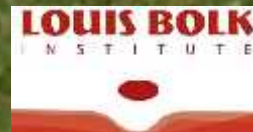


# SUCCESS STORIES OF NITROGEN ACROSS TWO DECADES OF INTERNATIONAL CONFERENCES

WILLEM ERISMAN  
ENRICO DAMMERS  
M GALLOWAY  
ALEY LEACH  
BERT BLEEKER



**7th International Nitrogen Conference (INI 2016)**  
4-8 DECEMBER 2016  
MELBOURNE CRICKET GROUND | VICTORIA | AUSTRALIA  
'SOLUTIONS TO IMPROVE NITROGEN USE EFFICIENCY FOR THE WORLD'



Faculty of Earth  
and Life Sciences

# NI – CONFERENCES



1. 1998 – Noordwijkerhout  
(The Netherlands)

2. 2001 –  
Washington (USA)

3. 2004 –  
Nanjing (China)

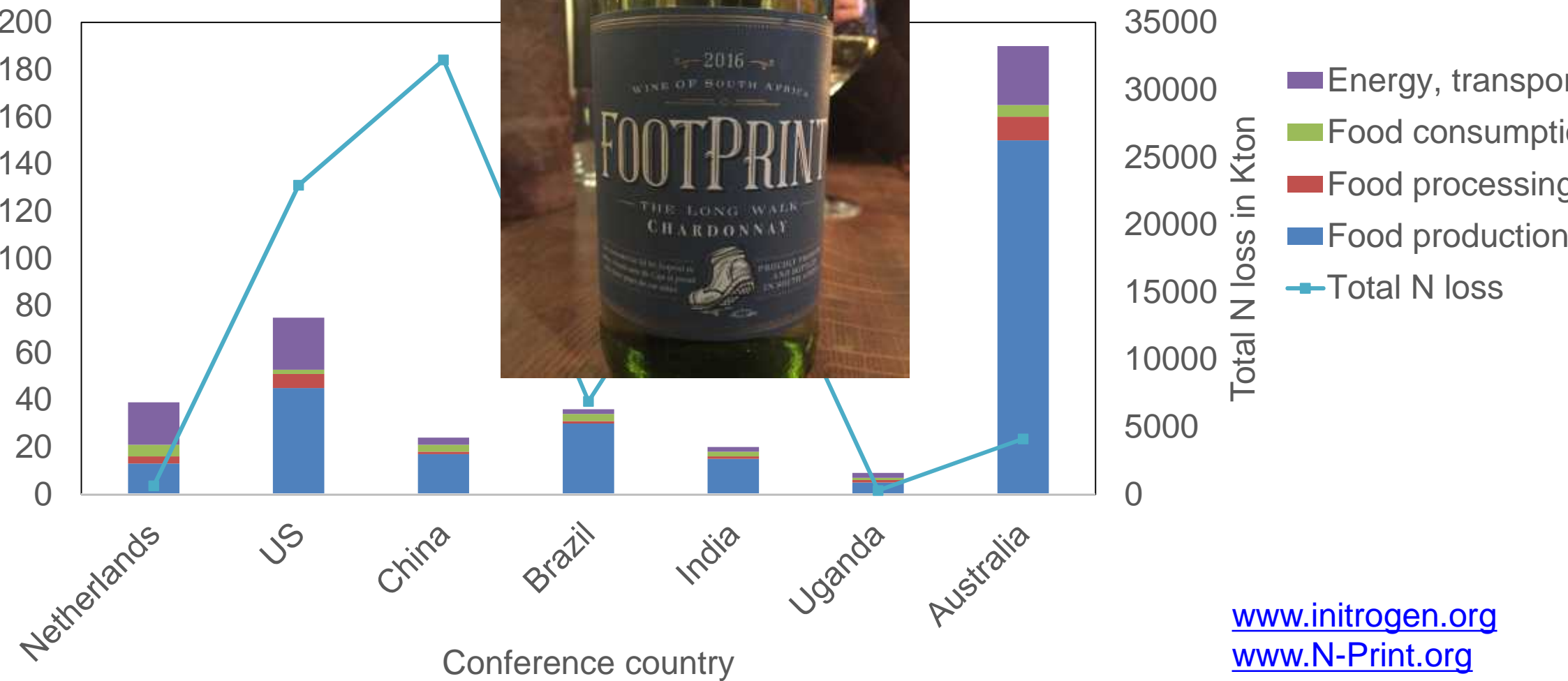
5. 2010 – New Delhi  
(India)

4. 2007 –  
Costa de Sauipe  
(Brazil)

6. 2013 – Kampala  
(Uganda)

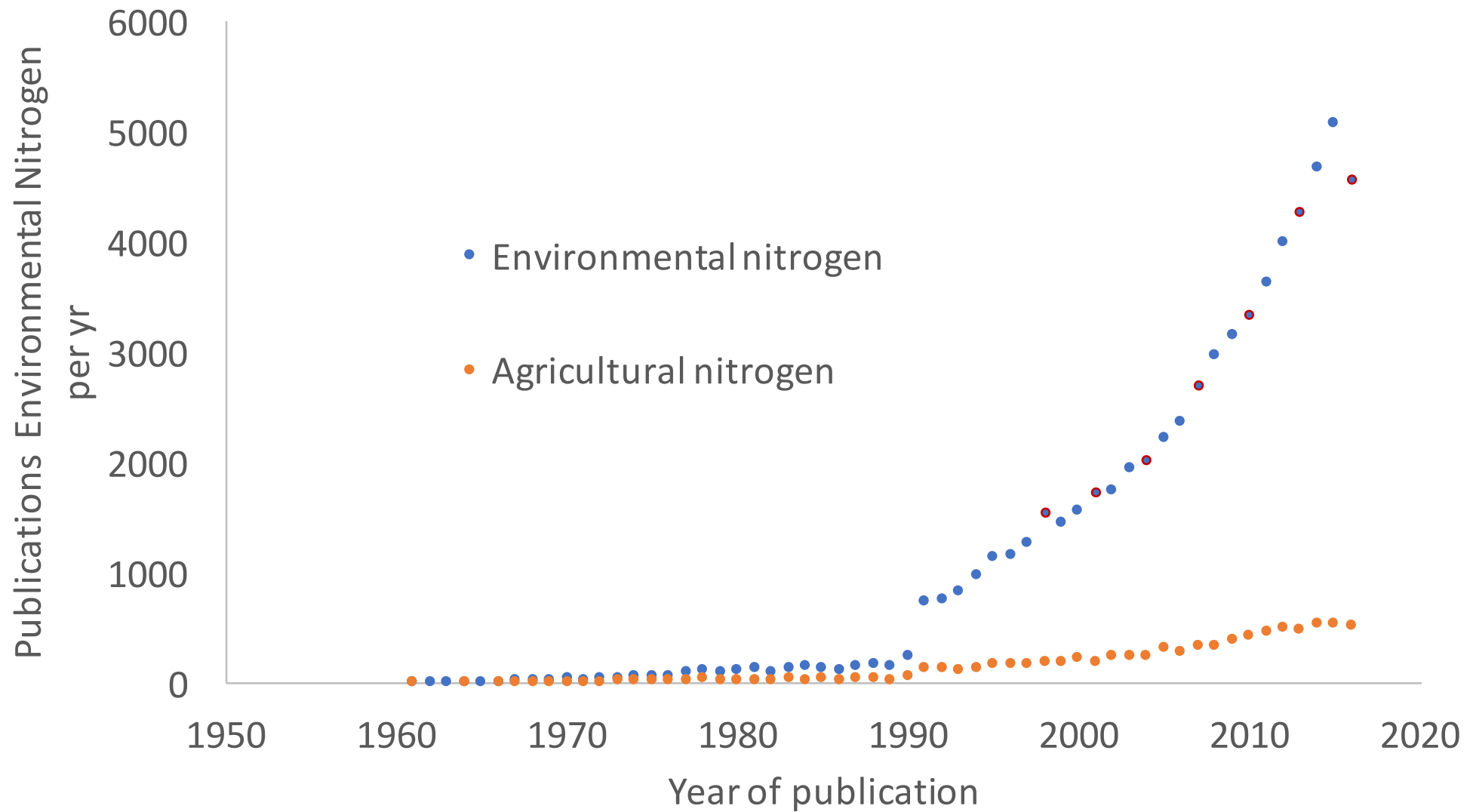
7. 2016 –  
Melbourne  
(Australia)

