NUTRIENT MANAGEMENT, CLIMATE CHANGE AND CHALLENGES FOR AGRICULTURE

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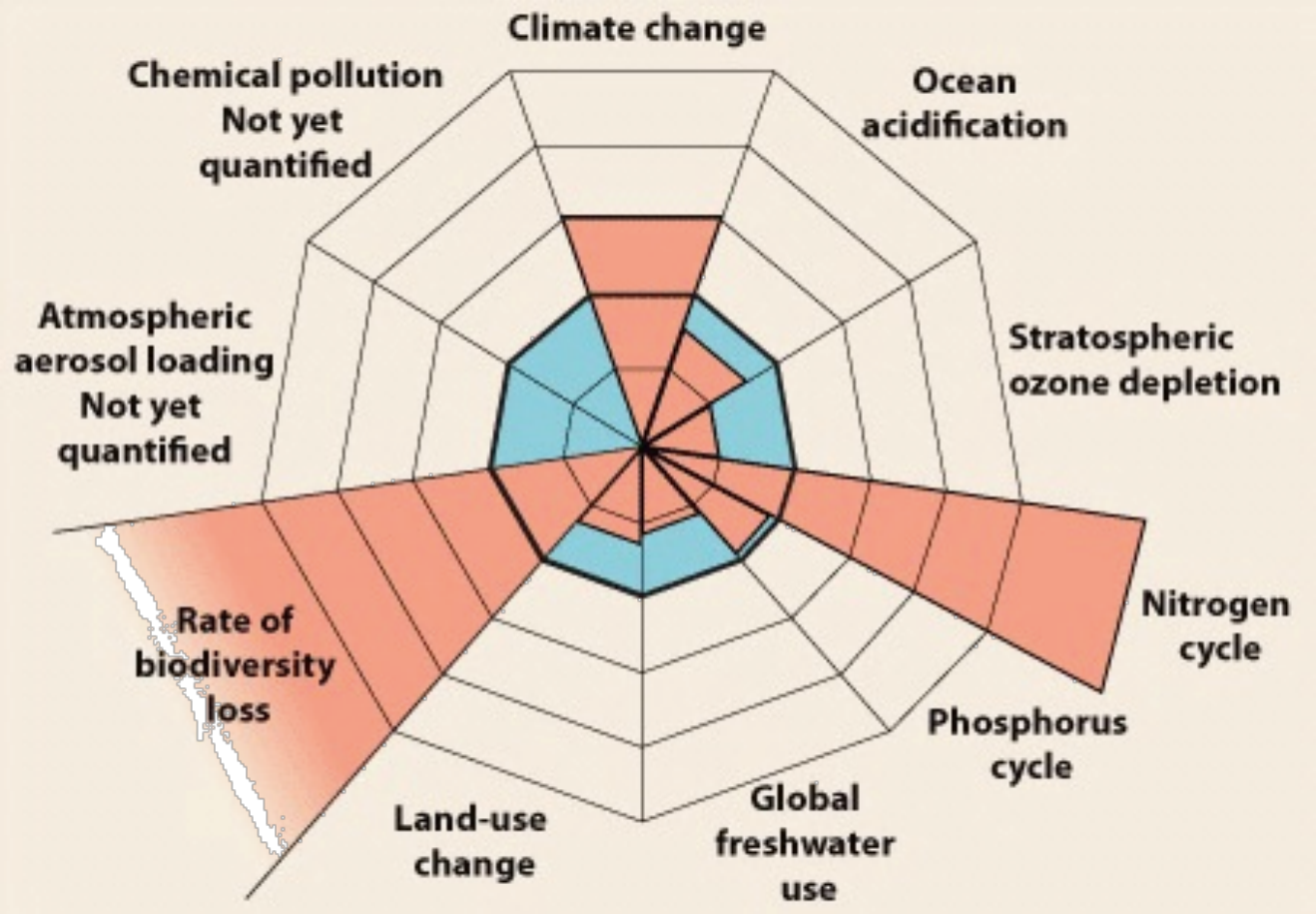
INI International Nitrogen Initiative

IFDC

GLOBAL TraPs

GPNM Global Partnership on Nutrient Management

PLANETARY BOUNDARY FOR NITROGEN EXCEEDED



Rockström et al. 2009 Nature

FERTILIZER EFFICIENCY FOR FOOD

100 kg

14 kg

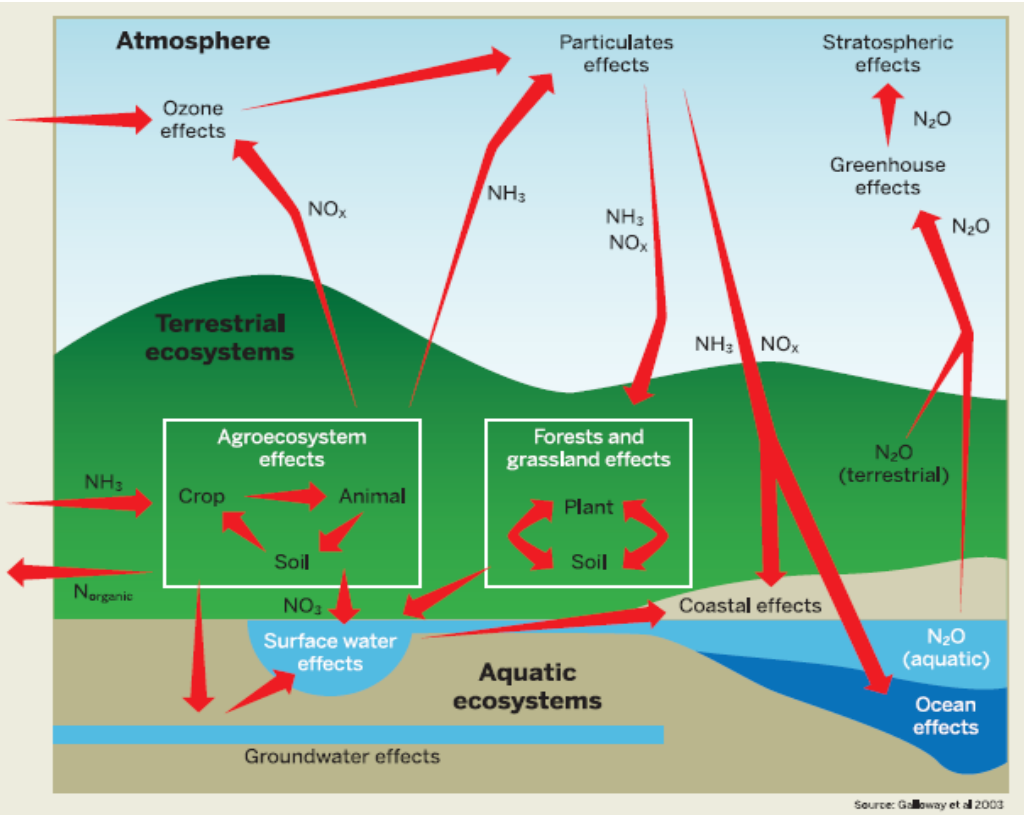
4 kg

3 kg

95 kg is lost to the environment

FERTILIZING THE BIOSPHERE AND THE CASCADE

Natural & anthropogenic sources

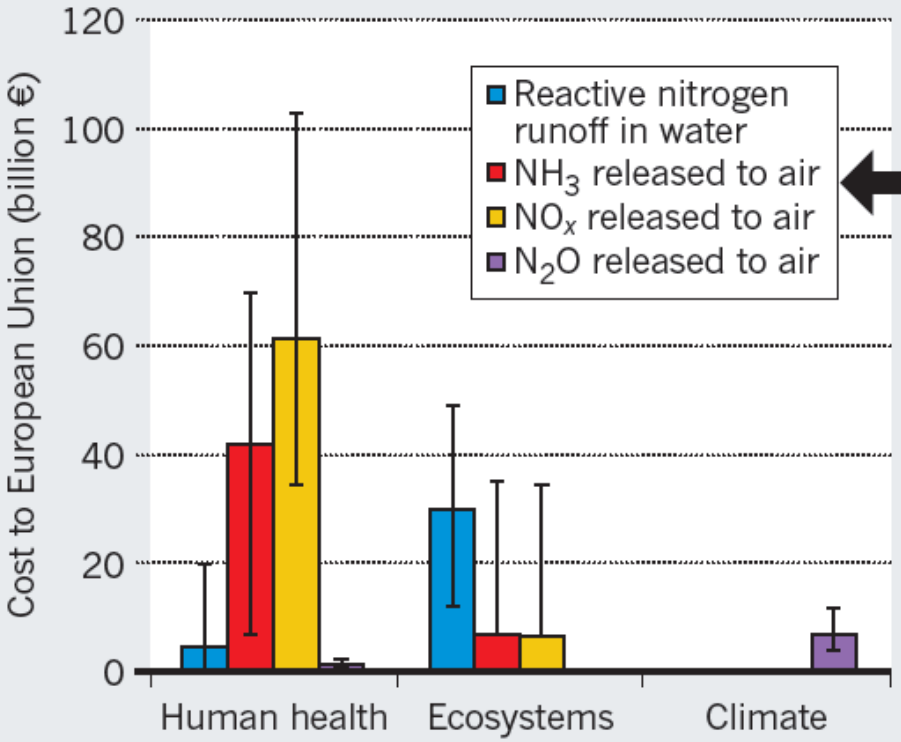


Cascade through the environment

NITROGEN DAMAGE COSTS AND BENEFITS

DAMAGE COSTS OF NITROGEN POLLUTION

Agriculture and fossil-fuel burning load the environment with reactive nitrogen, affecting water, soils and air.



