a task force on reactive N → booklet in 2006 to raise awareness of the members
- 2006: IFA established a task force on fertilizer best management practices → workshop in Belgium in 2007
- 2007: PPI becomes IPNI → a Nitrogen Program is established
In Summary

- Much greater trust among stakeholders
- Improved communication and better understanding of respective expectations
- Stronger involvement of all stakeholders in trying to achieve common goals
- But… disagreements on some sensitive issues still remain
What Next?
Challenges for INI

- New chairman to be appointed soon
- Remain scientifically sound and independent from policy pressures
- Find funds for organizing additional workshops (e.g. on N and human health)
- Budget constraints for the Latin American, Asian and African centers
- Keep right balance between regions with “too much” and those with “too little” reactive N
- Strengthen partnerships between key stakeholders

James Galloway
University of Virginia, USA
Chairman of INI
The INI Regional Centers

North America

Europe

Asia

Latin America

Africa

Will become East Asia

South Asia to be established soon
The 5th International Nitrogen Conference

We should support Africa for N 2013

N 1998
N 2001
N 2004
N 2007
N 2010
Nov/Dec 2010
New Delhi, India
Challenges for the Industry

- Remain actively involved in INI through IFA and IPNI
- Closely monitor scientific and policy issues relating to fertilizer N
- Develop links with other suppliers of N sources to agriculture (animal manure, biofuel co-products, sewage sludge)
- Increase links at the regional level, in particular in Asia, Latin America and Africa
- Help manage unwanted impacts associated with the use of fertilizer N (and possibly other N sources in agriculture)
- Advocate in favour of greater fertilizer N use in Africa
- Better communicate on industry’s initiatives and achievements, in particular on fertilizer BMPs
Thank you!

www.fertilizer.org