# FOOTPRINTS

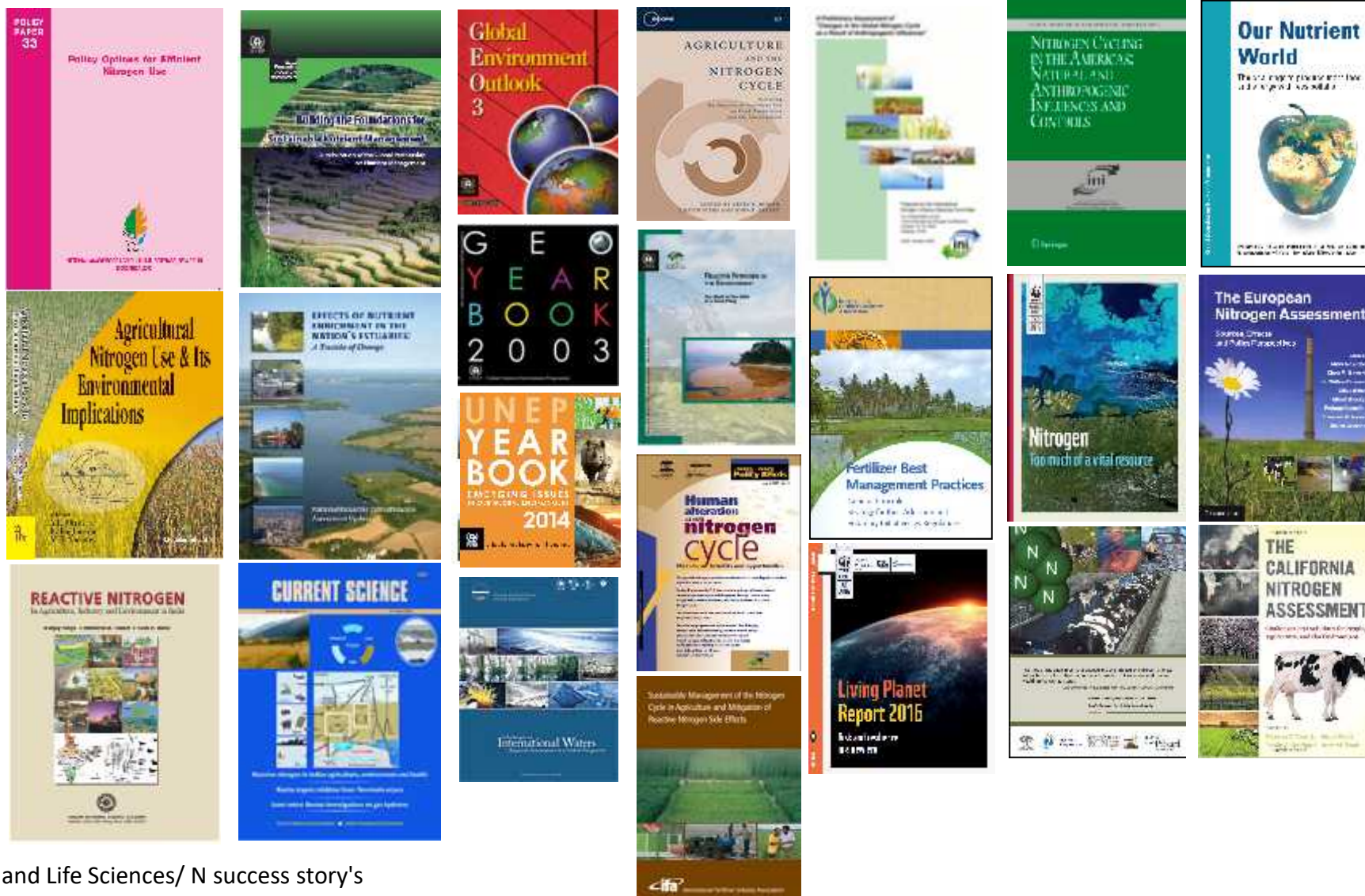


[www.initrogen.org](http://www.initrogen.org)  
[www.N-Print.org](http://www.N-Print.org)

# INCREASING NUMBER OF PEER REVIEWED PUBLICATIONS



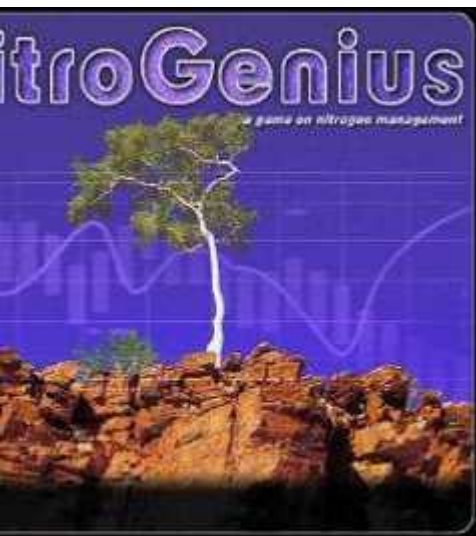
# NITROGEN ASSESSMENTS



And many more ....

Earth and Life Sciences/ N success story's

# TOOLS FOR OUTREACH AND COMMUNICATION



[www.nine-esf.org](http://www.nine-esf.org)

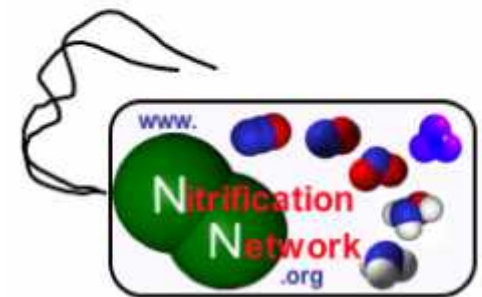


[www.initrogen.org](http://www.initrogen.org)

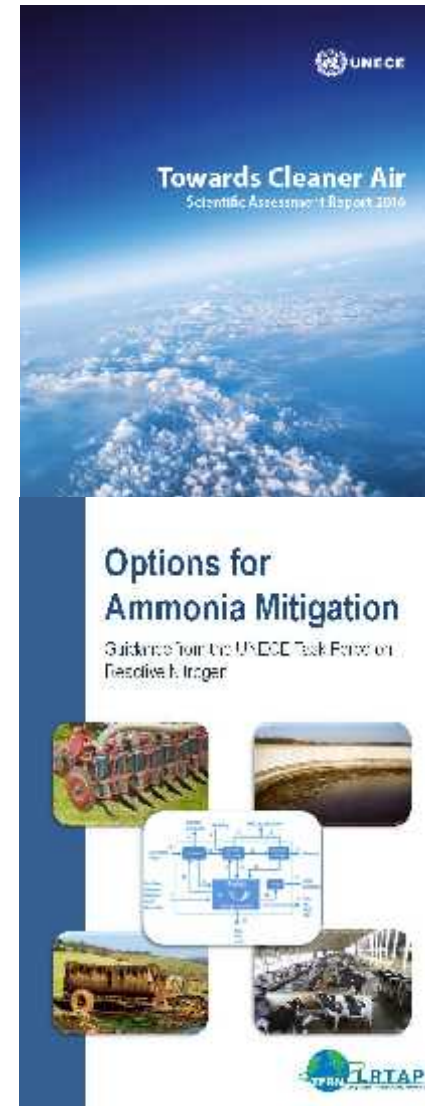
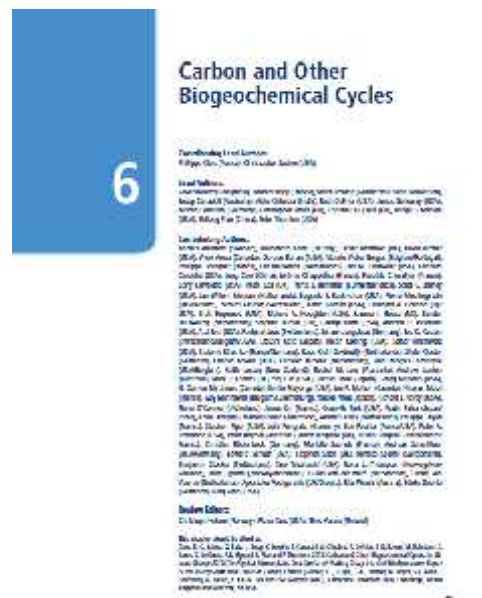
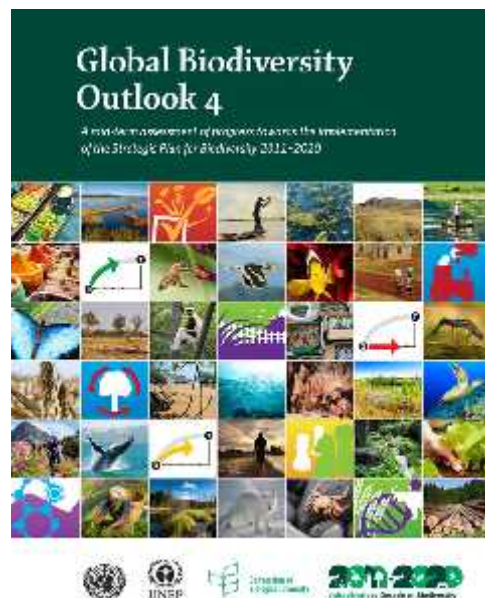