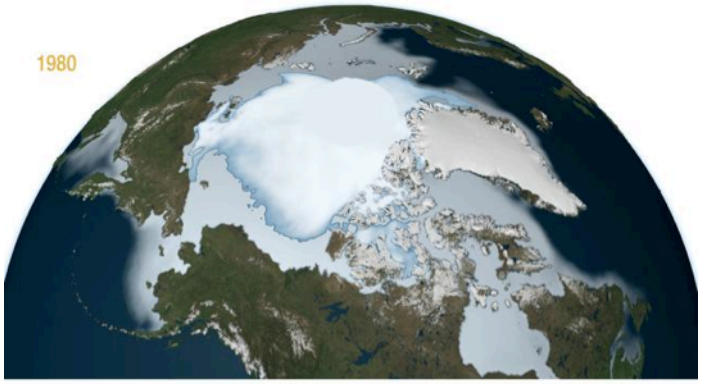
Total cost for EU27:
€70 – 320 billion
or €150 - 750 pp

1-4% of average European income

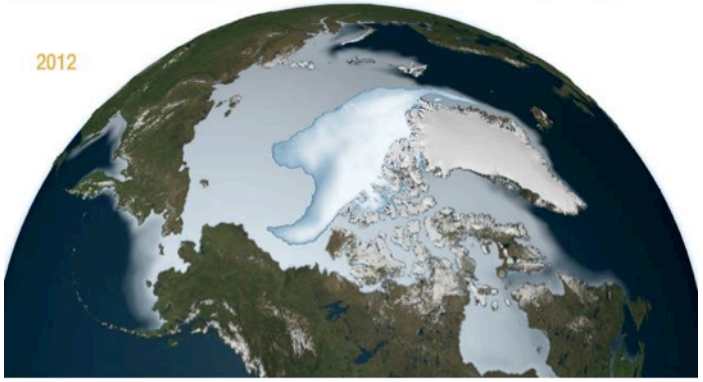
Agriculture: €20 – 150 billion costs versus €10 – 100 billion benefit of fertilizers for farmers

Sutton et al. (2011)

THE CONCERNS RELATED TO CLIMATE CHANGE

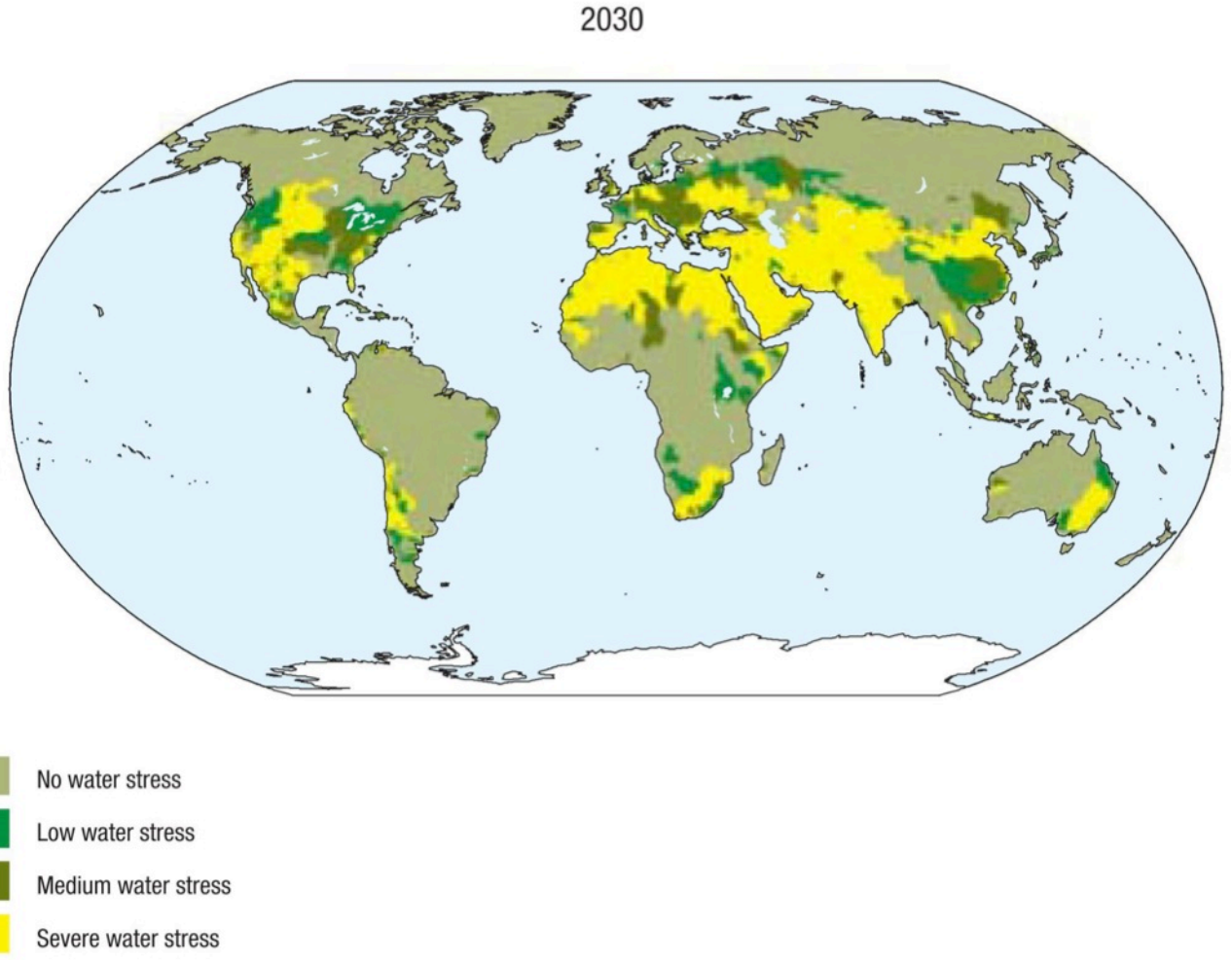


Events that are probably linked to global warming



Global climate change is predicted to affect air and water temperatures, sea-level rise, precipitation, wind patterns, and the frequency and intensity of storms.

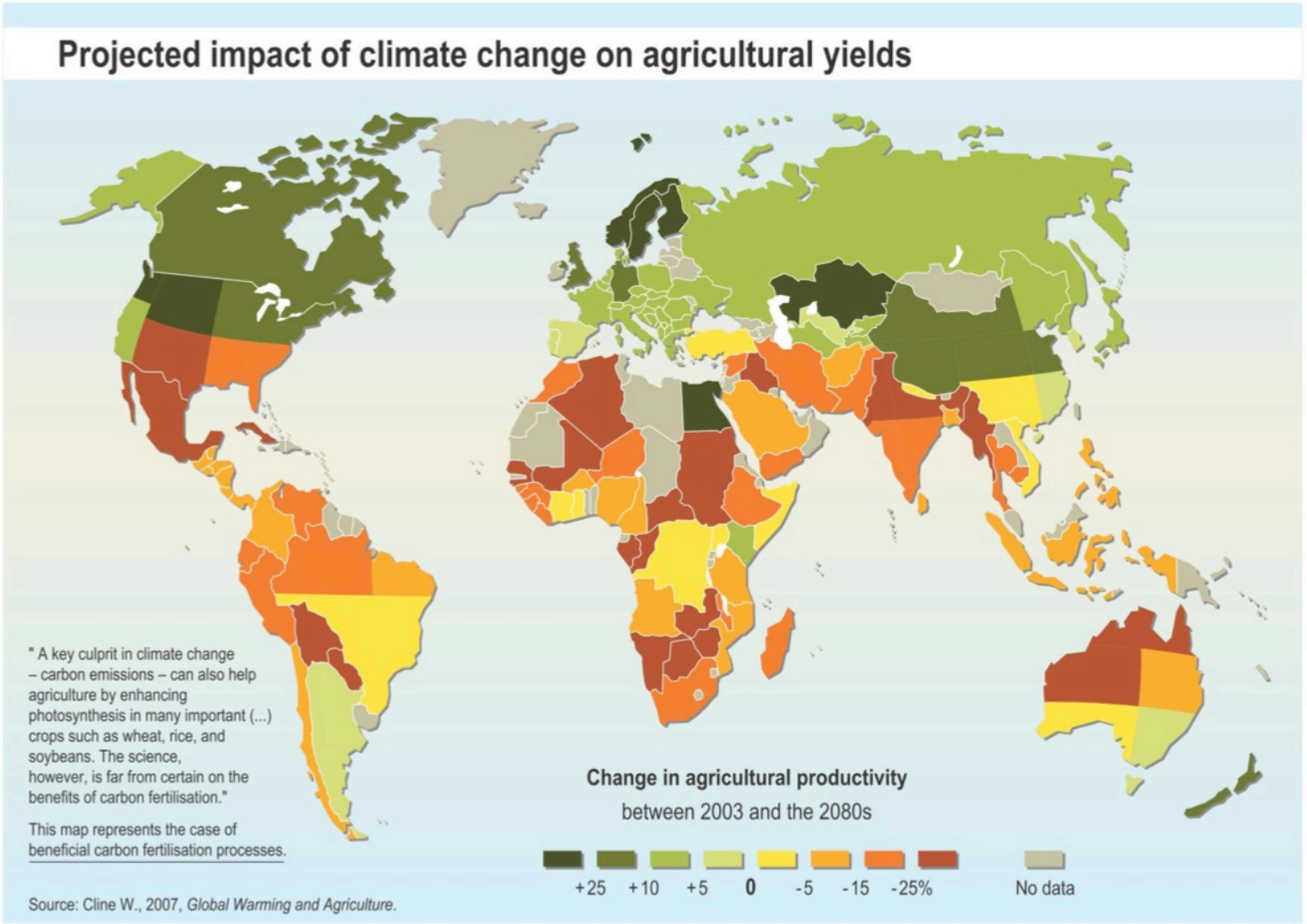
ENDANGERED PRODUCTIVITY: WATER STRESS IN 2030



Source: OECD Environmental Outlook Baseline.

