What is a nitrogen footprint?

UNH Sustainability Institute

N Print

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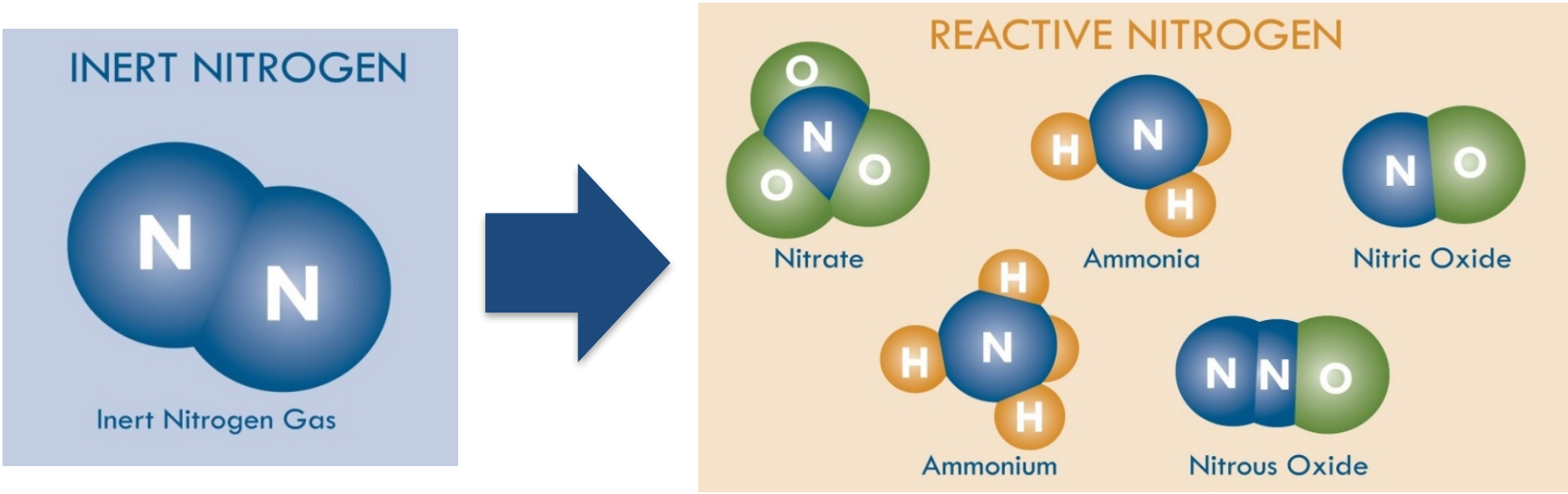
Outline

1. Why is nitrogen important?
2. What is a nitrogen footprint?
3. SIMAP: A tool for campuses
4. Opportunities for reduction

What is reactive nitrogen?