[www.n-print.org](http://www.n-print.org)

# ORGANISATIONS, NETWORKS AND PROJECTS

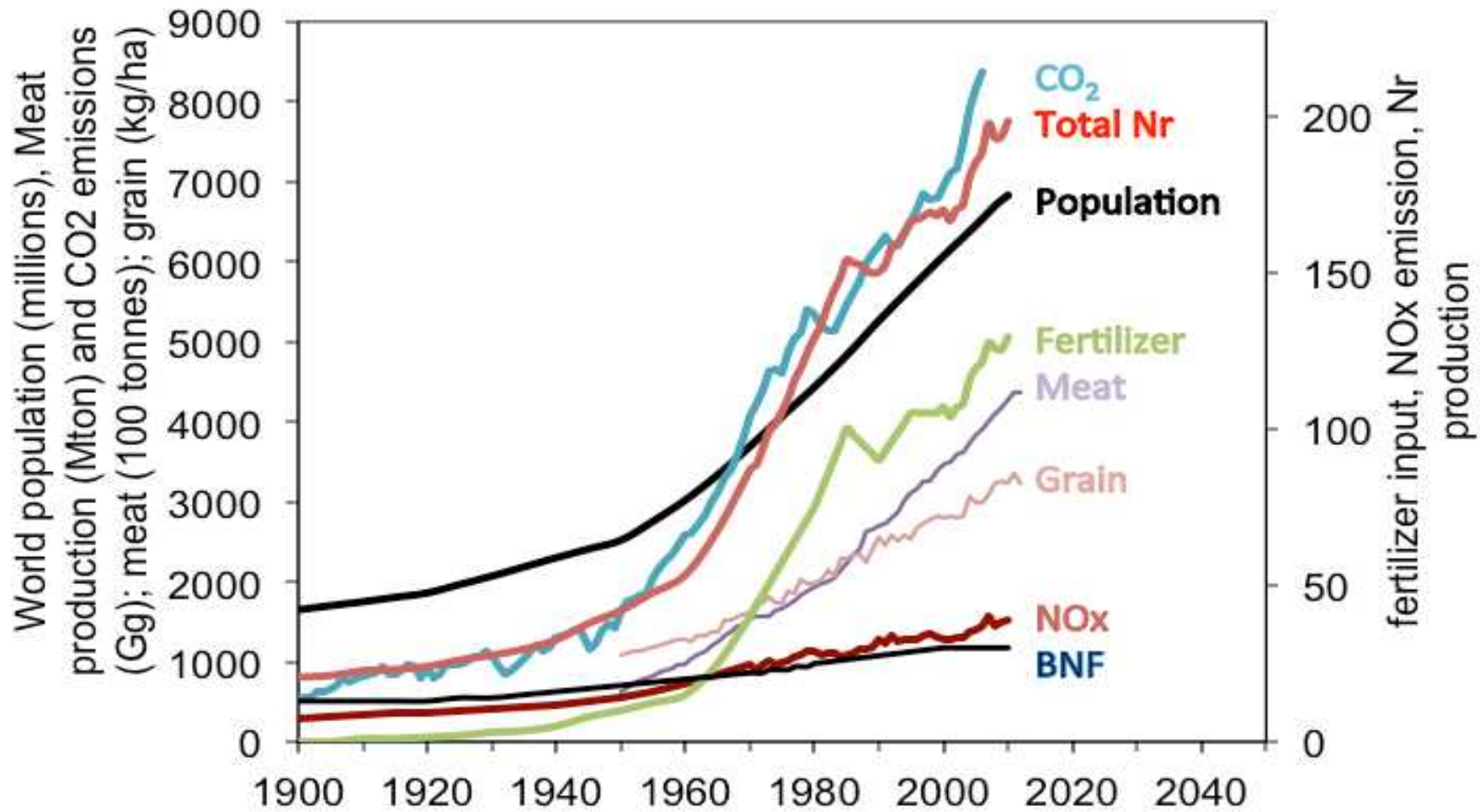


# POLICY RELEVANT INPUTS/OUTPUT





# GLOBAL TRENDS IN HUMAN POPULATION, NR, CO2 AND GRAIN AND MEAT PRODUCTION



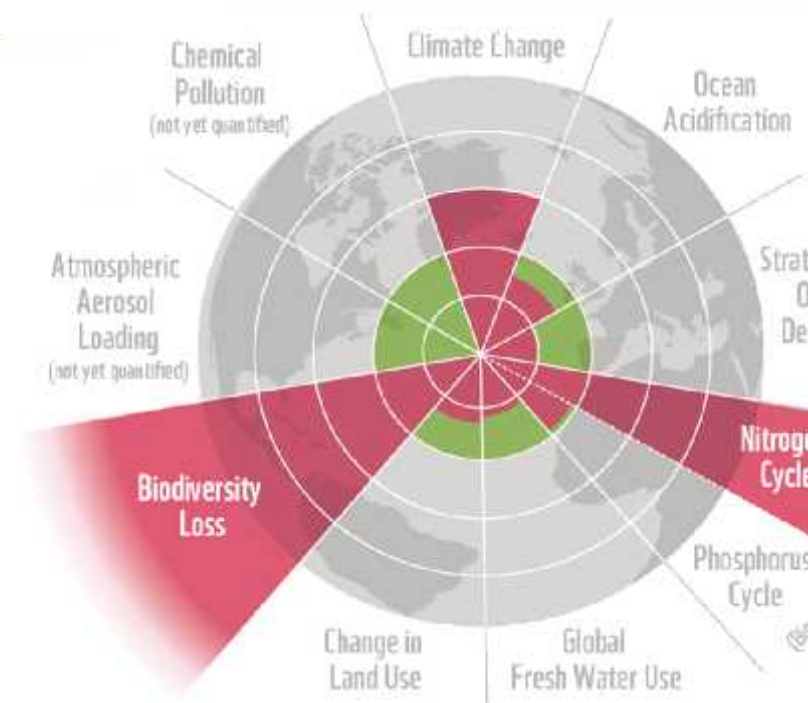
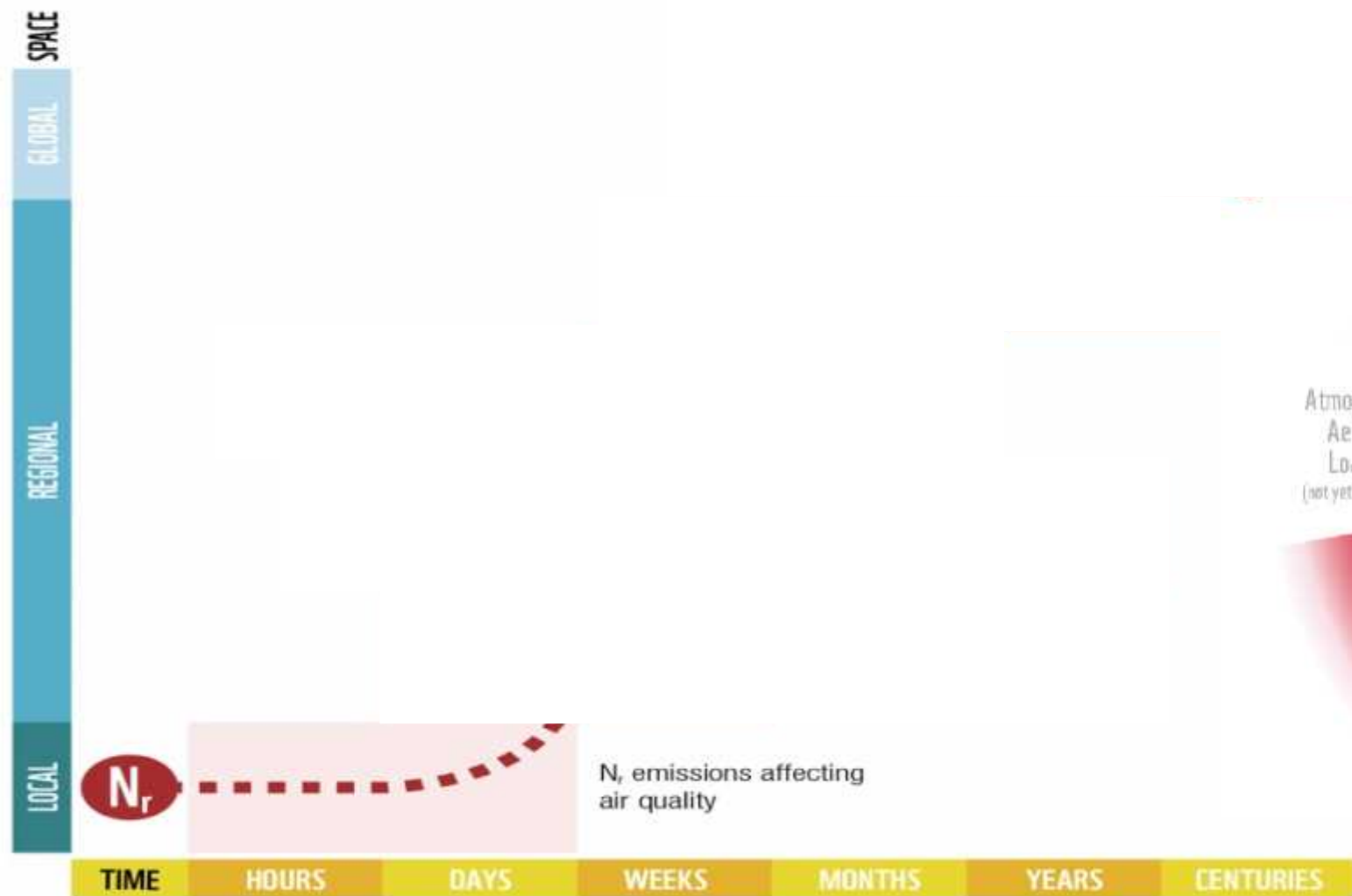
**48%** of the global population eat because of fertilizers