OECD ENVIRONMENTAL OUTLOOK TO 2030 – ISBN 978-92-64-04048-9 – © OECD 2008

ENDANGERED PRODUCTIVITY: CLIMATE CHANGE



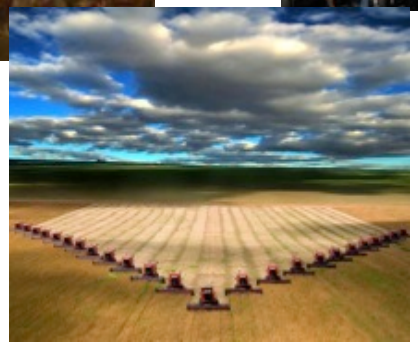
Source: SOER, Global Megatrends 2010

CHANGES TO THE N CYCLE AND GHG EMISSIONS HAVE THE SAME DRIVERS

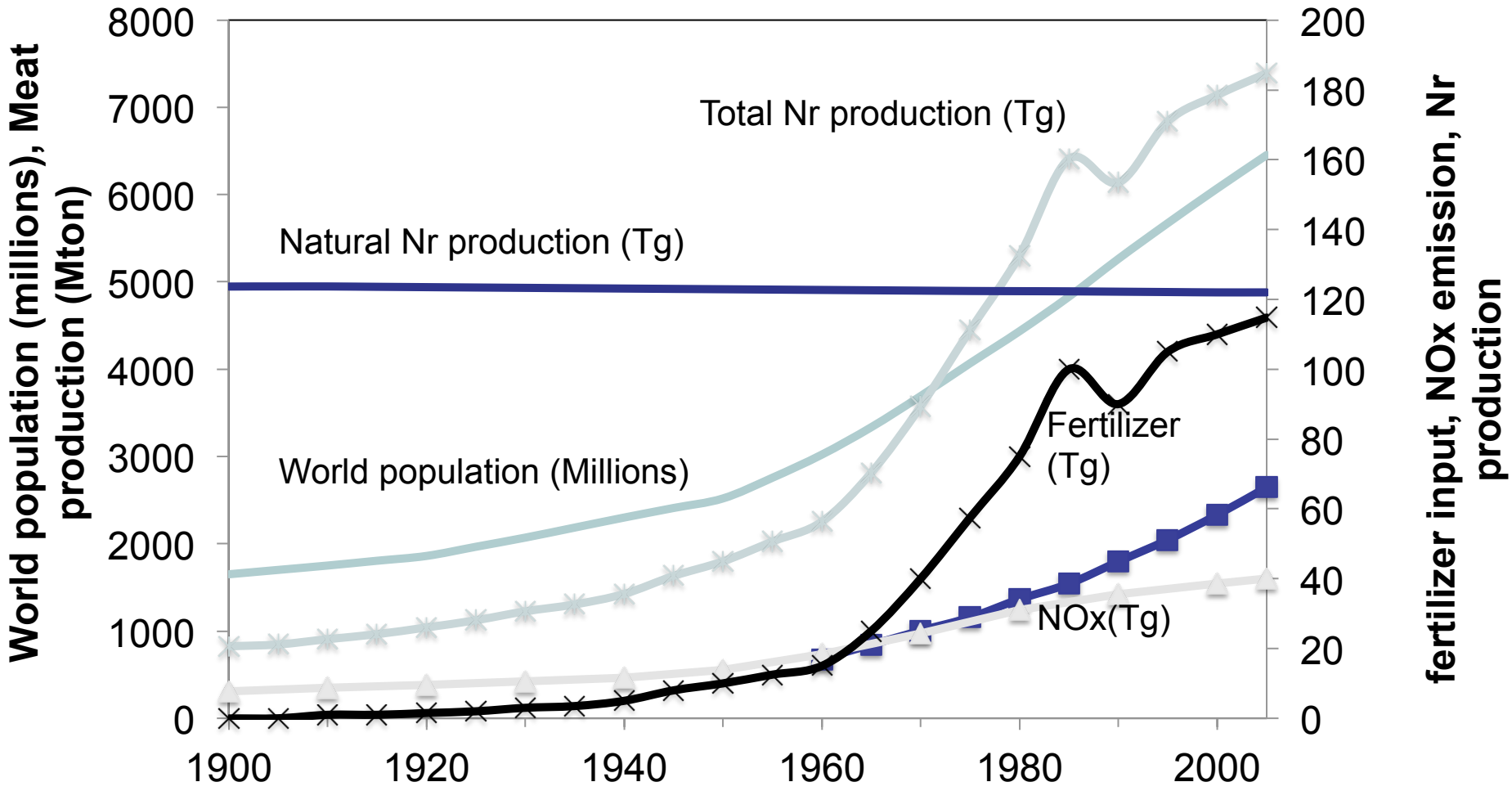






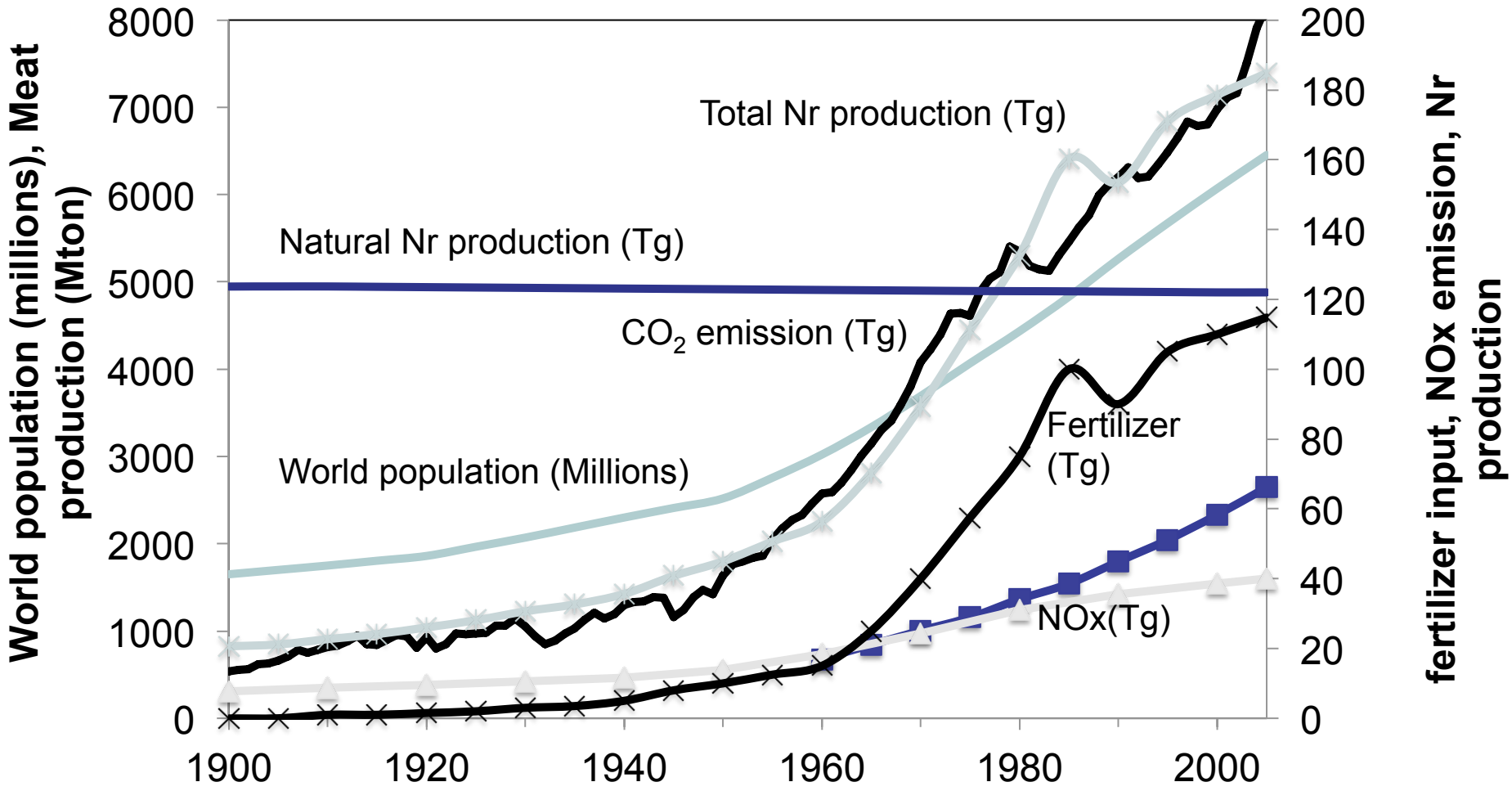



