Food Reporting

SIMAP
SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

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UNIVERSITY *of* VIRGINIA

Outline

1. Why food reporting matters

2. How to determine the campus food footprint using SIMAP
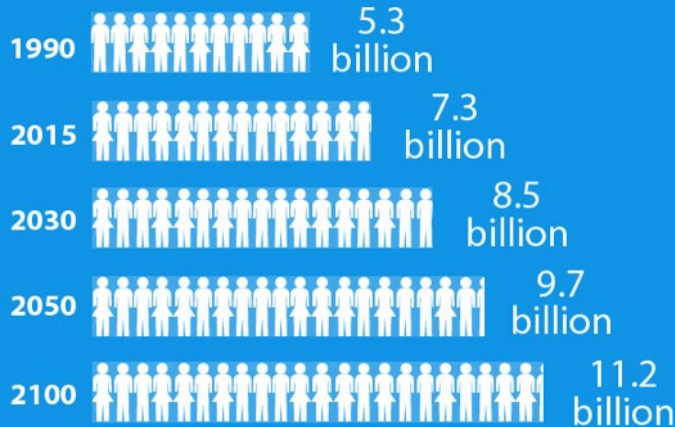
3. A case study at the University of Virginia

1) Why food reporting matters

Food is central to life, health, culture, & quality of life

World Population
Projected world population until 2100

- **1990** — 5.3 billion
- **2015** — 7.3 billion
- **2030** — 8.5 billion
- **2050** — 9.7 billion
- **2100** — 11.2 billion

Source: United Nations Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2015 Revision*
Produced by: United Nations Department of Public Information

2015 TIME FOR GLOBAL ACTION
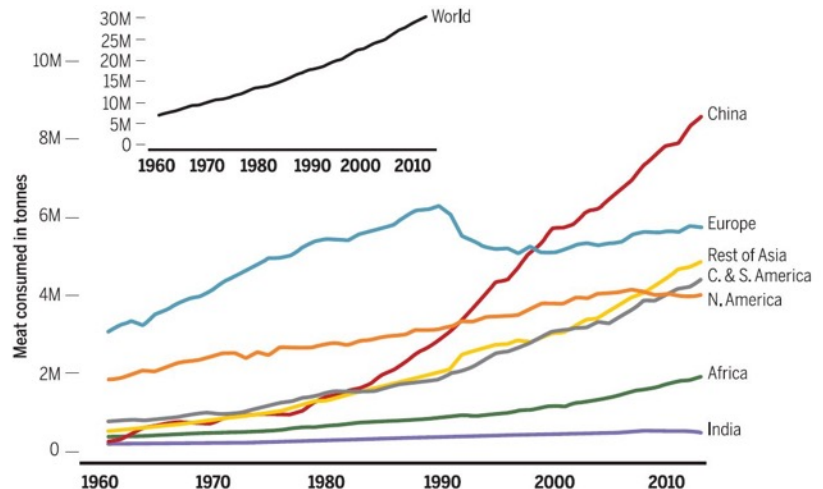
Total consumption of meat (in million metric tons) in different regions and (inset) globally. [Data are from www.fao.org/faostat/en/?#data.]
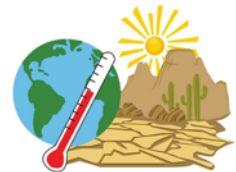
Global meat consumption is increasing on a total and per capita basis.

The environmental impacts

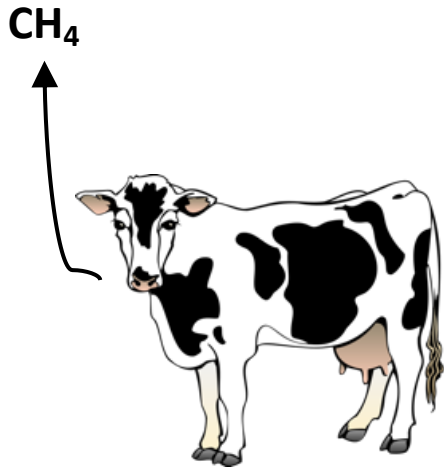**How does food production impact the environment?**
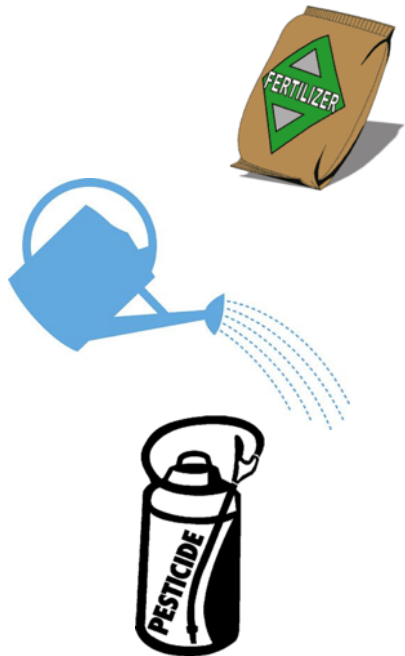
- Greenhouse gas emissions

- Nutrient pollution
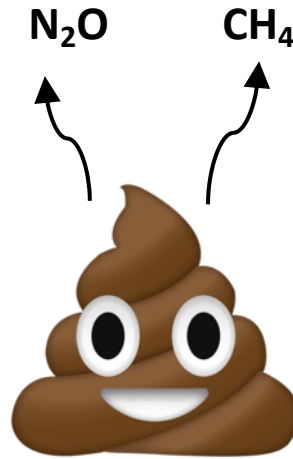
- Biodiversity loss