# NITROGEN STIMULATES ALL GROWTH



David, Michelangelo Buonarroti (1475 - 1564)

# TOO MUCH NITROGEN: IN A CASCADE

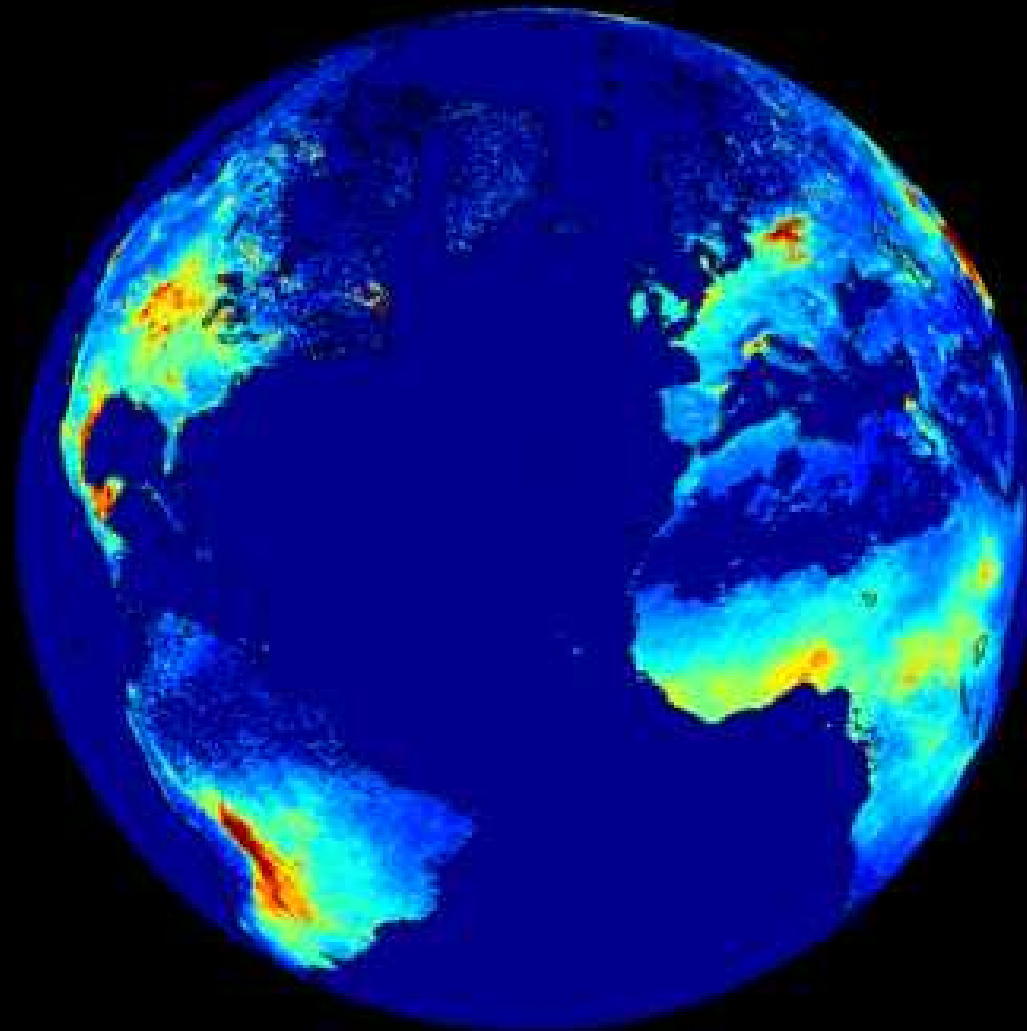


Rockström et al. 2009

Galloway et al. 2003

# AMMONIA SATELLITE OBSERVATIONS

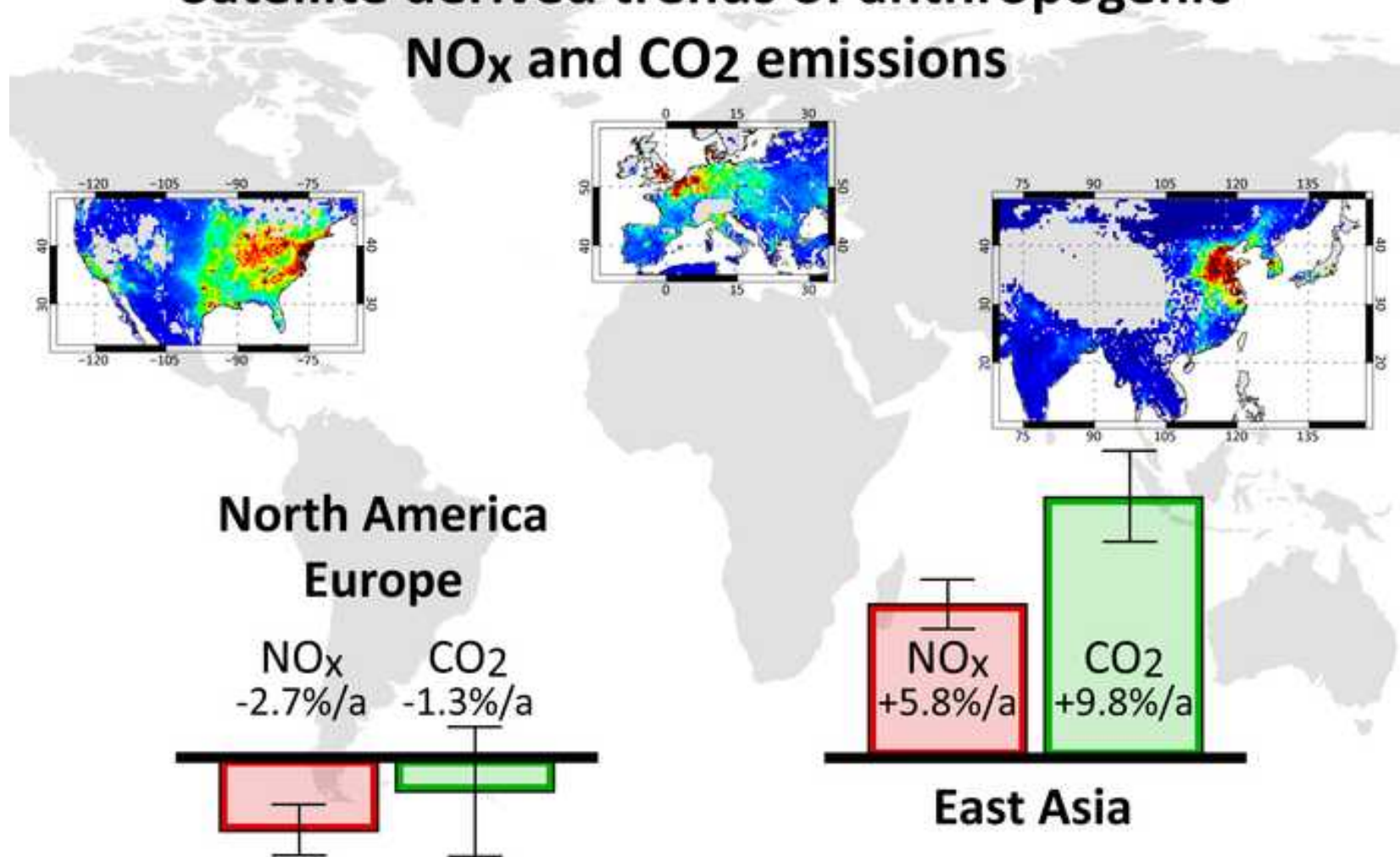
2011 NH<sub>3</sub> distribution



Van Damme et al. 2014

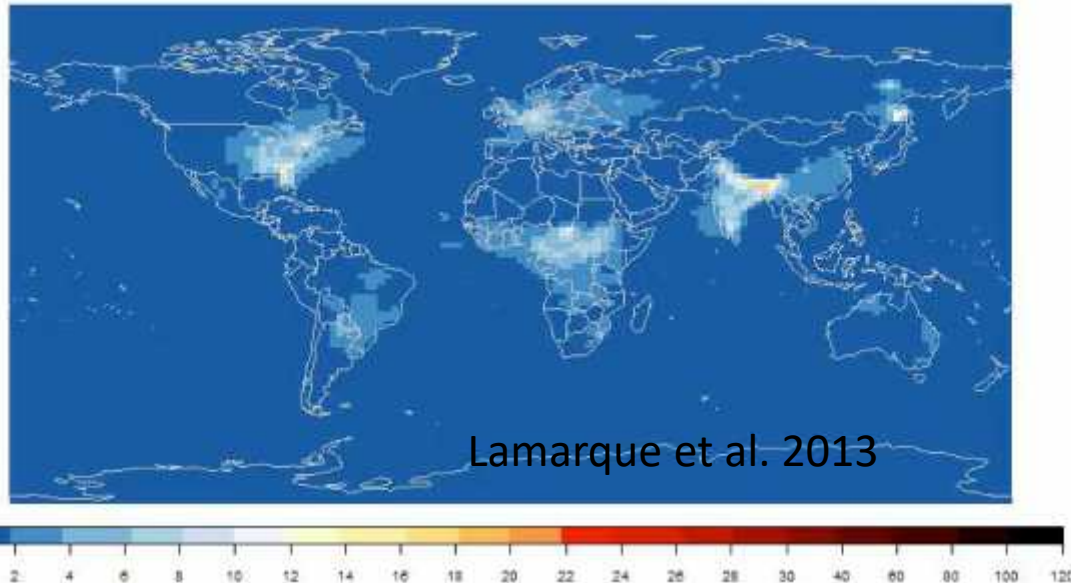
# MISSIONS TREND AS AVERAGE RATE PER YEAR FROM 2003 TO 2010

## Satellite derived trends of anthropogenic NO<sub>x</sub> and CO<sub>2</sub> emissions

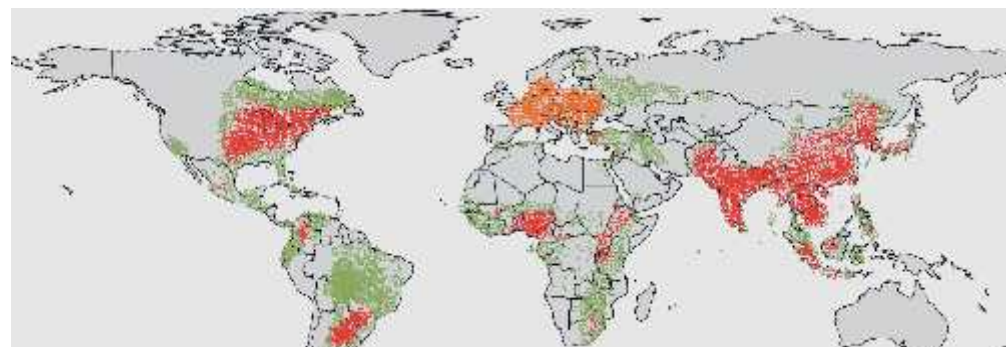