MORE NITROGEN IS NOW FIXED BY HUMAN ACTIVITIES THAN BY NATURAL PROCESSES



04.07.13

TRENDS IN REACTIVE N FORMATION AND CO_2 EMISSIONS ARE SIMILAR



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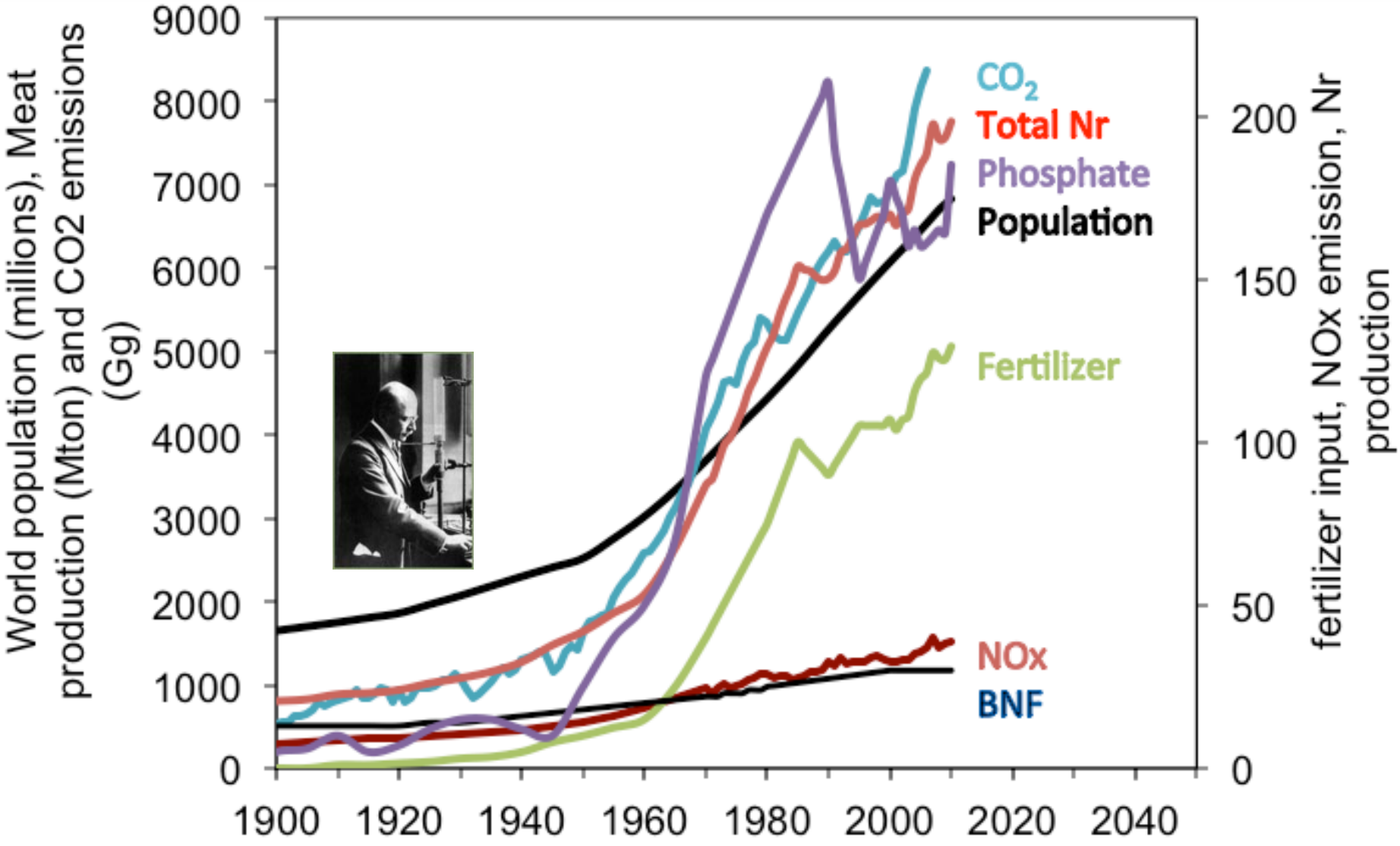
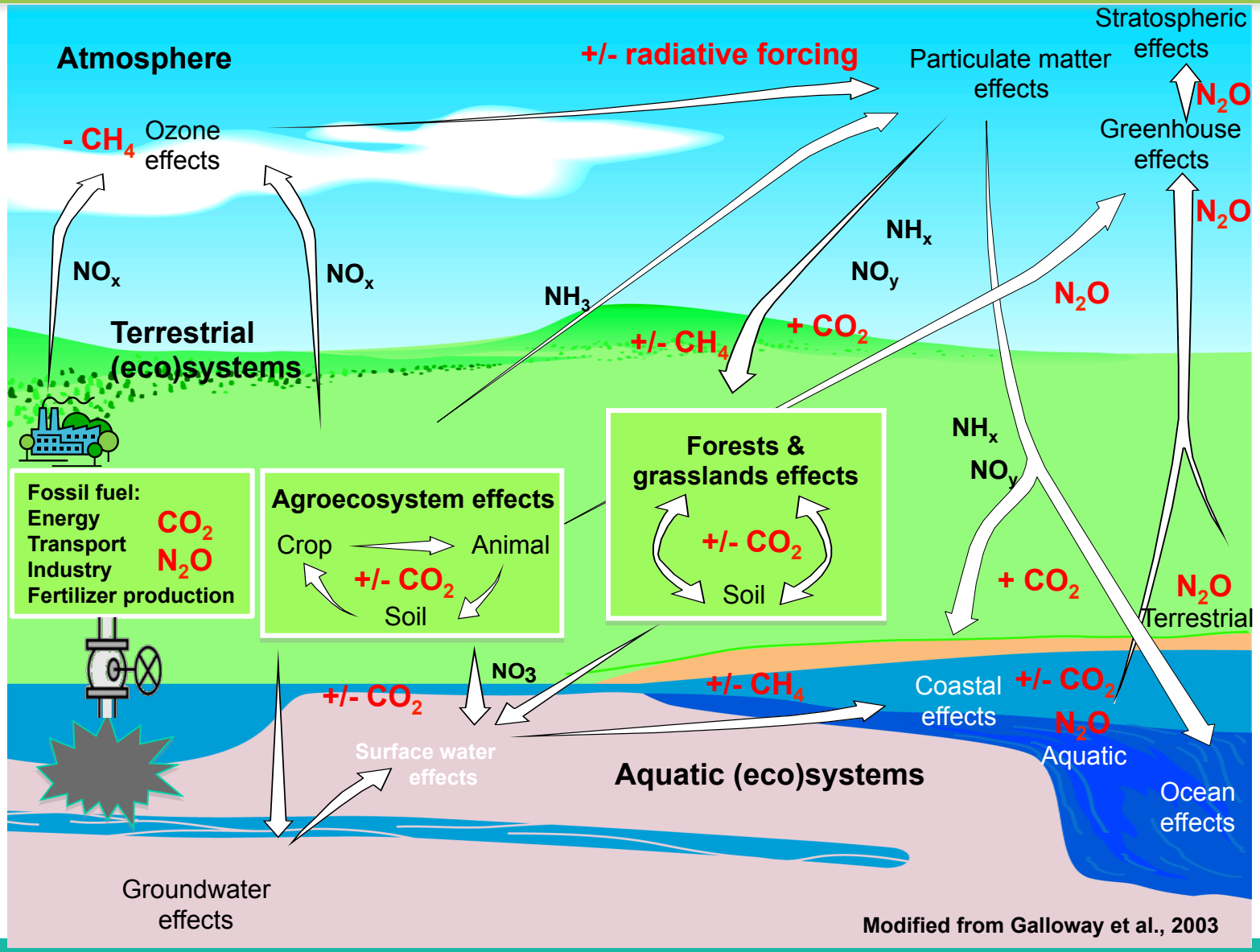
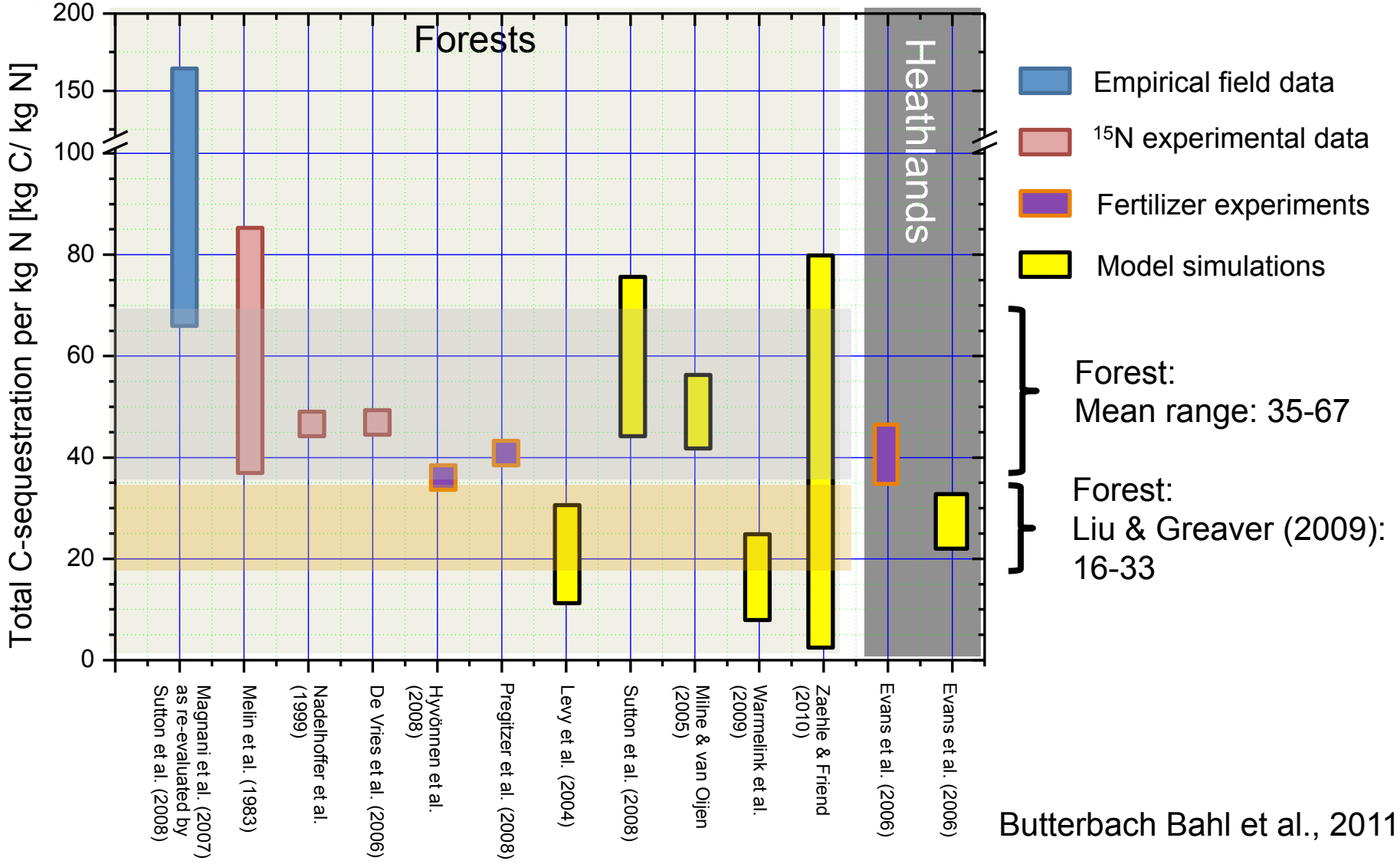
GLOBAL TRENDS IN HUMAN POPULATION, N AND P USE AND CO2 EMISSIONS