- Land use

- Freshwater consumption

In this webinar, we will focus on the first two:
the carbon and nitrogen footprint of food.
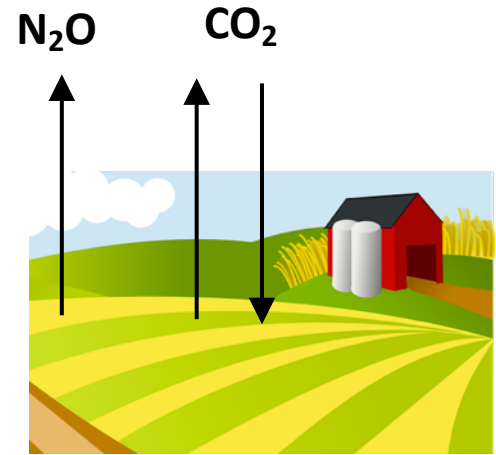
Sources of GHGs from food production

CH_4

Enteric fermentation (cow burps)

N_2O CH_4

Manure management

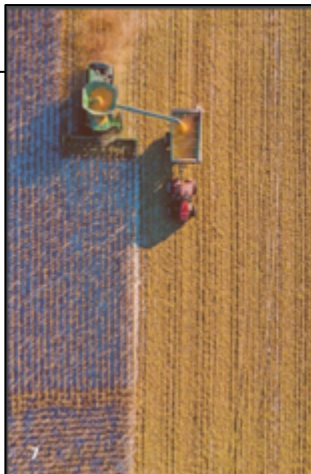N_2O CO_2

Soil respiration

On a global scale, _deforestation_ is a large source of GHGs

IPCC Special Report: Climate Change and Land

Climate change is making a **challenging situation worse and undermining food security**.

Agriculture, food production, and deforestation are major drivers of climate change.

ipcc
INTERGOVERNMENTAL PANEL ON climate change

Climate Change and Land

An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems

Summary for Policymakers

WG I · WG II · WG III

Released August 2019
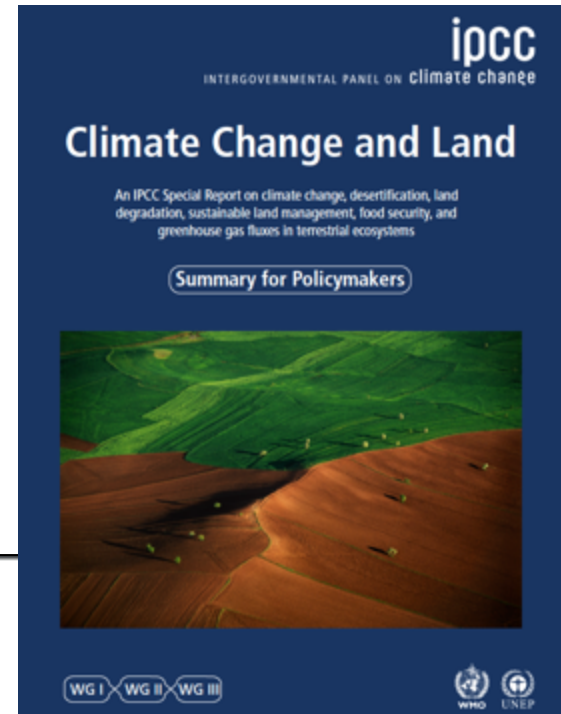
Nutrient pollution: Nitrogen and phosphorus

We need nutrients
(e.g., nitrogen, phosphorus)
to grow crops…

…But those same nutrients cause
environmental pollution

Nutrient sources

Phosphorus

Mining
And reserves are limited and concentrated

Nitrogen
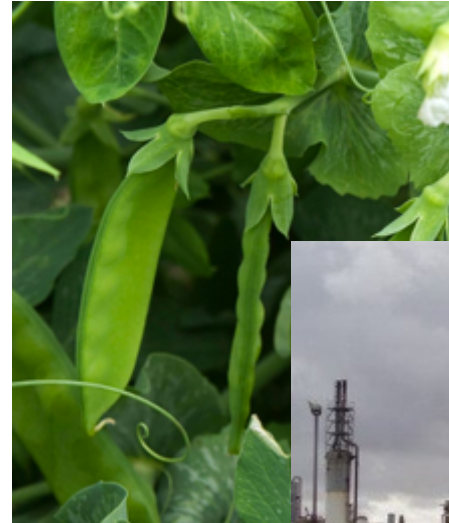
Biological N fixation

Haber-Bosch process

Or from recycling!
For example: Manure, compost, crop residue

Nitrogen pollution: Impacts

ENVIRONMENTAL IMPACTS AND THE NITROGEN CASCADE

Smog and Haze   Forest Die-Back   Acidification

Ozone Hole   Climate Change   Eutrophication
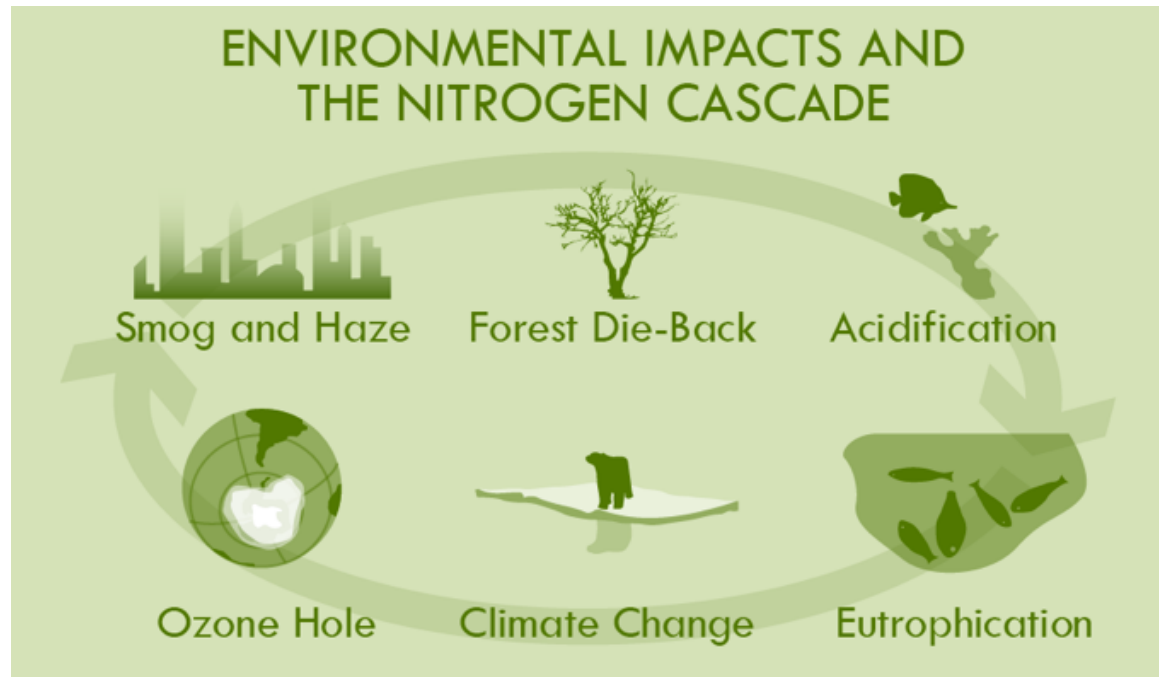
Agriculture more directly causes soil quality and water quality impacts, but it can indirectly cause all of these impacts through the nitrogen cascade.