# NITROGEN DEPOSITION TRENDS IN RELATION TO C-SEQUESTRATION AND BIODIVERSITY

N deposition in 1900 in kg N / ha / yr



Lamarque et al. 2013



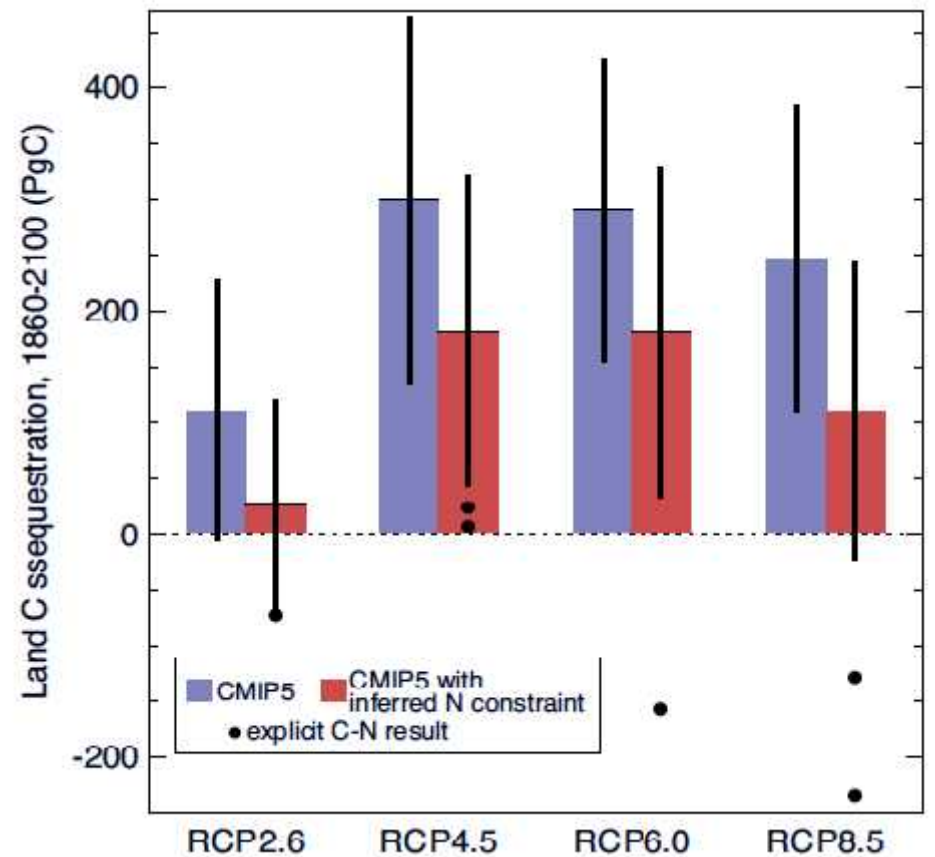
Bleeker et al. 2010

- Nitrogen deposition classes**
- Exceeds 10 kg per hectare and is increasing
  - Exceeds 10 kg per hectare and is decreasing
  - Between 5 and 10 kg per hectare and increasing

Notes: Dark orange indicates areas protected under the Convention on Biological Diversity where total nitrogen deposition is relatively high and is estimated to increase by 2030, green areas where it is still relatively low but increasing, and light orange where it is high but is decreasing.