THE 'CASCADE EFFECT' IN RELATION TO CLIMATE



NITROGEN ENHANCES TERRESTRIAL CARBON STORAGE

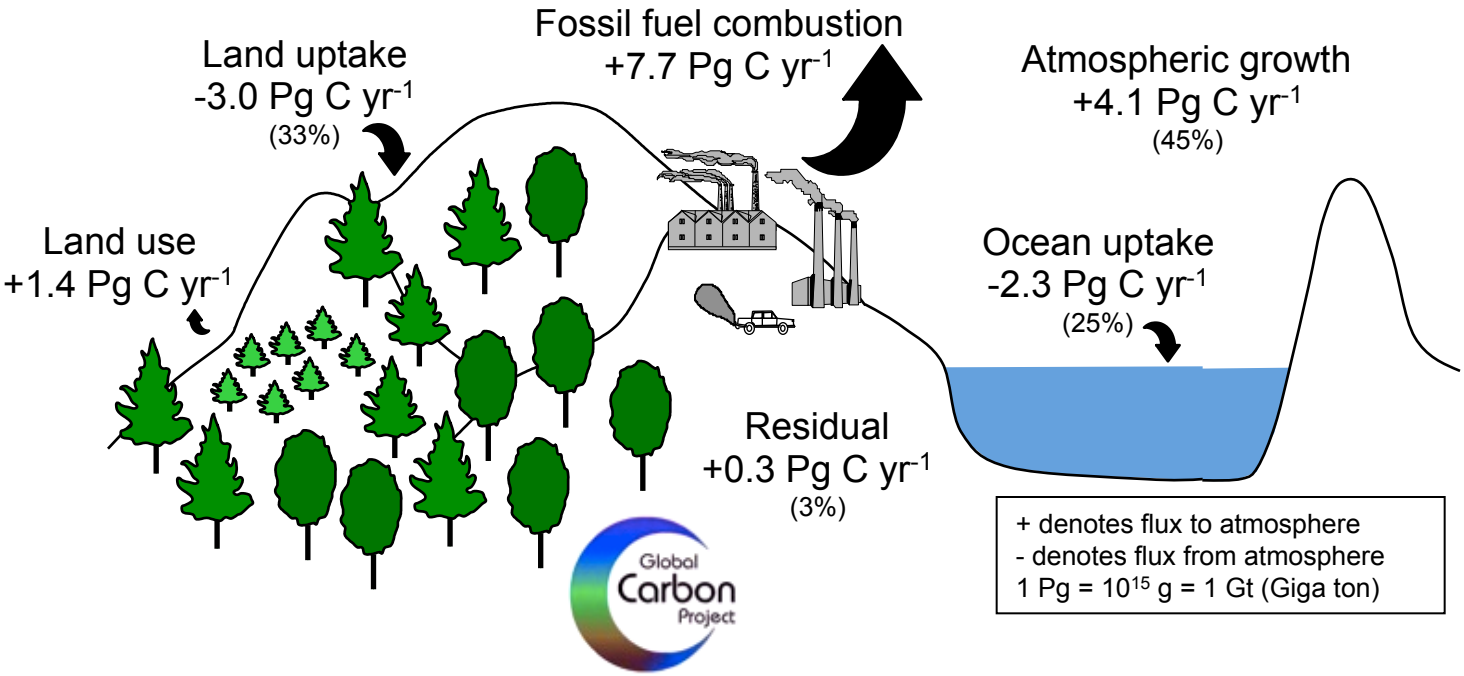


Butterbach Bahl et al., 2011

NITROGEN AND THE CARBON CYCLE

N deposition increased carbon storage by:
~0.3 Pg C yr^{-1} in terrestrial systems
~0.3 Pg C yr^{-1} in marine areas (Blue Carbon)
Limitations of P, other nutrients ..?

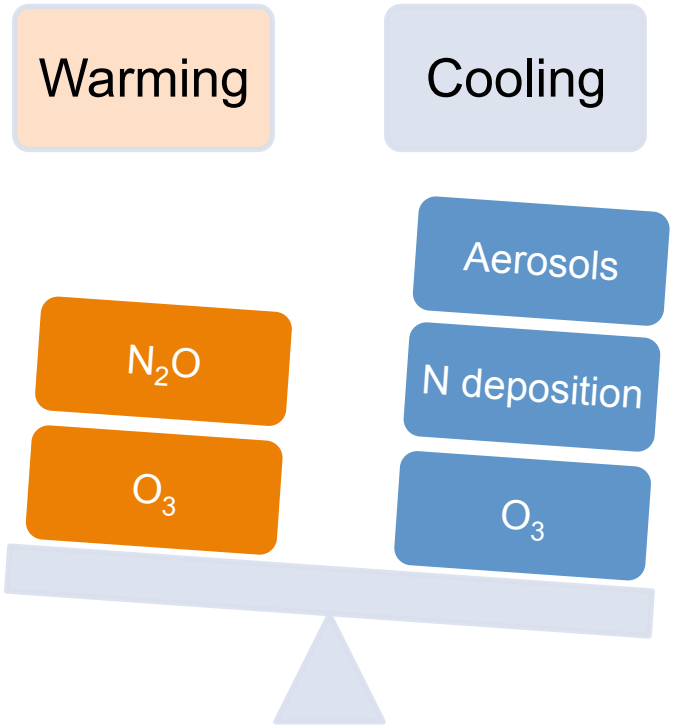
Global carbon cycle, 2000-2008



Data from
Le Quéré (2010)

NET EFFECT OF N ON GLOBAL RADIATION BALANCE

Process	Forcing (W m^{-2})
N_2O emission	0.16
NO_x emission atmosphere	-0.29
NH_3 emission atmosphere	-0.09
N and C in terrestrial systems and oceans Mineralisation	-0.2 -0.2 0.25
O_3 phytotoxicity	0.13
CH_4	0
Total	-0.24