Summary: Why food reporting matters

Because we want to maintain the benefits of our modern agricultural system	... But we have to address many challenges to ensure that it is sustainable and just
- Producing more food than ever before - Agricultural technologies improve resource efficiency - Intensification saves land	- Alleviate rural poverty - Improve diets and health - Preserve resources for future generations - Address climate change

Challenge:

Produce enough healthy food while minimizing environmental damage.

Comparing across food footprints

What is a footprint?

= The pressure on the environment from resource consumption

Water	Carbon	Nitrogen
Freshwater consumption during food production	*Greenhouse gas emissions* during food production	*Nitrogen pollution losses* during food production

Water footprint of food

Beef — 6,600
Dairy — 2,900 L
Pork — 2,800 L
Poultry — 1,500 L
Eggs — 1,300 L
Fish — N/A
Grains — 2,000 L
Beans — 1,700 L
Vegetables — 100 L
Fruits — 500 L
Potatoes — 100 L
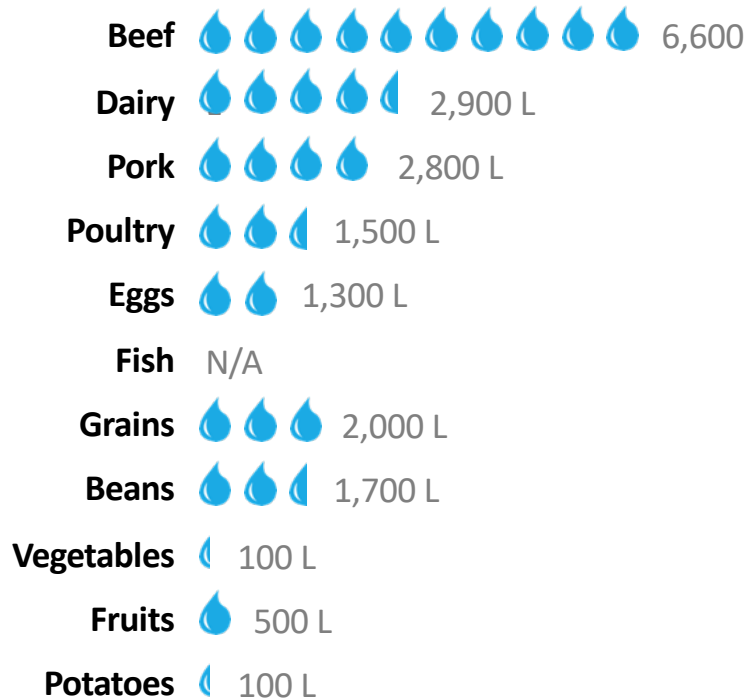
Liters of freshwater required to produce 1 kilogram of food

Water (L)