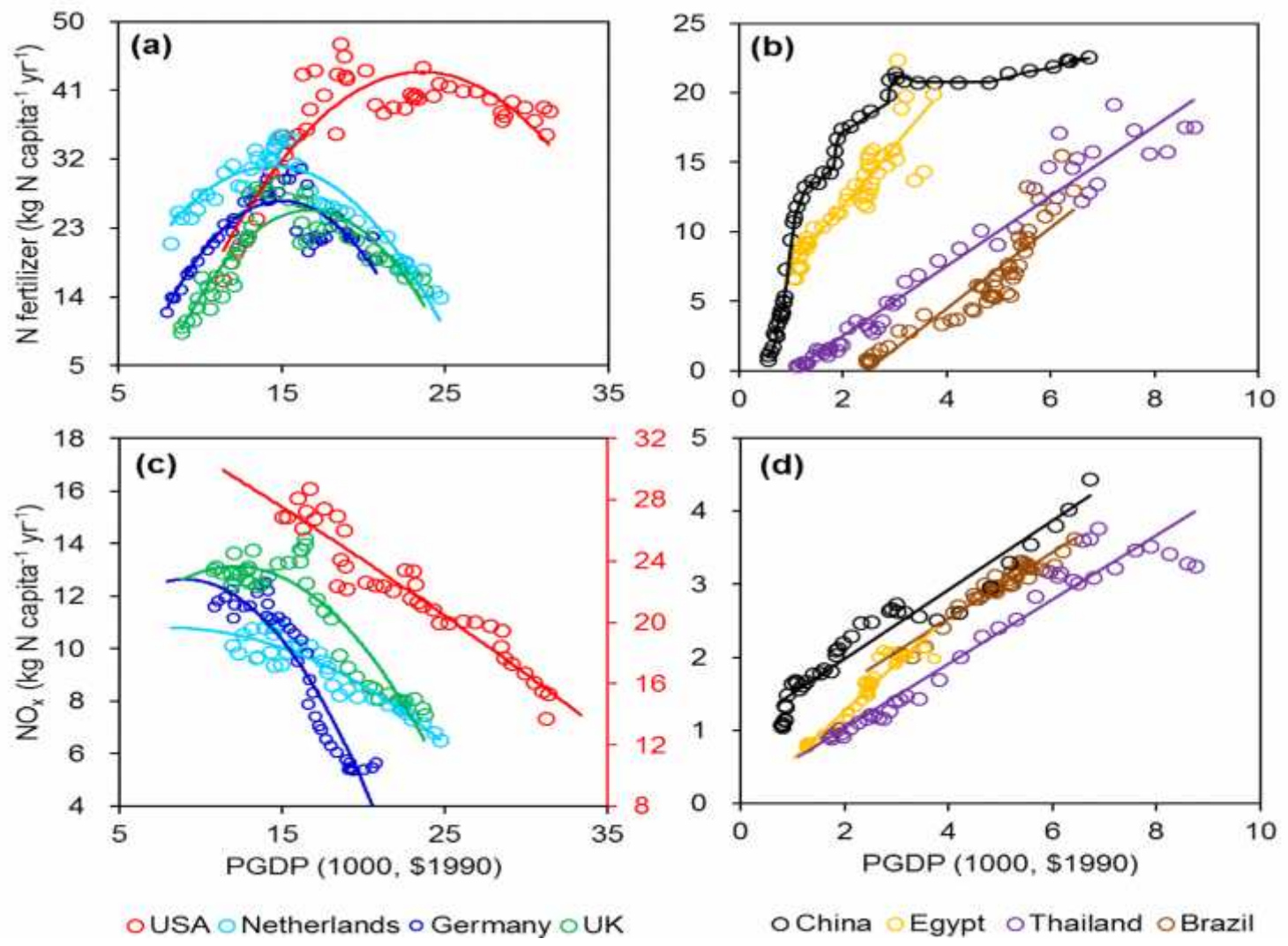
Source: Bleeker et al. 2010.

Estimated influence of nitrogen availability on total carbon sequestration over the period 1860–2100



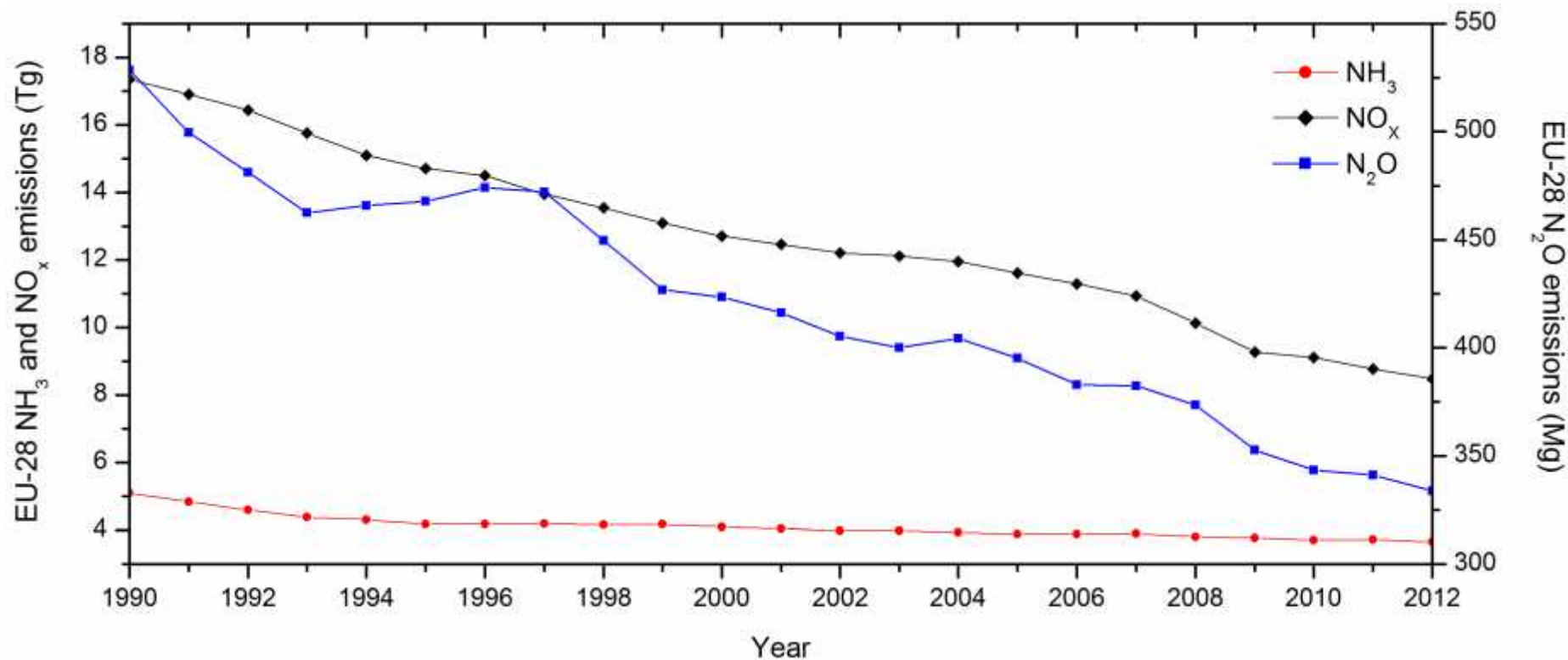
Wang and Houlton (2009)

# FERTILIZER USE AND NO<sub>x</sub> EMISSION WITH PER-CAPITA GDP



Gu et al. submitted

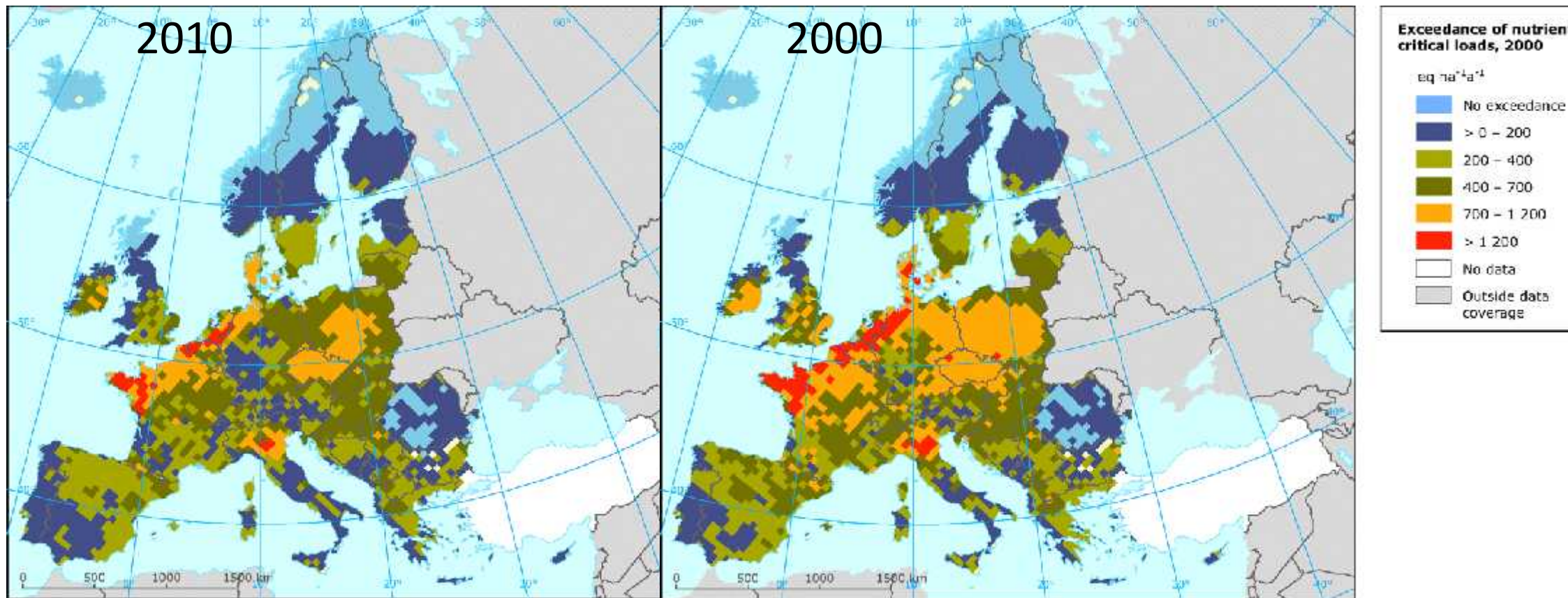
# CHANGE IN ATMOSPHERIC NITROGEN EMISSIONS IN EUROPE



Between 1980 and 2011 EU28 emissions decreased for:  
NO<sub>x</sub> by 49%,  
N<sub>2</sub>O by 19%  
NH<sub>3</sub> by 18%