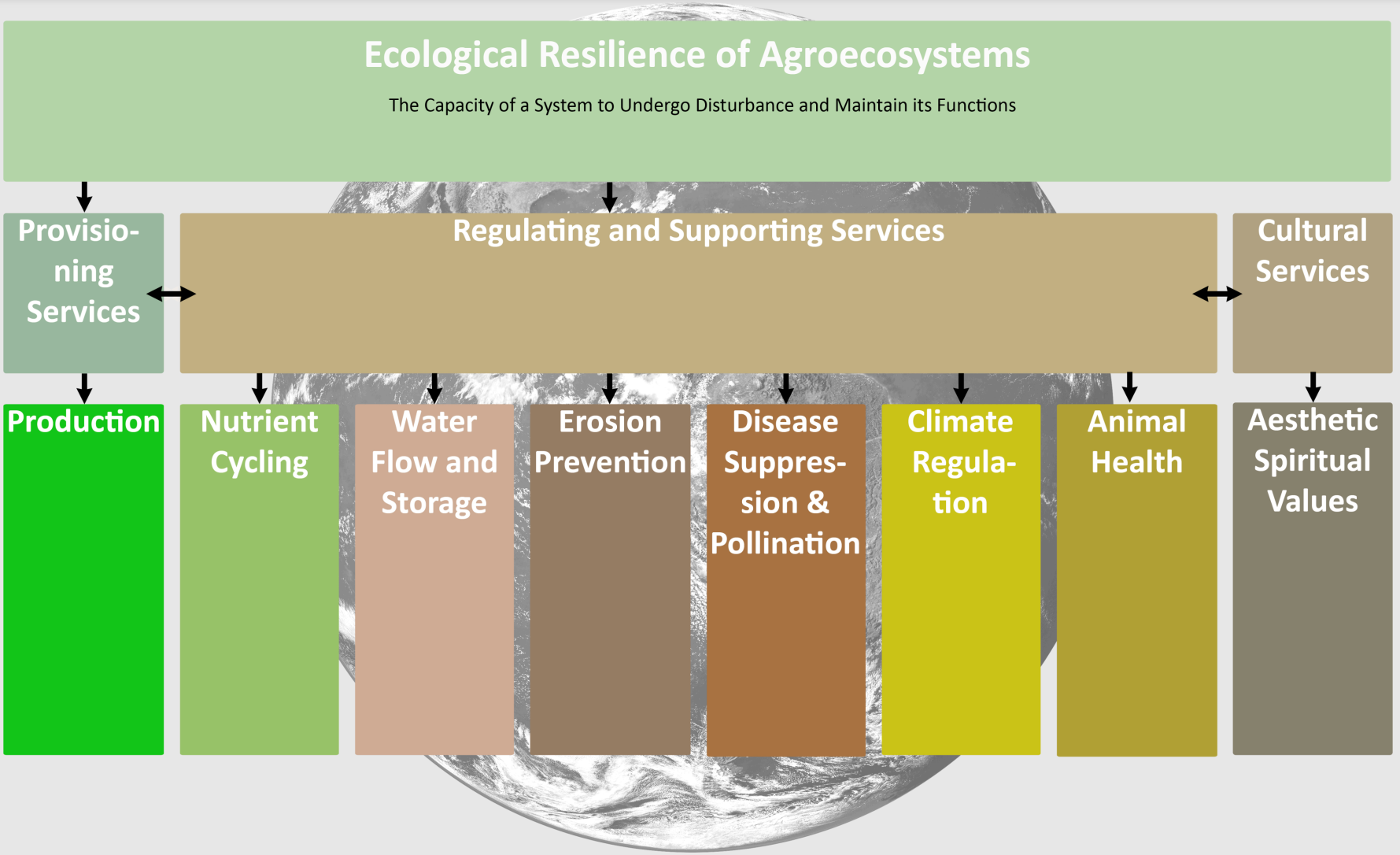


Total forcing: 1.6 W m^{-2}:
N-effect -0.24 [-0.5 to +0.2] W m^{-2}

Erisman et al., 2011

CLIMATE AND NUTRIENT SMART AGRICULTURE

PRINCIPLES FOR SUSTAINABLE AGRICULTURE

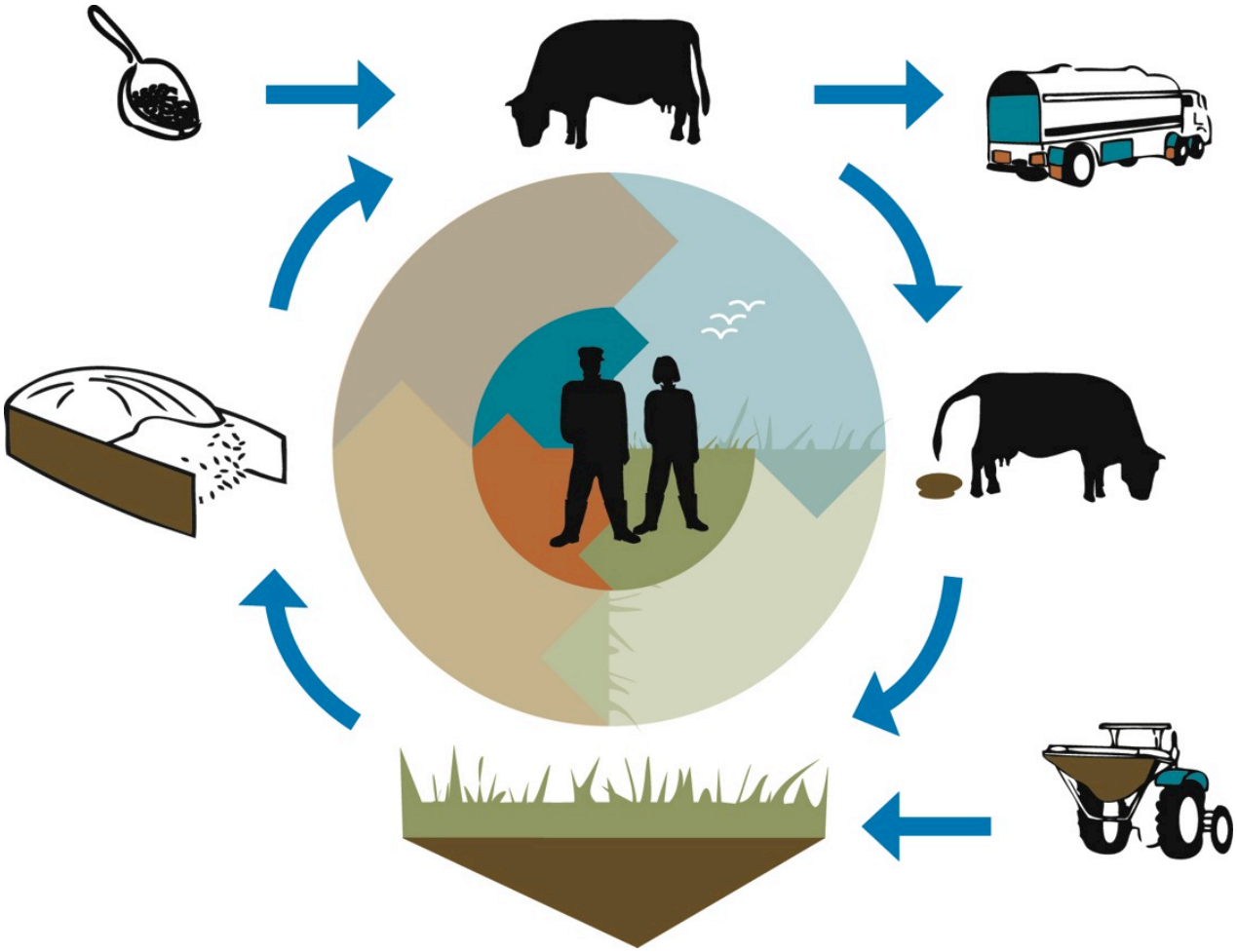



Saving our soils is
saving our food!

SOIL (LIFE) MAKES THE DIFFERENCE!

- 200 gr soil contains 0,5 gr soil life
- More than 12.000 species
- Many functions a.o. Nutrient management, water storage, etc.

CLOSE NUTRIENT CYCLES



ETC
Adviesgroep Nederland

FOSSIL FUEL DEPENDENCE OF AGRICULTURE

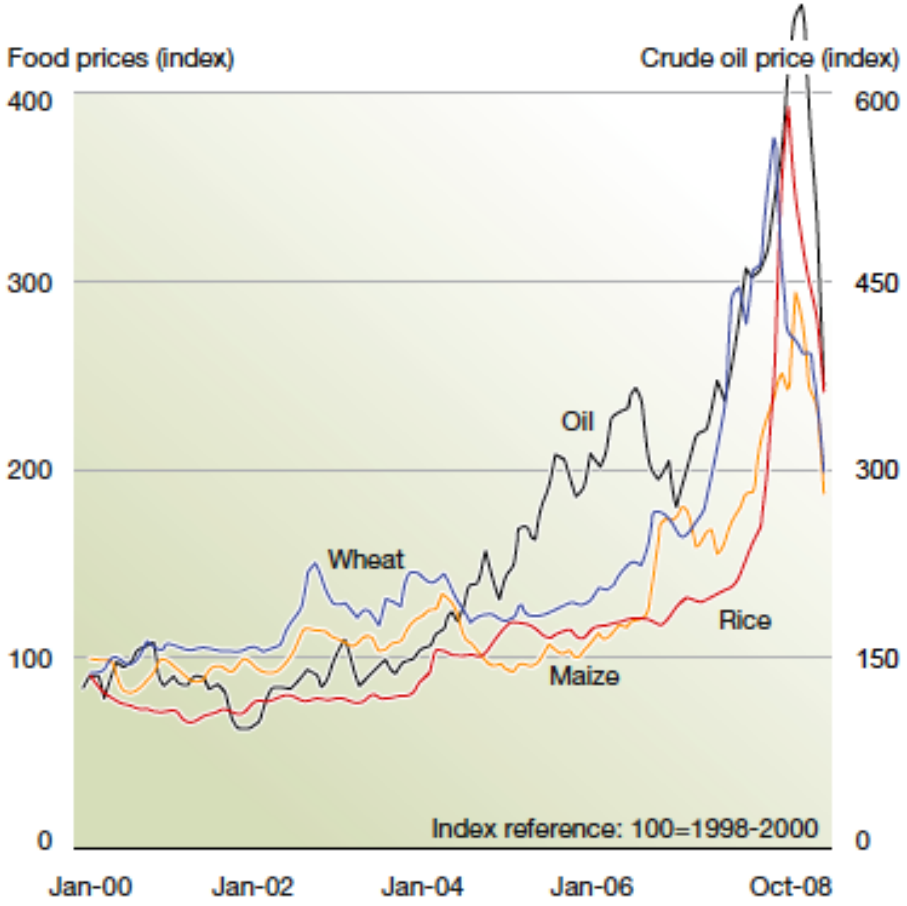
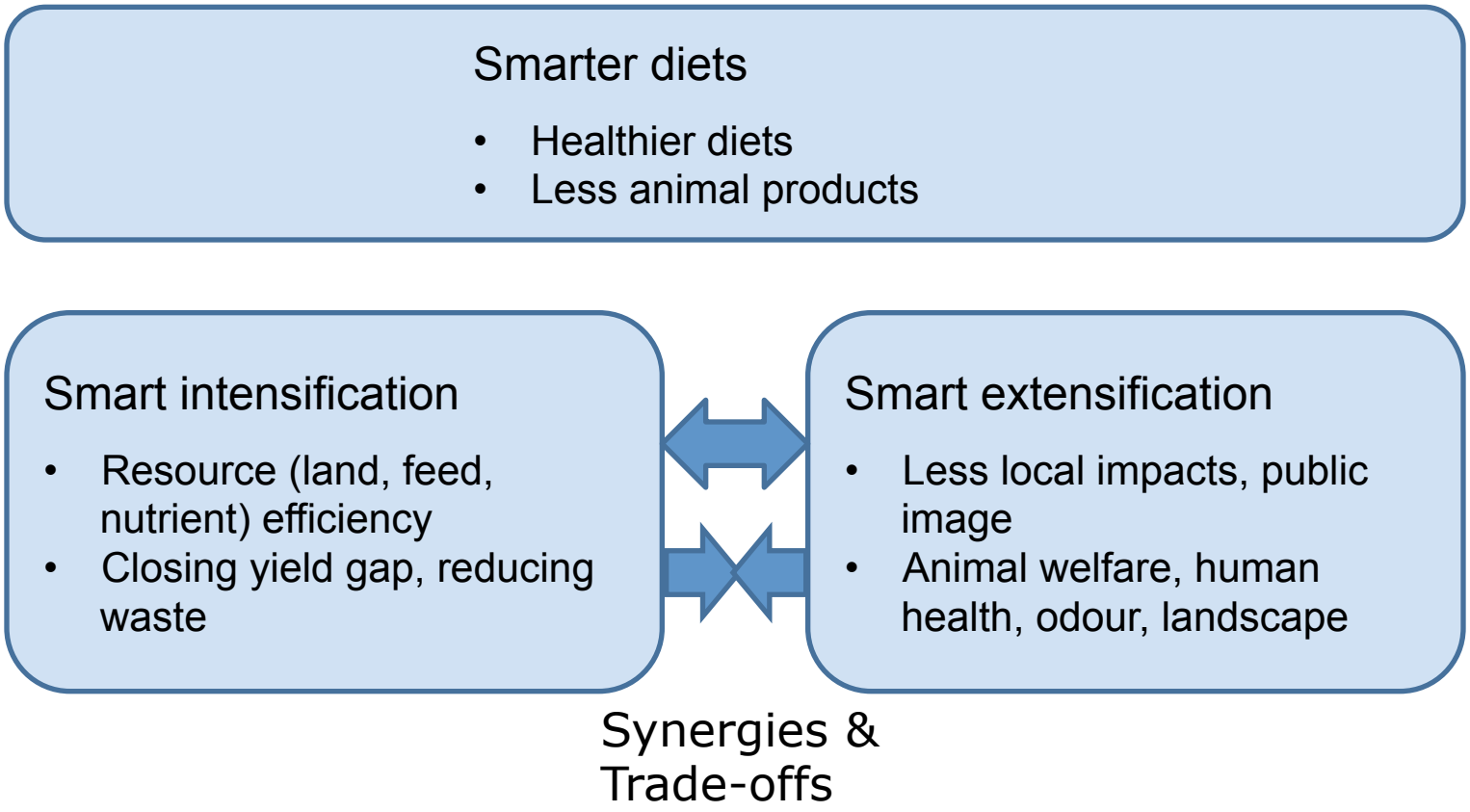