For 1 kg food

Leach et al. 2016, updated

Water + carbon footprint of food

Food	Water/Carbon	Amount
Beef	💧💧💧💧💧💧💧💧💧💧 CO_2 CO_2 CO_2 CO_2 CO_2 CO_2 CO_2 CO_2 CO_2 CO_2	27 kg eCO_2
Dairy	💧💧💧💧💧 CO_2 CO_2 CO_2 CO_2	10 kg eCO_2
Pork	💧💧💧💧 CO_2 CO_2 CO_2	7 kg eCO_2
Poultry	💧💧💧 CO_2 CO_2	5 kg eCO_2
Eggs	💧💧 CO_2 CO_2	4 kg eCO_2
Fish	CO_2 CO_2	4 kg eCO_2
Grains	💧💧💧 CO_2	0.6 kg eCO_2
Beans	💧💧💧 CO_2	0.8 kg eCO_2
Vegetables	💧 CO_2	0.7 kg eCO_2
Fruits	💧 CO_2	0.4 kg eCO_2
Potatoes	💧 CO_2	0.2 kg eCO_2
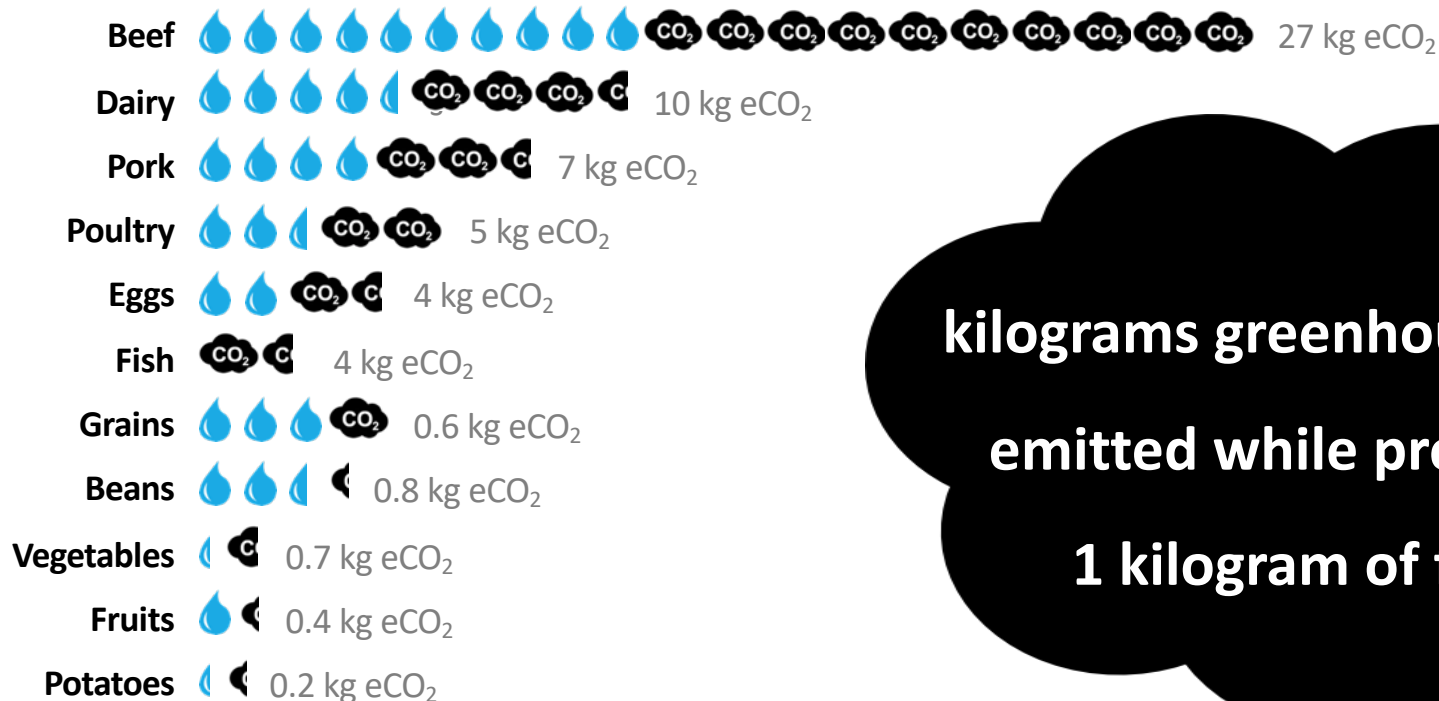
kilograms greenhouse gases emitted while producing 1 kilogram of food

💧 Water (L) CO_2 Carbon (kg eCO_2)

For 1 kg food

Leach et al. 2016, updated

Water + carbon + nitrogen footprint of food

Grams nitrogen released while producing 1 kilogram of food

Water (L)	Carbon (kg eCO₂)	Nitrogen (g N)

Beef — 460 g N
Dairy — 140 g N
Pork — 190 g N
Poultry — 170 g N
Eggs — 80 g N
Fish — 140 g N
Grains — 30 g N
Beans — 20 g N
Vegetables — 10 g N
Fruits — 6 g N
Potatoes — 9 g N

For 1 kg food

Leach et al. 2016, updated

Water + carbon + nitrogen footprint of food

Consistent trends across the three footprints

Crop footprints less than meat/animal products

Animal-based

Plant-based
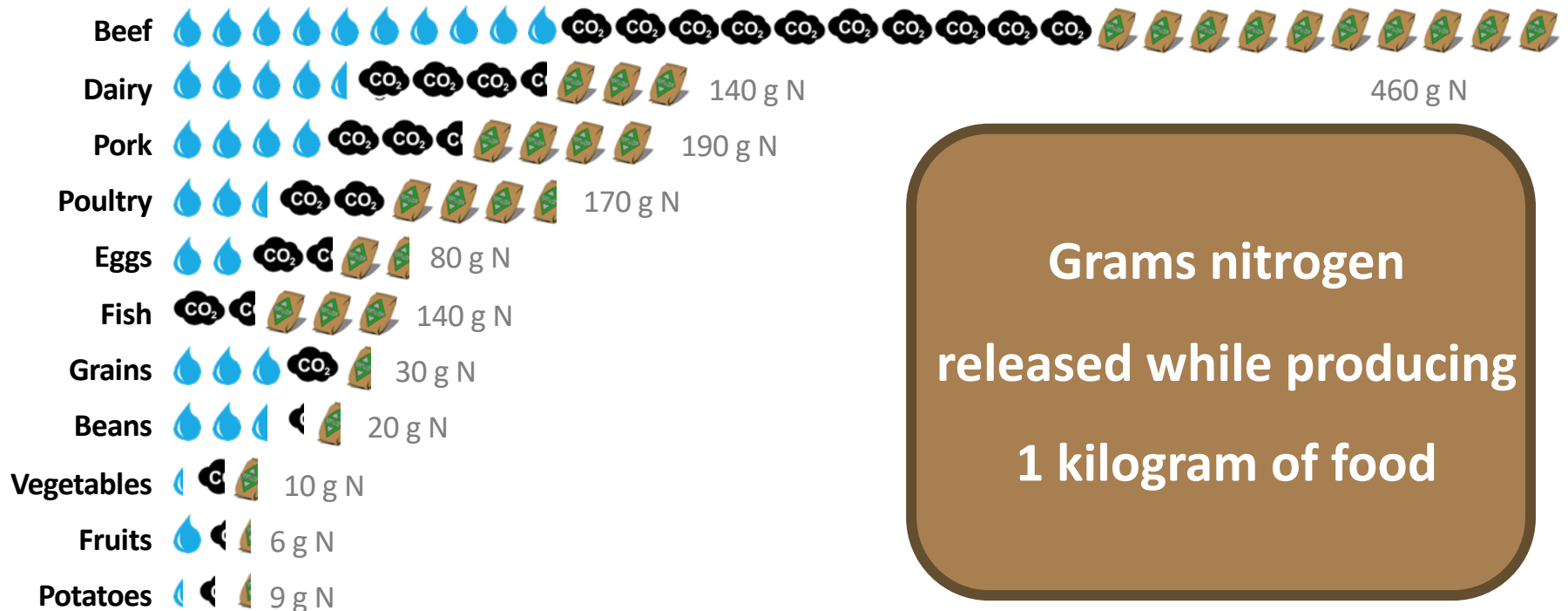
Water (L) Carbon (kg eCO₂) Nitrogen (g N)