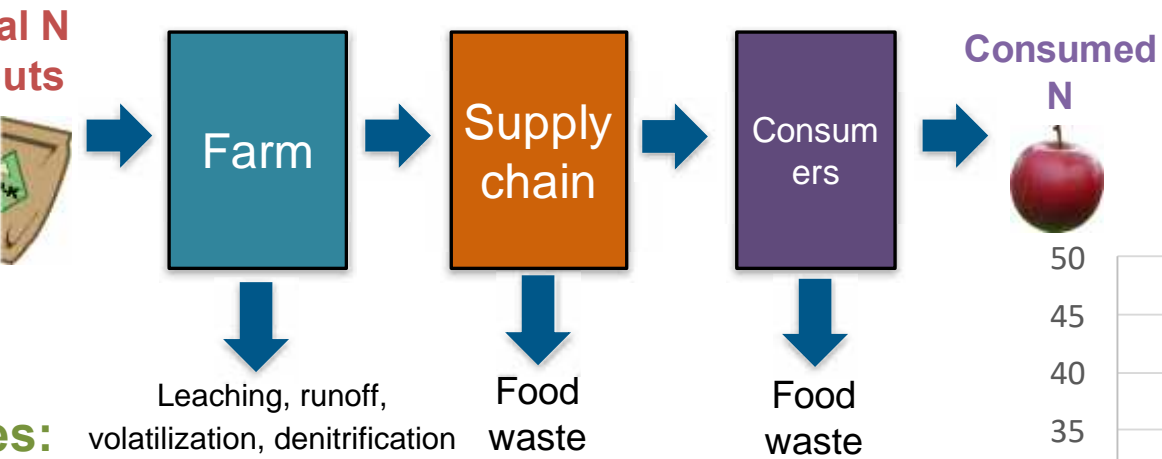


# EXCEEDANCE OF NUTRIENT CRITICAL LOADS 2000 - 2010

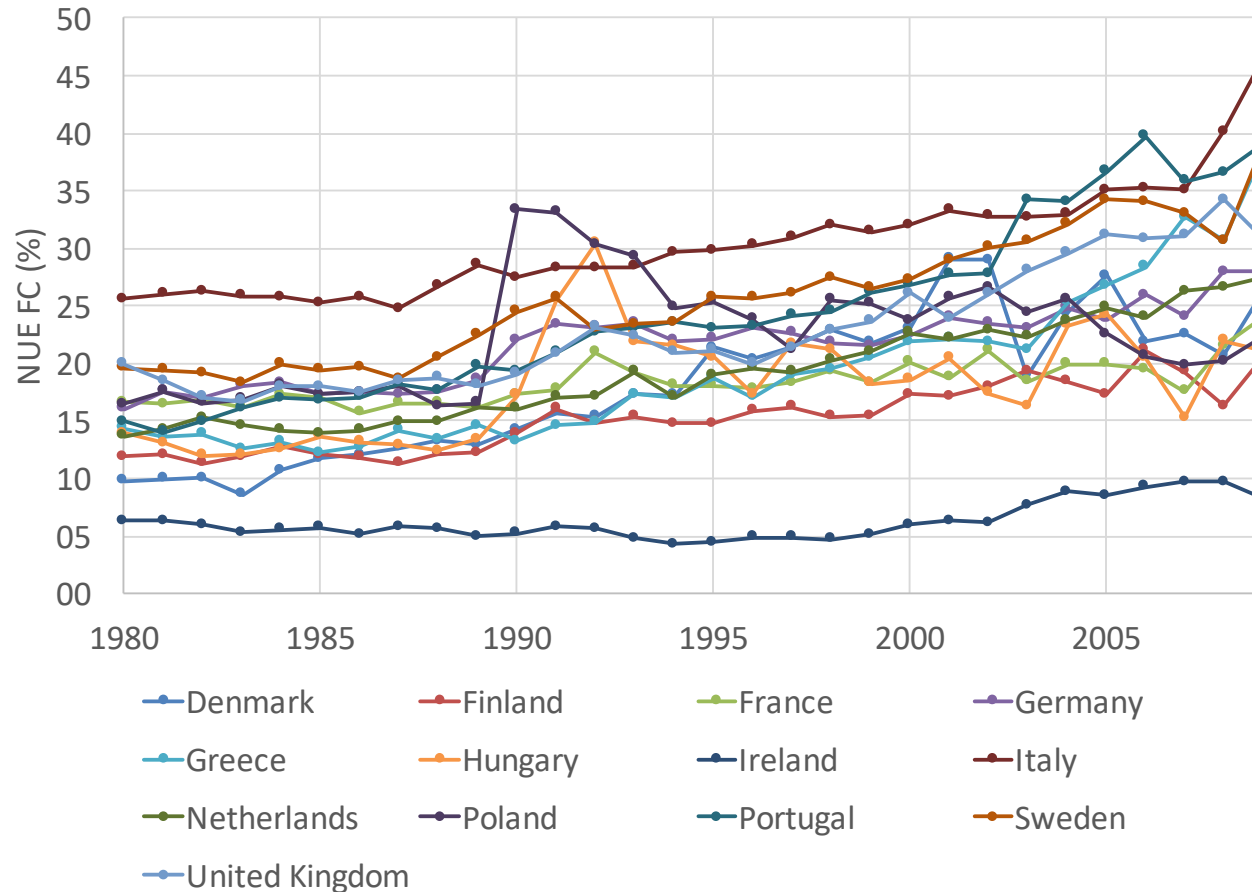


**Critical load:** “the highest deposition of (...) below which harmful effects in ecosystem structure and function do not occur according to present knowledge”