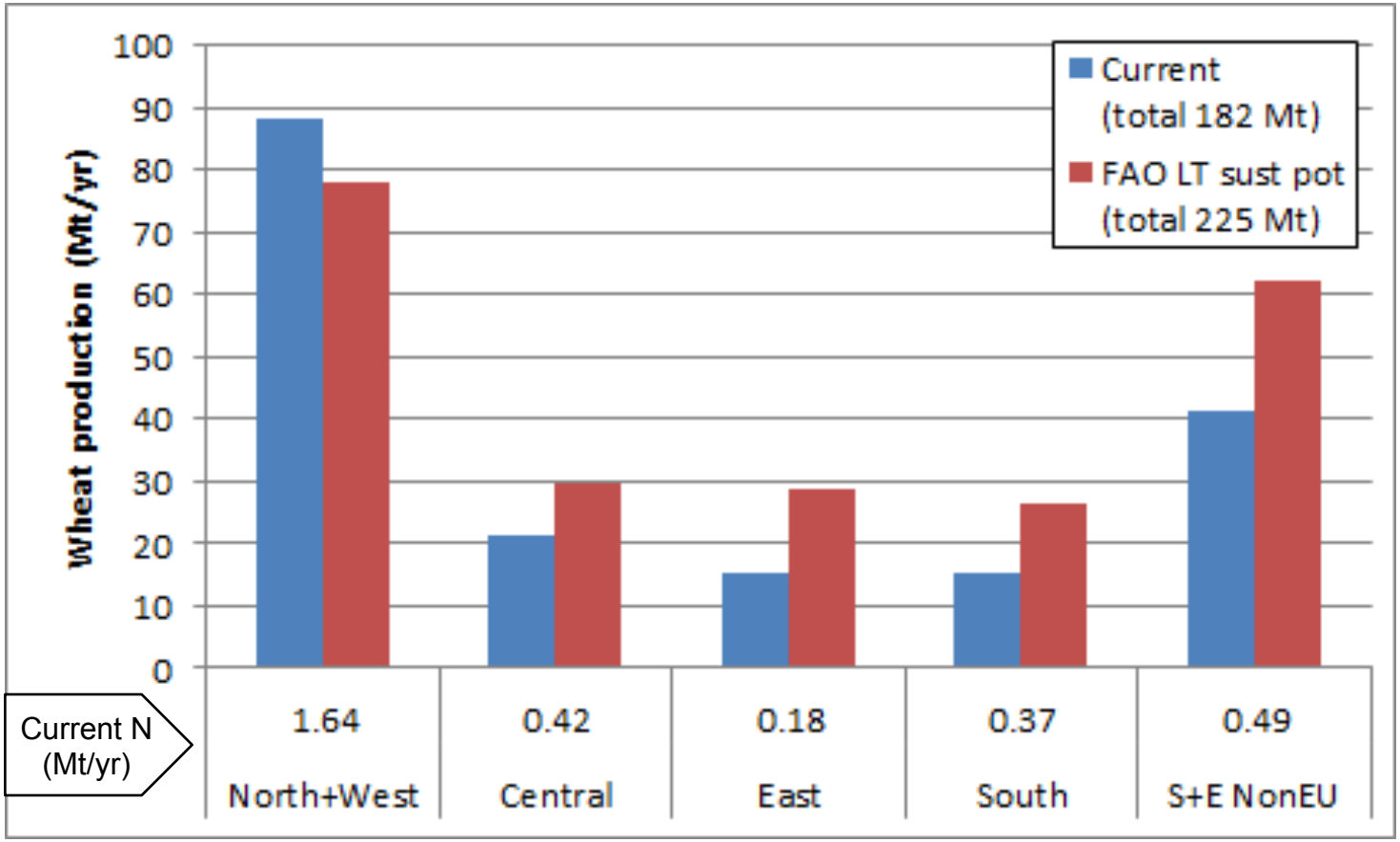
Figure 3: Changes in commodity prices in relation to oil prices. (Source: FAO, 2008; IMF, 2008).

STRATEGIES TO MORE SUSTAINABILITY



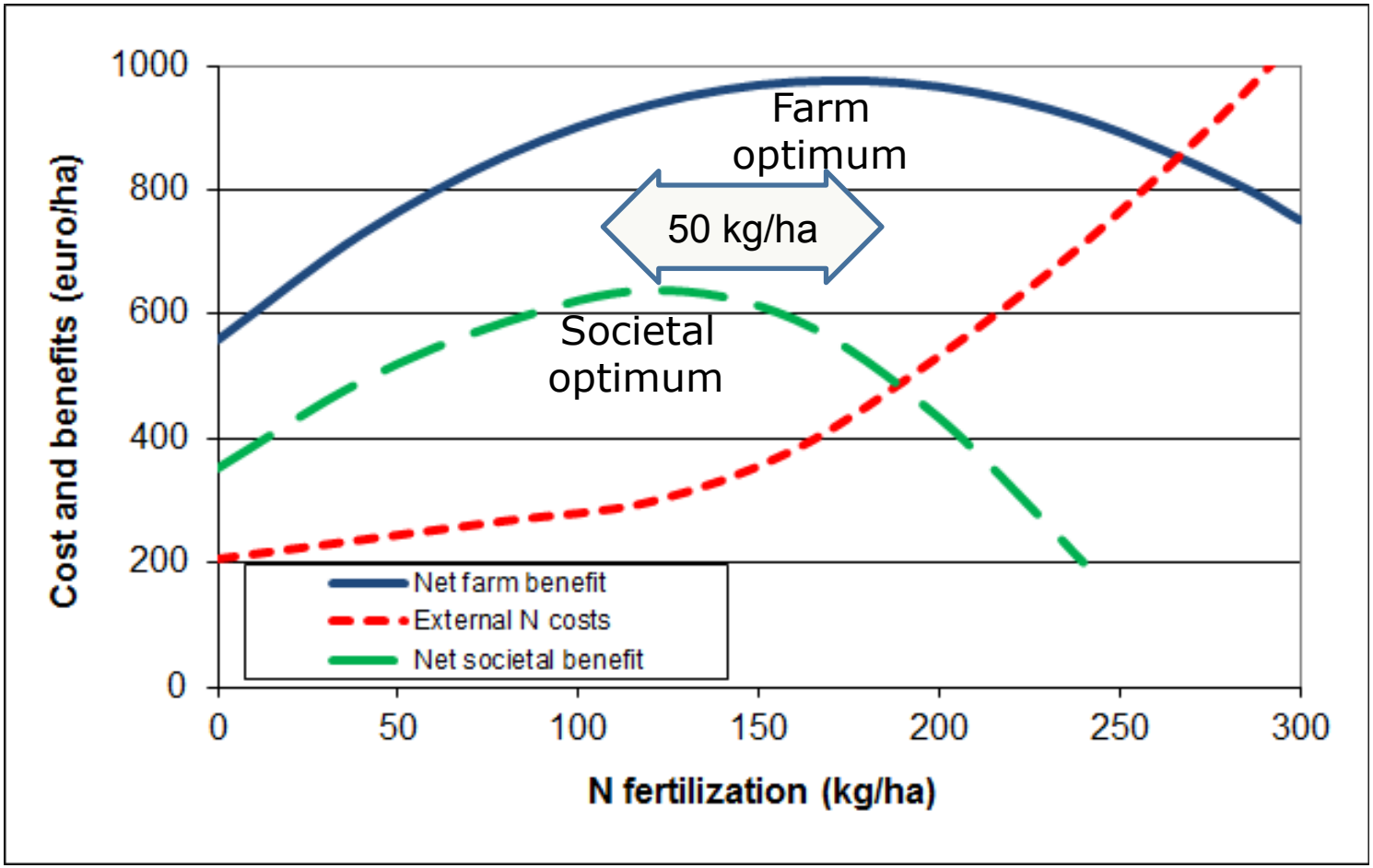
PRESENT AND POTENTIAL WHEAT PRODUCTION EUROPE

Smart intensification



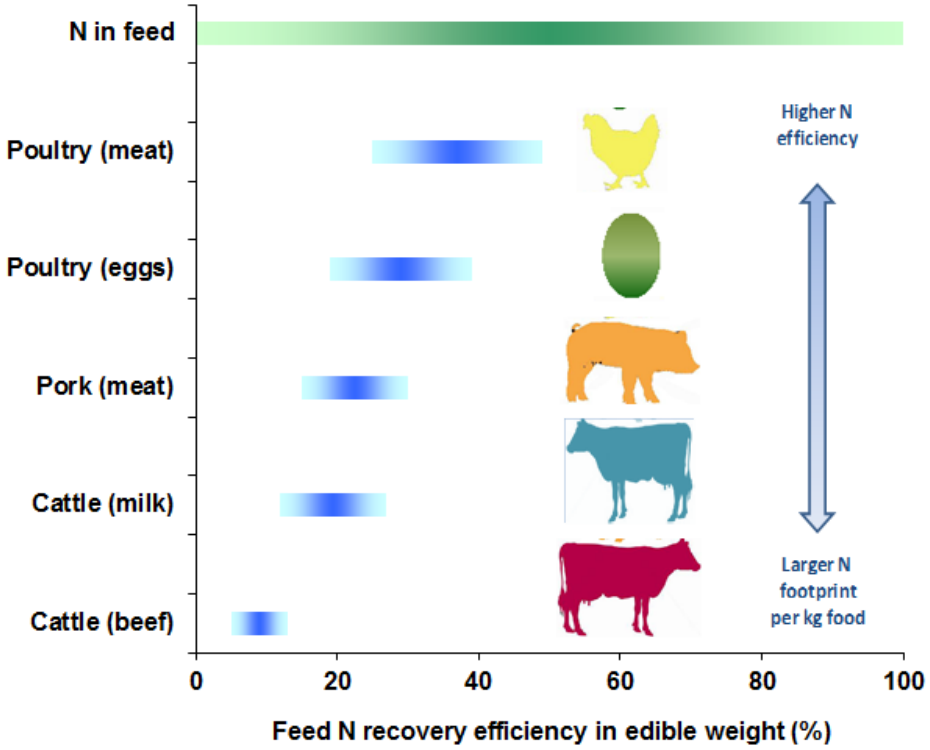
WHAT IS THE SOCIETAL OPTIMAL N RATE FOR WHEAT?