For 1 kg food
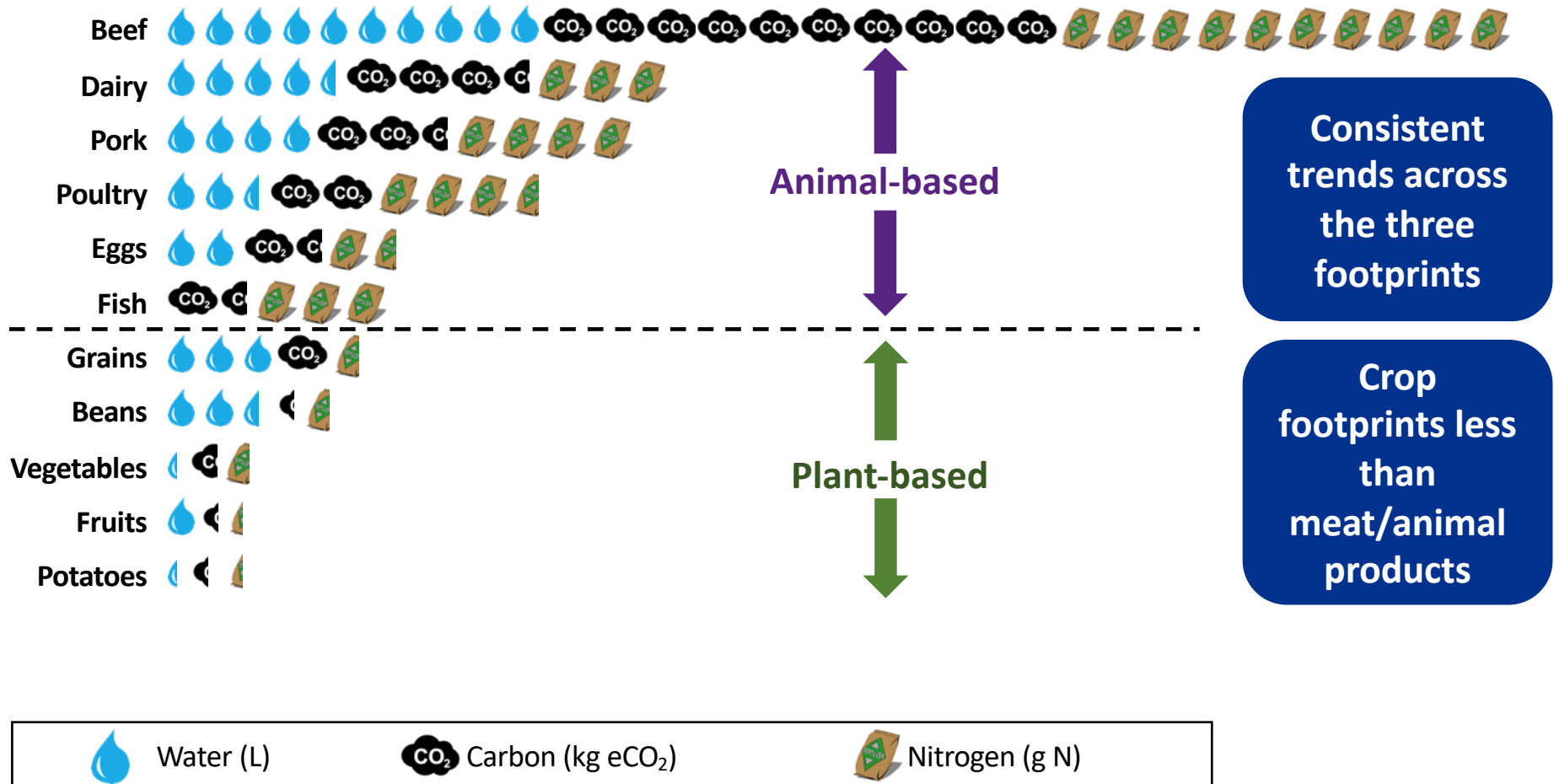
Leach et al. 2016, updated

How do alternative systems compare?

|	**Intensive/Conventional**	**Extensive/Organic**
Yields:	More productive per input	Less productive per input
Land:	Less land required	More land required
Emissions:	Lower emissions intensity	Higher emissions intensity
Environmental:	Concentrated pollution	More soil organic matter
		Less concentrated pollution
		Improved biodiversity

Take-away: Alternative farming practices help and are part of the solution, but they are not as effective as dietary shifts.
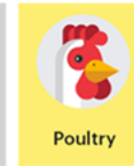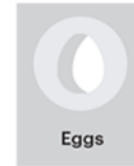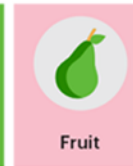
Opportunities for reductions
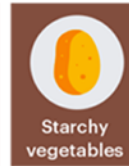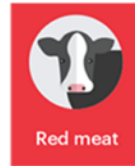
Shift diets
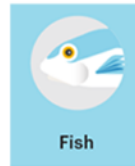
Eat Lancet Commission's Report

Reduce food waste

FOOD WASTE
24%
Calories produced for people that are never consumed

ENVIRONMENTAL WASTE
198m
Hectares used to produce food we don't eat (about the size of Mexico)

FINANCIAL WASTE
$1600
Value of food thrown out by the average U.S. family per year

WORLD RESOURCES INSTITUTE

Opportunities for reductions

How do we make progress on our campuses?

SIMAP — SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

"You can't manage what you don't measure."

2) How to determine the campus food footprint using SIMAP

What is SIMAP?