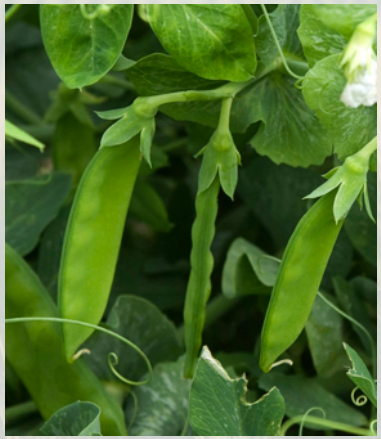


All species N except unreactive N_2

Figure by Andrew Greene

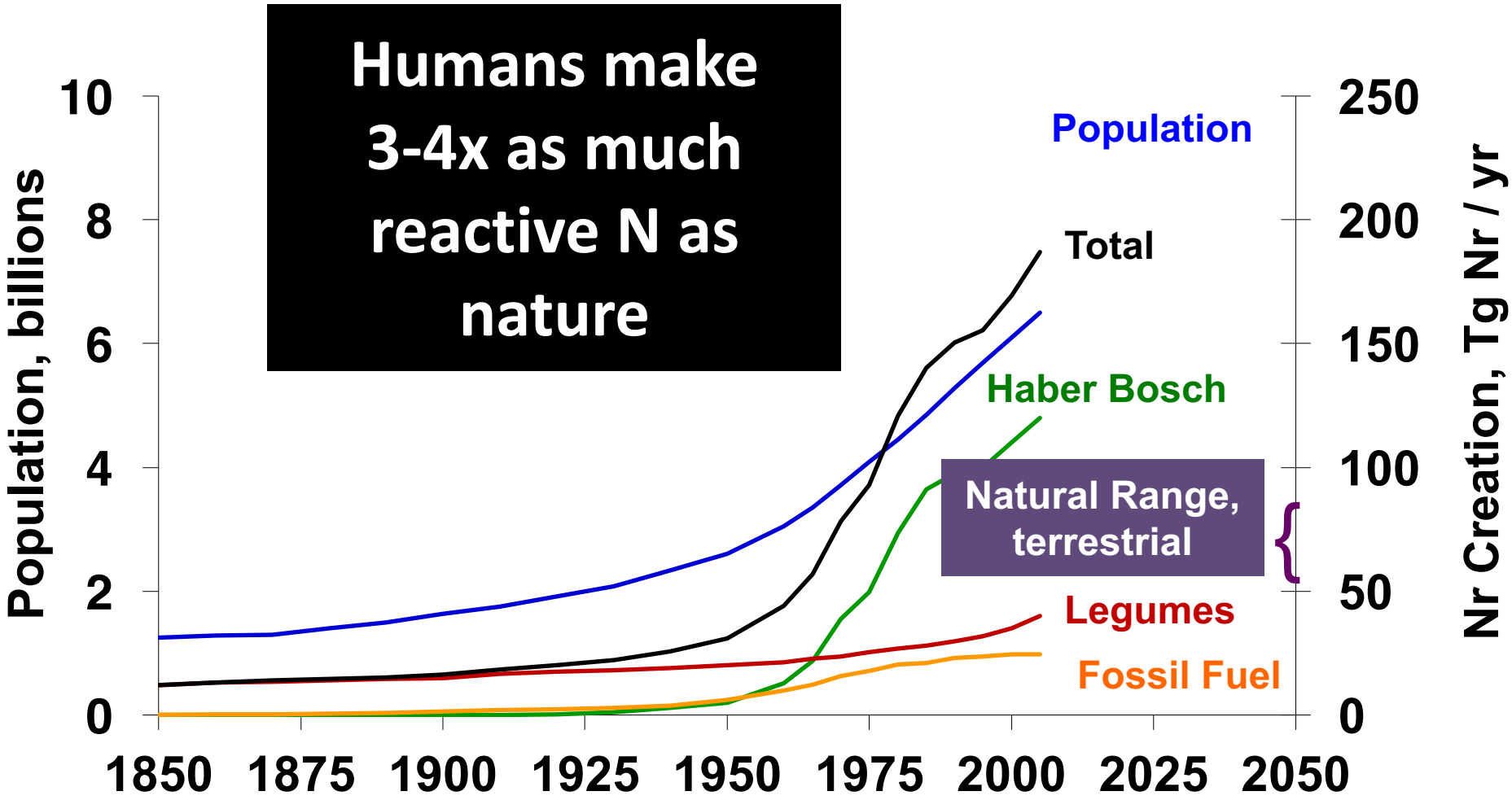
Today, reactive N is created by:

Natural processes



Man-made processes

Global anthropogenic reactive N creation



Galloway et al., 2003; 2008

Energy Production

N_2

Nr

ENVIRONMENT

Food Production

N_2

Nr

Nr

Slide by Jim Galloway

ENVIRONMENT

What are negative impacts from excess N?

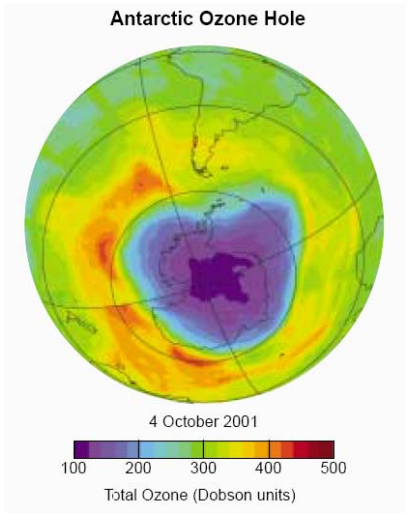
Smog, Haze

Forest Impacts

Acidification

Eutrophication

Climate change



Ozone Hole

Slide by Jim Galloway

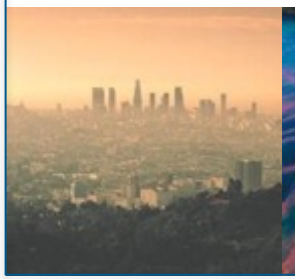
The Nitrogen Dilemma:

Benefits

Necessary for life
Synthetic fertilizer provides unlimited N supply for food

Drawbacks

Negative impacts to environmental & human health



Challenge:

Optimize the use of nitrogen,
while minimizing the negative impacts

Addressing the nitrogen challenge

1. Technology

2. Policy

3. Personal/institutional Action

What is a nitrogen footprint?

A **nitrogen footprint** is the amount of reactive nitrogen released to the environment as a result of an entity's resource consumption

1 Food*

**Food consumption and production*

2 Energy

The impact of FOOD CHOICES on a nitrogen footprint

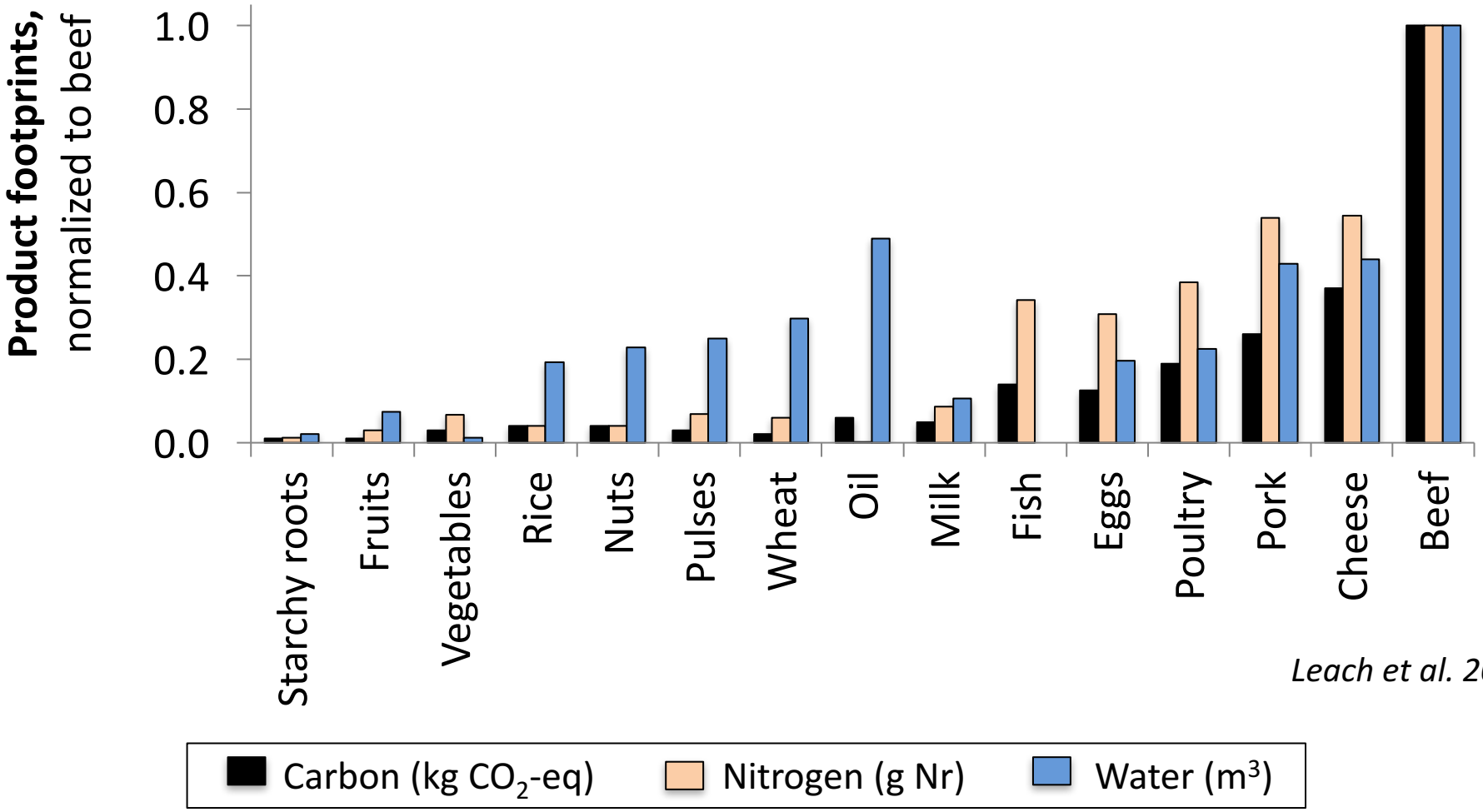
ENVIRONMENT

ENVIRONMENT

½ cup beans
15 g protein

3 oz steak
15 g protein

Carbon, nitrogen, & water footprint of food



Leach et al. 2016

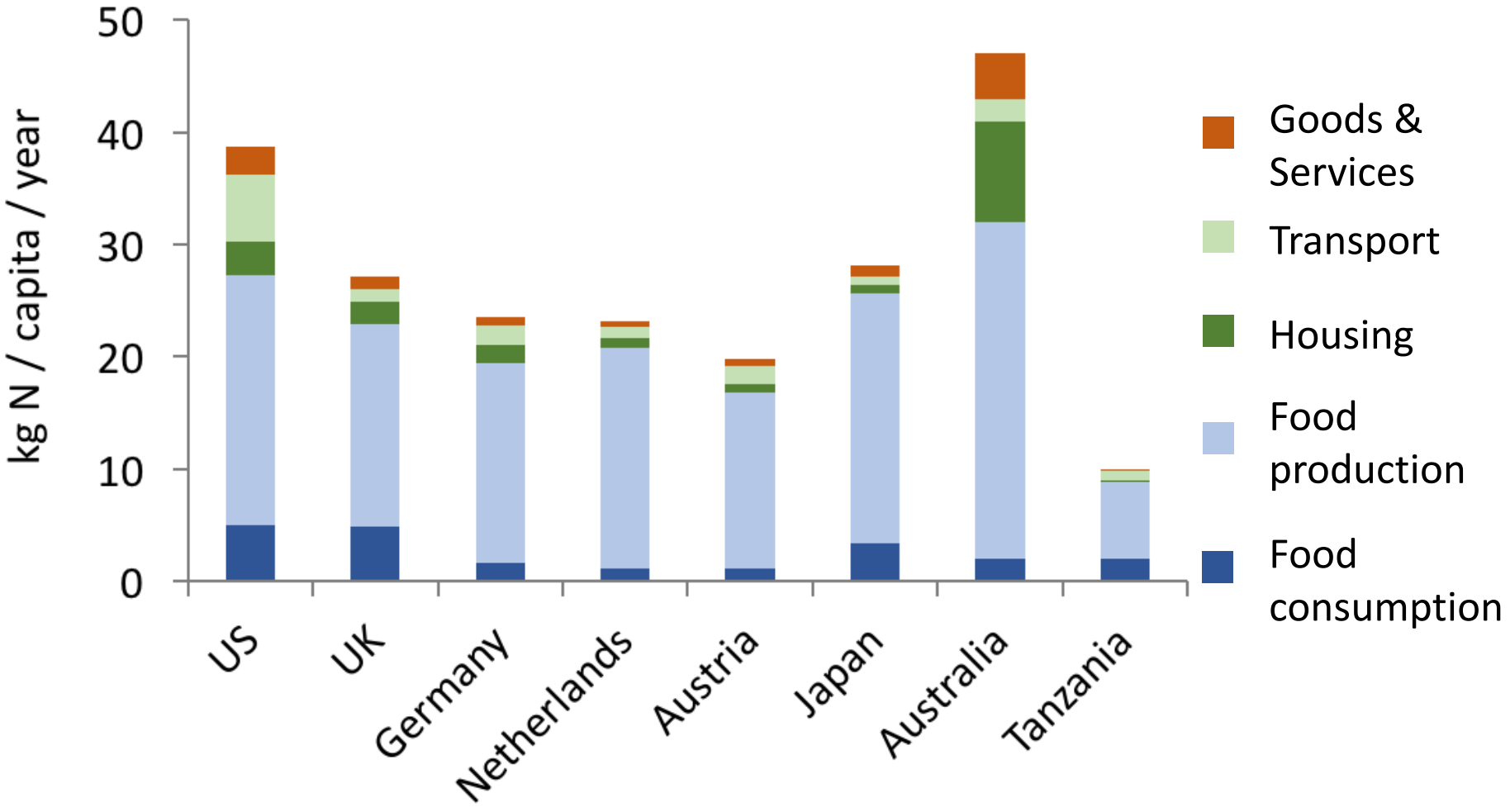
Consistent trends across the three footprints