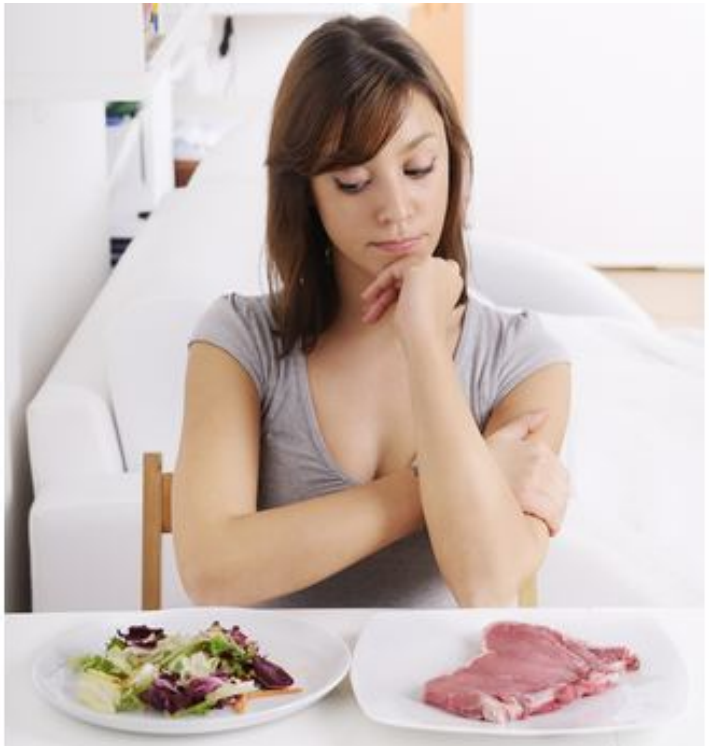
Smart extensification



CEREAL YIELD AND FERTILIZER USE

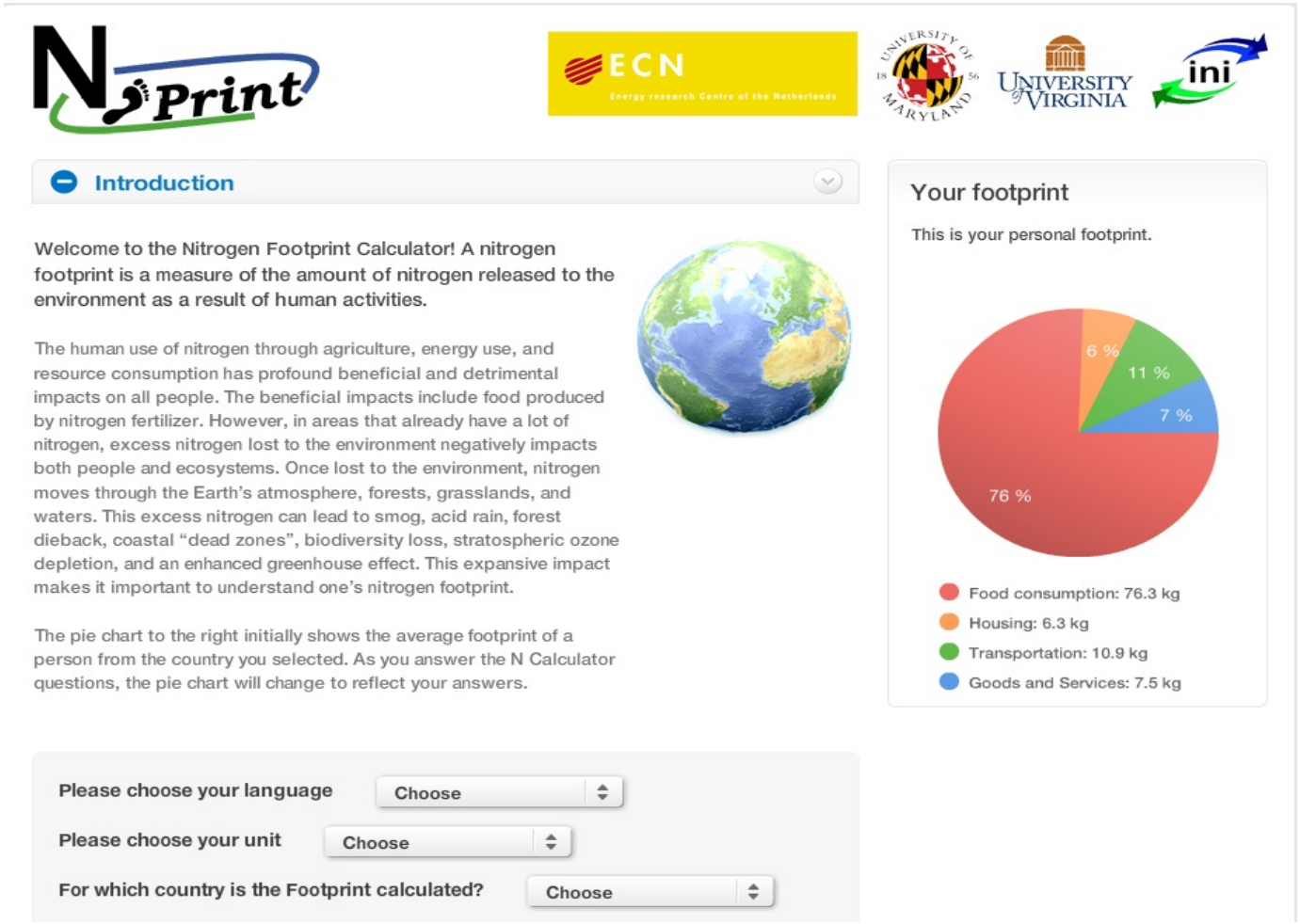
CHANGING PROTEIN SOURCES SAVES FEED, NUTRIENTS AND LAND





Sources: ENA, 2011, Protein Puzzle, PBL, 2011

THE NITROGEN FOOTPRINT



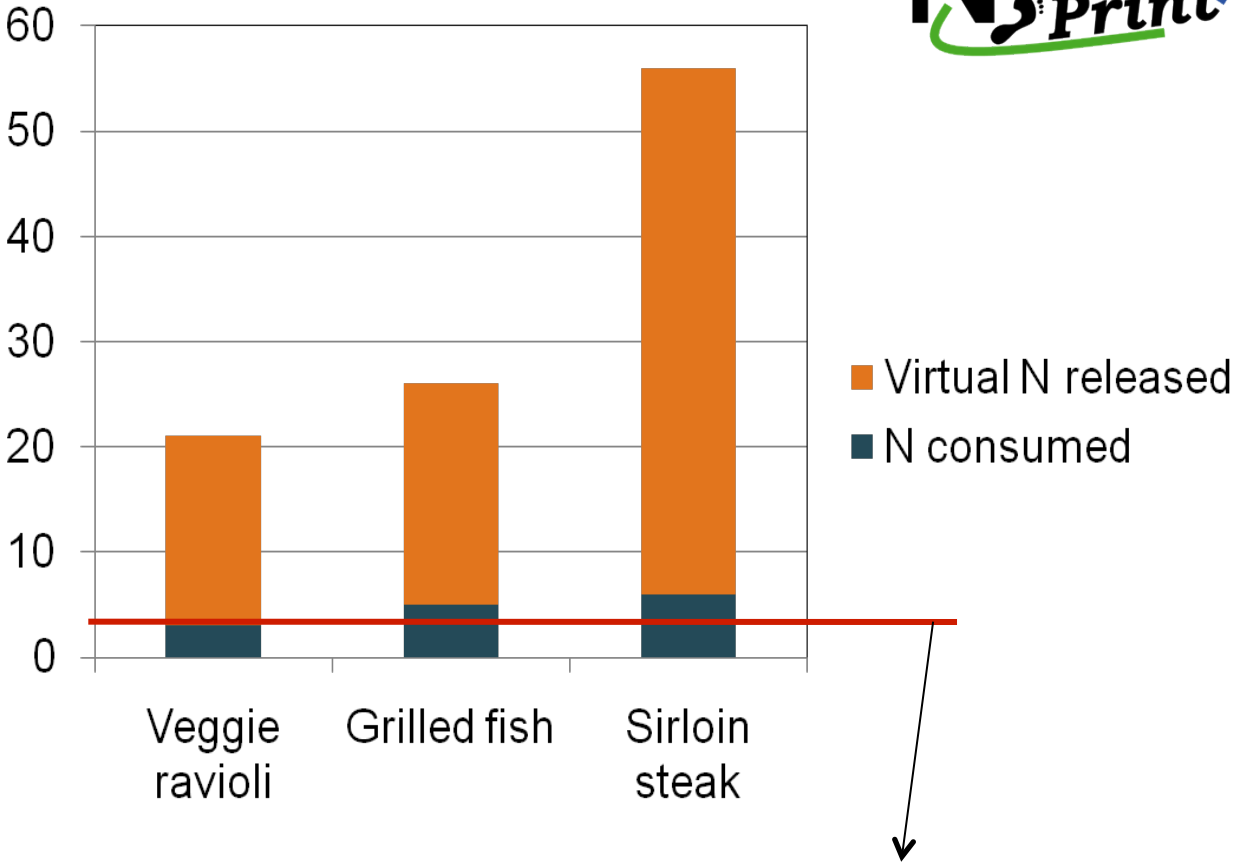
www.n-print.org

THE NITROGEN FOOTPRINT: YOUR LUNCH TODAY

Veggie ravioli

Grilled fish

Sirloin steak



Allison Leach

www.n-print.org

THANK YOU

And don't forget to reduce food waste!

Food waste per person per year in The Netherlands

(© Zembla)

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