A carbon and nitrogen accounting platform that can track, analyze, and improve your campus-wide sustainability

SIMAP combines two tools:
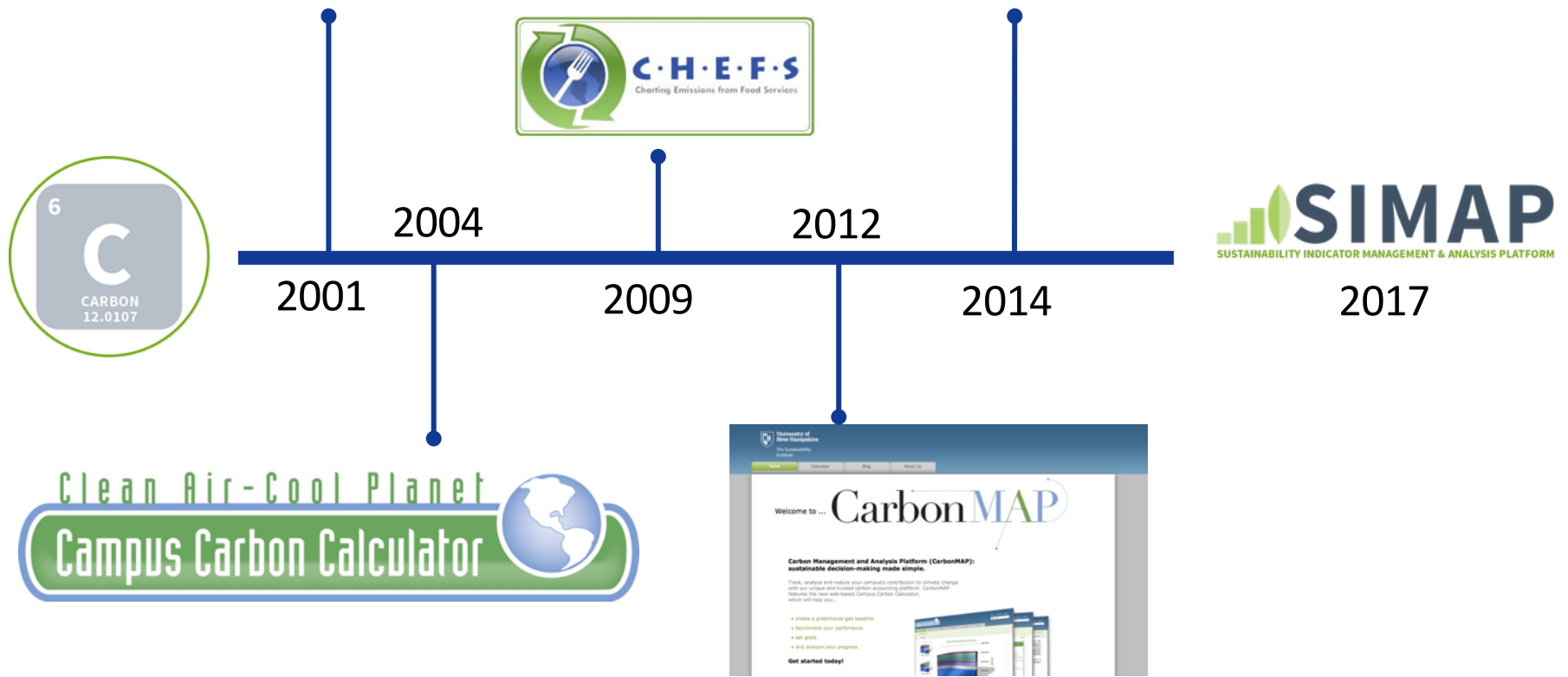
UNH Sustainability Institute

- Developed in 2001 at UNH
- Excel and web version
- Used by thousands of institutions

N Print

- Developed in 2009 at UVA
- Excel-based
- Used by 20 institutions
- Completed pilot testing