Crop footprints less than meat/animal products

Nitrogen footprint tool for consumers

Available at **www.N-Print.org**

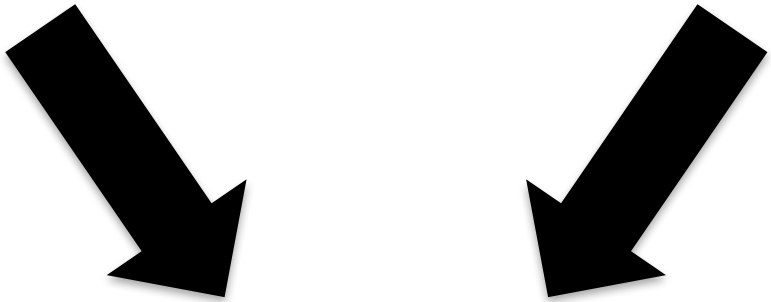
Personal N footprint by country



→ Food makes up more than 75% of a personal nitrogen footprint

Leach et al. 2012, Stevens et al. 2014, Pierer et al. 2014, Shibata et al. 2014, Liang et al. 2016, Hutton et al. 2017

SIMAP: A tool for campuses



SIMAP

SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

SIMAP integrates two campus sustainability tools

NITROGEN footprint:

*Consumption and production

N Print

- Developed in 2009 at UVA
- Used by 18 institutions
- **Completed pilot testing**

CARBON footprint:

*Consumption and production

UNH Sustainability Institute

- Developed in 2001 at UNH
- Used by **thousands** of institutions
- Excel & web-based tool

Why a combined C & N campus tool?

1. Broader picture of **environmental impacts**



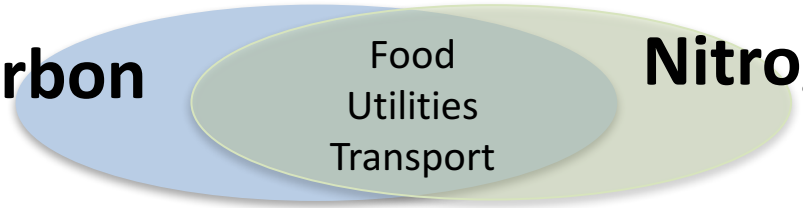
2. Win-win for most **reduction strategies**


Expand Composting & Food "Recycling"