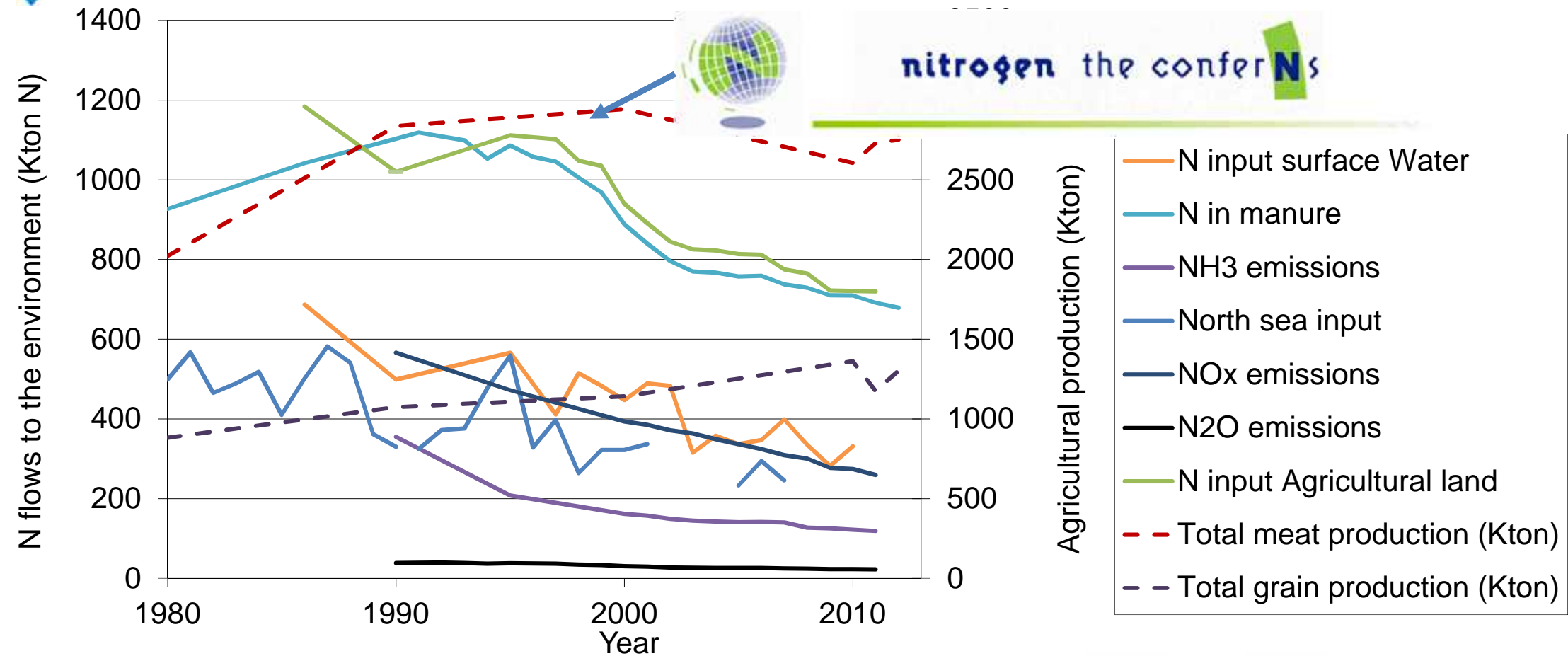
# FOOD CHAIN NUE INCREASE OVER YEARS IN EUROPEAN COUNTRIES



$$\text{Food chain NUE} = \frac{\text{Consumed N}}{\text{N Inputs}}$$

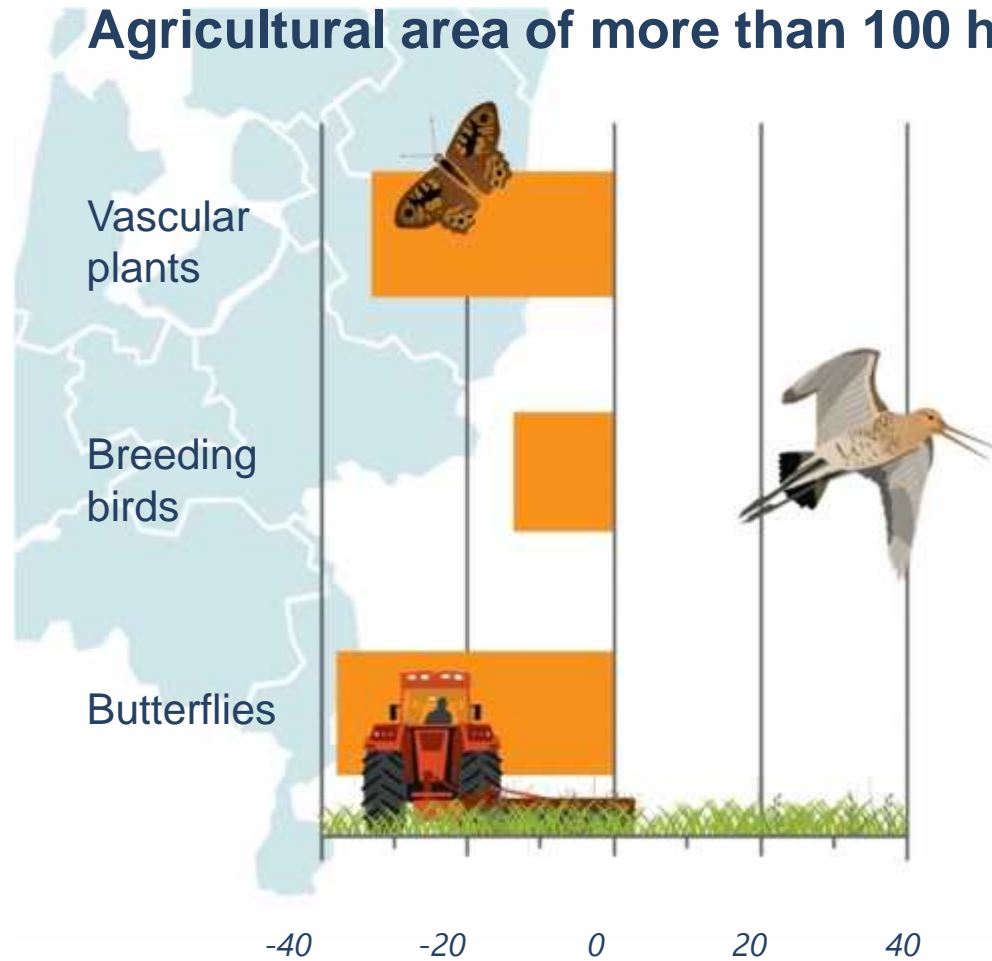


# SUCCESSFUL OF NITROGEN CONFERENCE IN THE NETHERLANDS



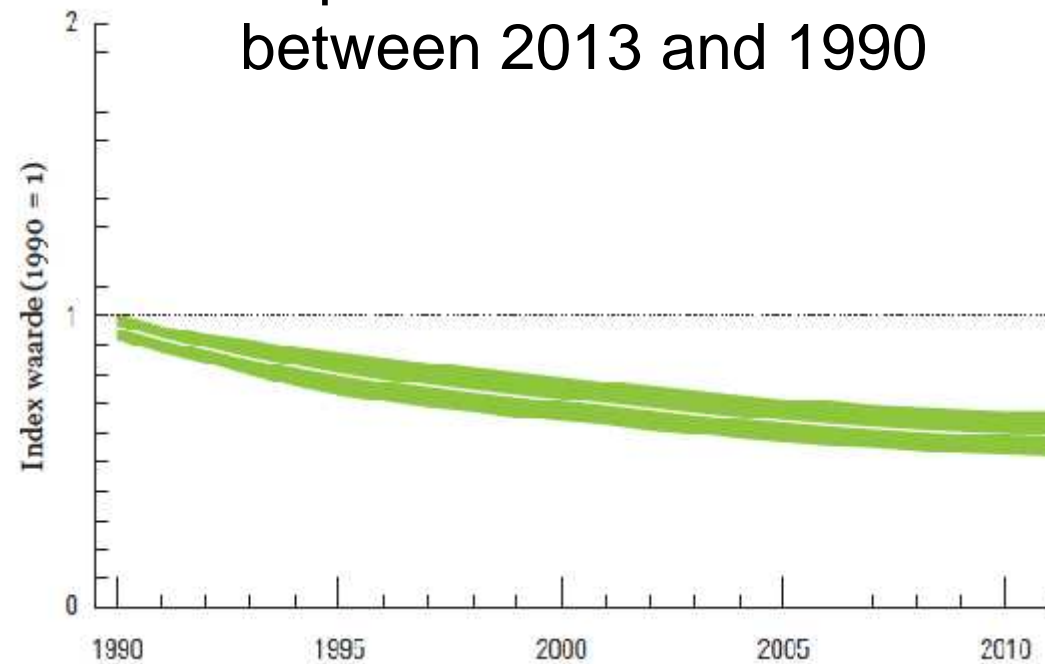
# CHANGES IN SPECIES IN THE PERIOD 1990-2005 RELATIVE TO 1975-1989

## Agricultural area of more than 100 ha



FLORON, SOVON, Van Swaay 2009

- Living Planet Index (WWF) based on 48 species
- Population decreased 40% between 2013 and 1990



# OUR STRATEGIES TO MORE SUSTAINABILITY FOR N CYCLING RELATED TO FOOD PRODUCTION



## Smarter diets, healthy lifestyle

- Healthier diets
- Less animal products
- Less waste

## Smart intensification

- Resource (land, feed, nutrient) efficiency
- Closing yield gap, reducing waste



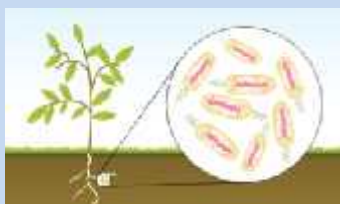
## Smart extensification

- Higher margins
- Less impacts: Animal welfare, human health, odour, landscape



## Close nutrient cycles

- Start with focussing on healthy soils
- Within their surroundings (losses, emissions, climate)



## Improve soil and Biological Nitrogen Fixation

- Improve soil quality and functioning
- Increasing BNF in agriculture
- Crop rotations

Van Grinsven et al.  
Erisman et al. 20

# Thank you for your attention



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[www.louisbolk.org](http://www.louisbolk.org)