How did we get here?
Carbon

How did we get here?
Nitrogen

- 2009 — University of Virginia
- 2013 — UVA N reduction goal
- 2014 — EPA grant / NFT v1 launched / NFT Network
- 2014-2017 — Pilot testing by cohorts 1-3
- 2017 — Sustainability: The Journal of Record — Special Issue on Nitrogen Footprints
- 2017 — SIMAP — SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM
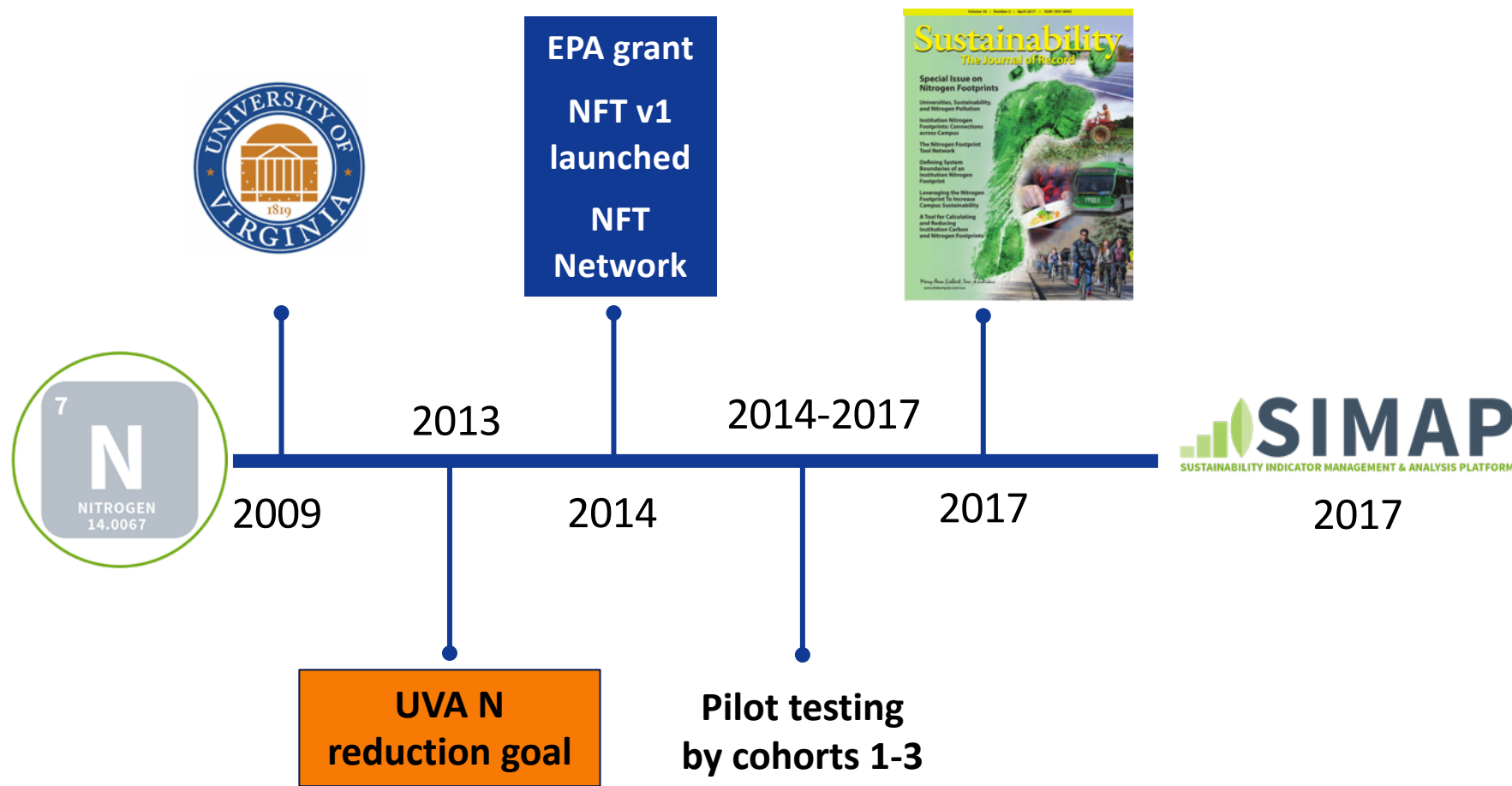
Why a new tool?

1 Broader picture of **environmental impacts**

2 **Single tracking tool**

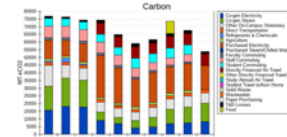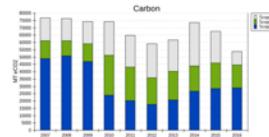**Carbon**   Food Energy   **Nitrogen**

3 Integrate with **other reporting platforms**

Second Nature   *Others in the future*

4 **Research about data trends**

5 **UNHSI's ability to support the tool**

SIMAP
SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

SIMPLIFYING SUSTAINABILITY DECISIONS

SIMAP® is a carbon and nitrogen-accounting platform that can track, analyze, and improve your campus-wide sustainability. Our proven algorithms, based on nearly two decades of work supporting campus inventories with the Campus Carbon Calculator, CarbonMAP and Nitrogen Footprint Tool, will help you:

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

GET STARTED!

YOUR CAMPUS FOOTPRINT

6 C CARBON 12.0107

7 N NITROGEN 14.0067

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.

SUBSCRIPTION TIERS

While SIMAP offers basic functionality at no cost, we also offer two premium subscription levels that provide additional features at a nominal license fee. Our model allows UNH to cover the costs of continuing to offer and support this tool for the good of the entire campus-based sustainability community.

| BASIC (FREE) | TIER 1 ($350*): | TIER 2 (TBD): |

NEWSFEED

Graphs are now interactive! Check them out on the results tab and review the user guidance for how to use them.

SIMAP data review appointment request and data review document are on our Support page.

Thank you for taking the survey and for your feedback about what is working and what could be improved. We are analyzing the results now and will provide communications on what the development priorities will be and the timelines. We really appreciate your feedback!

"The Nitrogen Footprint Tool for Universities" webinar presented on 6/27/18

New and simpler data collection template now available!

Please read this new guidance on the updated Scope 2 market-based purchased electricity calculations with residual emissions factors.

Check out the FAQs and changes and updates.

Training Webinar Accounting for Renewable Energy in SIMAP: Recording posted on the training page.

CarbonMAP users can still request your data HERE.