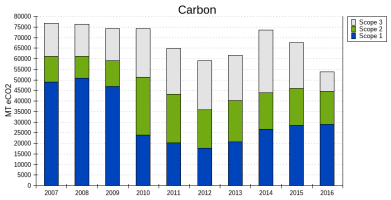

Reduce Energy Consumption

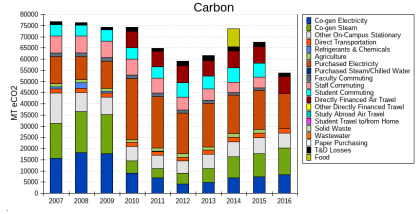

Substitute Non-Meat Proteins

3. **Reduced data entry**



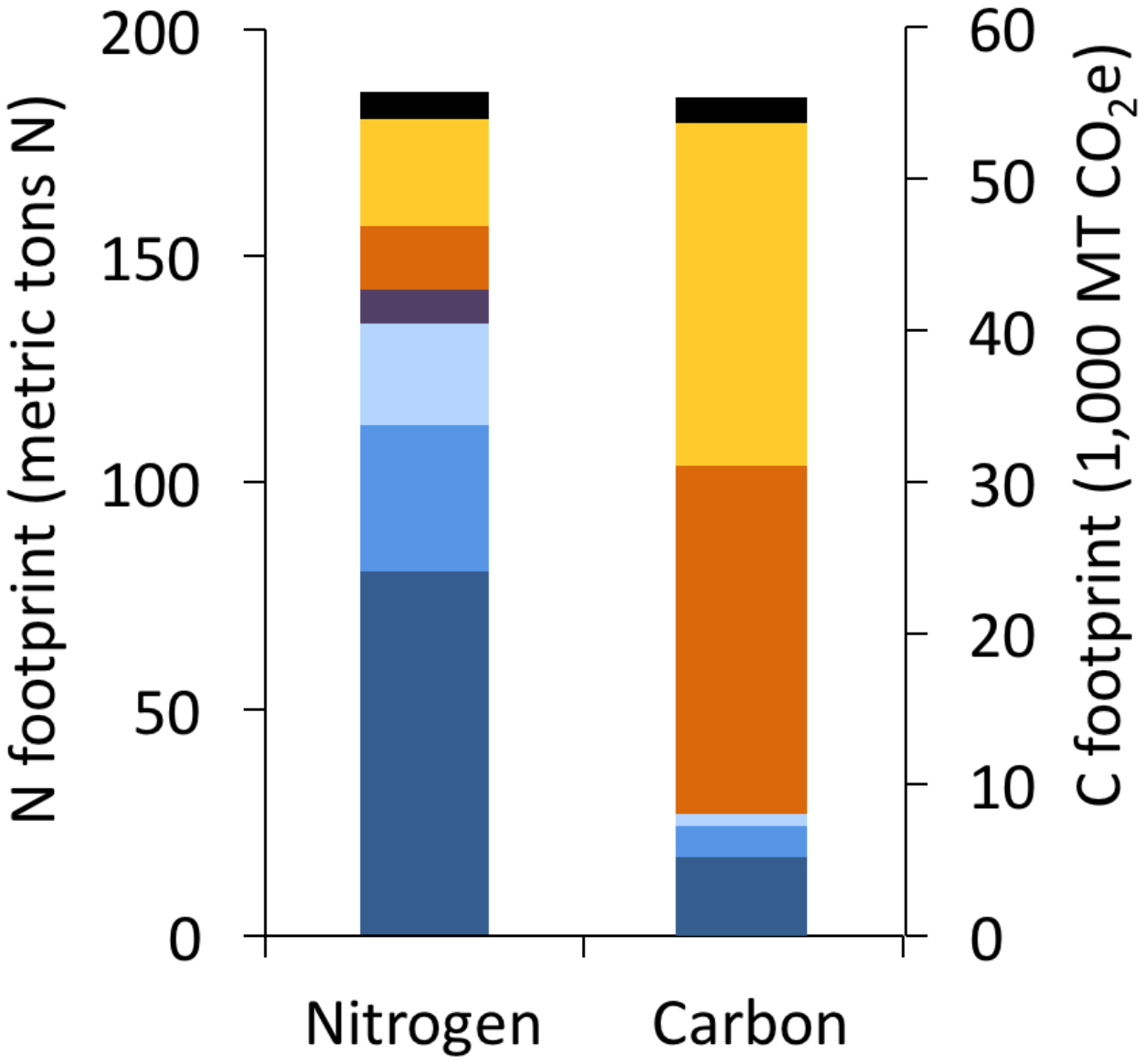
4. **Aggregated campus data set**





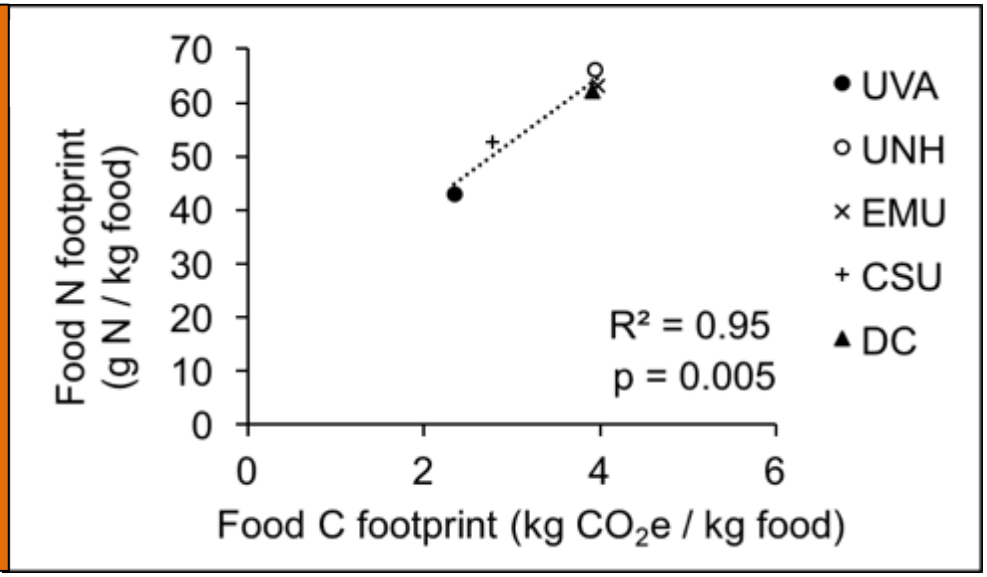
UNH's footprints in 2014

University of New Hampshire

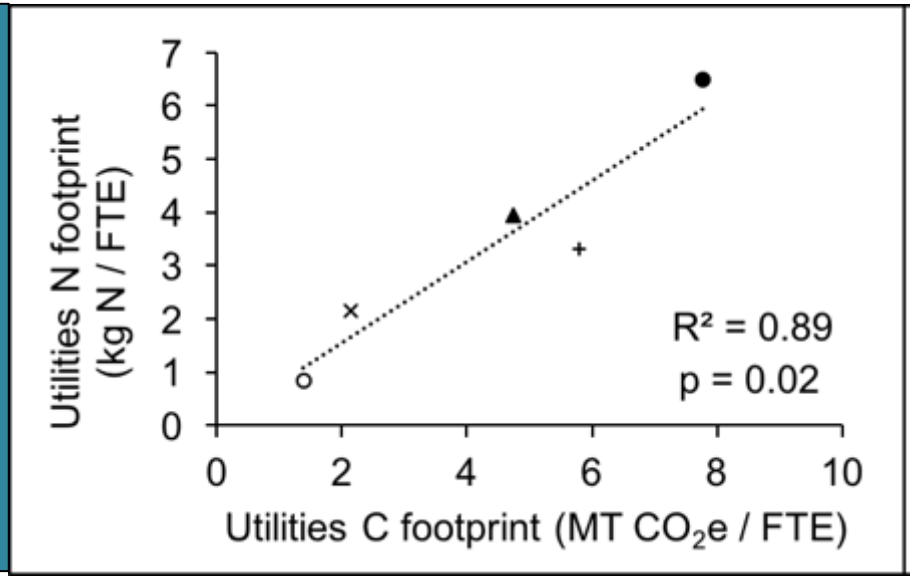


Leach et al. 2017

Food by meal served



Utilities sector



Strong correlations indicate win-win for reduction strategies

FTE = Full Time Equiv.

Leach et al. 2017

SIMAP

My account Log out

SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

HOME | 1. ACCOUNT | 2. DATA ENTRY | 3. RESULTS | REPORTS | DATA MGMT | RESOURCES

SIMPLIFYING SUSTAINABLE DECISIONS

SIMAP™ (Sustainability Indicator Management and Analysis Platform) is a carbon and nitrogen-accounting platform that can track, analyze, and improve your campus-wide sustainability. Our proven algorithms will help you:

- **Create a baseline**
- **Benchmark your performance**
- **Create reports**
- **Set goals**
- **Analyze your progress year over year**

Who can participate: Any campus-based organization or institution can take advantage of SIMAP's tools and functions.

How to participate: Create a new account with SIMAP. Once you've logged into the portal, select a subscription level and make a payment. Second Nature members will receive discounts automatically.

YOUR CAMPUS FOOTPRINT

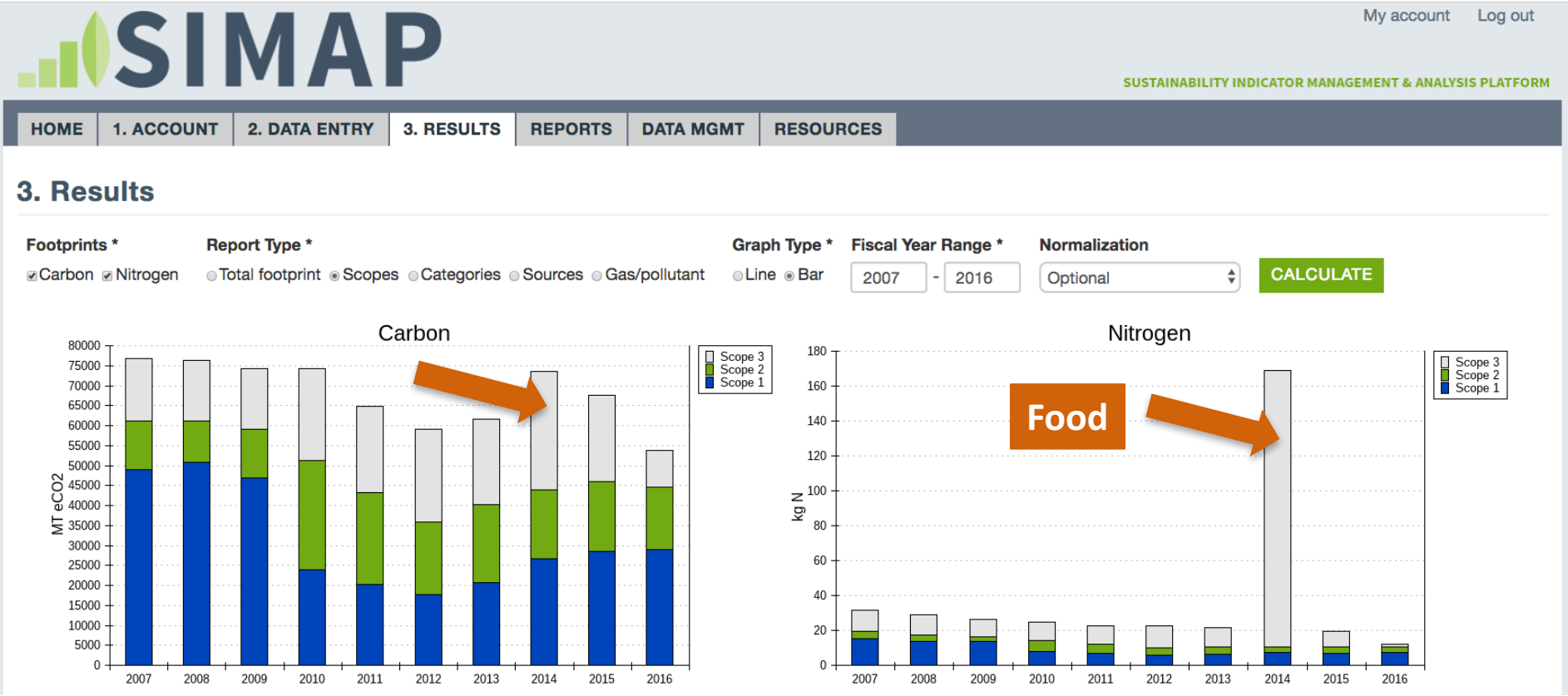
CARBON

CO2 emissions from generating power, treating waste, daily commuting, and even the use of paper, contribute to a campus' carbon footprint. Reducing these greenhouse gas emissions will help slow the effects of climate change and global warming.

NITROGEN

Reactive nitrogen can result from everyday activities like food service, energy use, transportation, and ground fertilizer. Reducing your nitrogen footprint can provide benefits to air and water quality, while helping prevent climate change.

GET STARTED!



Track carbon and nitrogen footprints over time

Food data in 2014 only

What can you do?

Calculate your N footprint: **www.N-PRINT.org**

Energy:

- Reduce utility usage
- Public transit
- Reduce, reuse, recycle!

Food:

- Recommended protein
- Less animal protein
- Less N-intensive meat
- Food from sustainable farms
- Reduce food waste

Summary and conclusions

Nitrogen challenge:
Optimize nitrogen's benefits
while minimizing its negative consequences

Consumers

Personal N footprint model educates consumers

N-Print

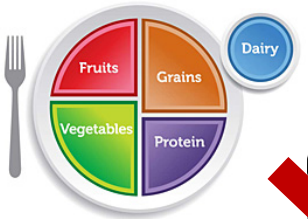
www.N-Print.org

Institutions

Well-positioned to manage N pollution and educate a community

SIMAP
SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

Reductions



Acknowledgments

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