SIMAP

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

3. Results

Footprints *
☑ Carbon ☑ Nitrogen

Report Type *
○ Total footprint ○ Scopes ◉ Categories ○ Sources ○ Gas/pollutant

Scope 2 Method ❶ *
◉ Market-Based ○ Location-Based ○ Custom Fuel Mix
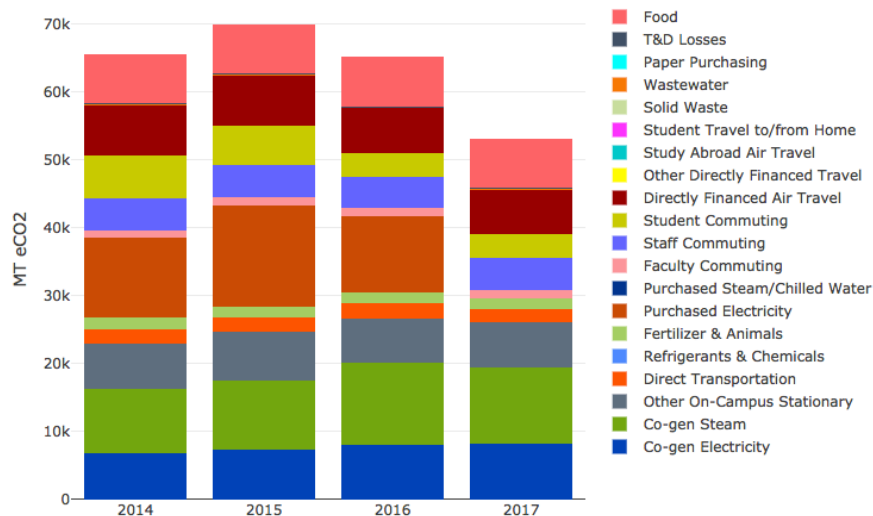
Graph Type *
○ Line ◉ Bar
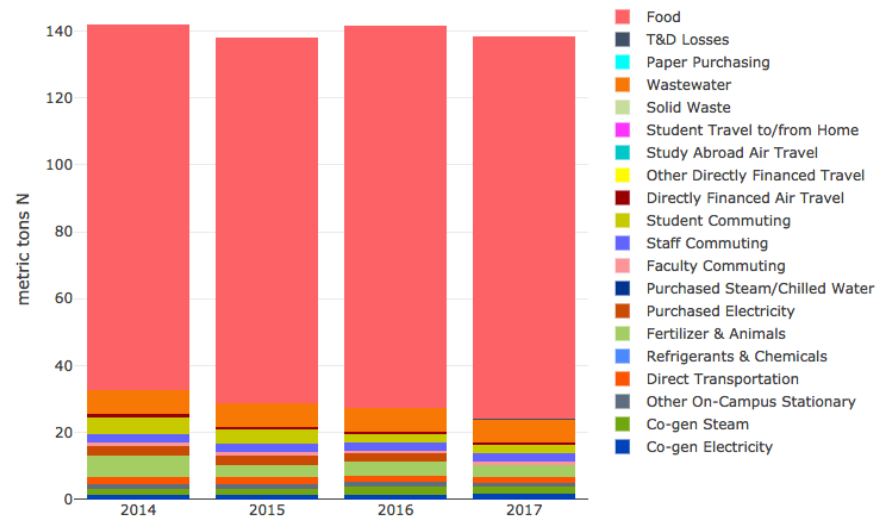
Fiscal Year Range *
[2014] - [2017]

Normalization
[None ▾]

[CALCULATE]

❓ Get help with graphs

Carbon

Legend (Carbon):
- Food
- T&D Losses
- Paper Purchasing
- Wastewater
- Solid Waste
- Student Travel to/from Home
- Study Abroad Air Travel
- Other Directly Financed Travel
- Directly Financed Air Travel
- Student Commuting
- Staff Commuting
- Faculty Commuting
- Purchased Steam/Chilled Water
- Purchased Electricity
- Fertilizer & Animals
- Refrigerants & Chemicals
- Direct Transportation
- Other On-Campus Stationary
- Co-gen Steam
- Co-gen Electricity

Nitrogen

Legend (Nitrogen):
- Food
- T&D Losses
- Paper Purchasing
- Wastewater
- Solid Waste
- Student Travel to/from Home
- Study Abroad Air Travel
- Other Directly Financed Travel
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- Co-gen Steam
- Co-gen Electricity

Carbon

Fiscal Year	Scope	Source	CO2 (kg)	CO2 (MTCDE)	CH4 (kg)	CH4 (MTCDE)	N2O (kg)	N2O (MTCDE)	GHG MTCDE
2014	1	Co-gen Electricity	6,840,038	6,840.04	701	17.52	17	4.98	6,862.53
2014	1	Co-gen Steam	9,377,846	9,377.85	961	24.02	23	6.82	9,408.69

Entering food data in SIMAP

1. **Food data collection and processing**

2. **Entering food data in SIMAP**

3. **Using the results**

NFT Network

Food data collection and processing

Request purchase records

| ITEM	BRAND	DESCRIPTION	PK	SIZE	QTY
337045	WEST CRK	EGG WHL W/CITRIC BNB TFF	1	20 LB	5264
362013	WEST CRK	FRUIT SALAD DLX ORANGE GRAPE	1	8 LB	3724
293477	ROMA	BEEF SIRLOIN STK PHILLY SLCD FZ	2	5 LB	3622
310503	ASSOLUTI	CHICKEN TNDRLN BRD PAR FRIED	2	5 LB	3099
158754	WEST CRK	CHICKEN TNDR JUMBO CLPPD CVP	4	10 LB	2740
904599	NLS NEST	EGG BRWN LG CAGE FREE	1	15 DZ	2607
276878	APPLAUSE	CHICKEN BRST NUGGET BRD FC FZ	2	5 LB	2303
861588	STONY	YOGURT STRWBRY LF ORGANIC BULK	6	32 OZ	2270
247412	WEST CRK	BEEF PATTY 5/1 GRND 80/20 FZ	50	3.2 OZ	2208
950233	STONY	YOGURT FRNCH VANILLA ORGANIC NF	6	32 OZ	2119
310514	ASSOLUTI	CHICKEN BRST STRIPS FC GRILL	2	5 LB	2109
882098	OLD CAL	SAUCE MARINARA FCY POUCH	6	106 OZ	1862
38268	TYSON	CHICKEN BRST PATTY HS FC CN FZ	60	3.53 OZ	1754
264197	ROMA	SAUCE ALFREDO RTU TFF	4	80 OZ	1612
53381	GOLD MED	FLOUR FULL STRENGTH TFF	1	50 LB	1494
197448	WEST CRK	CHICKEN DICED WHI & DARK FC 1/2	1	10 LB	1475
993262	SLVR SRC	CORN CUT YLW	1	20 LB	1398
259374	DOLE	STRAWBERRIES DICED IQF	2	5 LB	1314
887415	SLVR SRC	CHICKEN TNDRLN FRITTER BRD FZ	1	10 LB	1303
890881	STONY	YOGURT BANANA VANILLA ORGANIC	6	32 OZ	1280
29137	LAMBSEAS	FRIES CRISSCUT SEASND	6	4.5 LB	1249
85236	TYSON	CHICKEN POPCORN BITE ORGNL RTC	2	5 LB	1217
51380	HEINZ	KETCHUP VOL-PAK TFF	1	3 GA	1208
320328	ROMA	CHEESE MOZZ WM PROV WHI CHED	6	5 LB	1179
395018	PACKER	BEEF FOR STEW CH FZ	2	5 LB	1159
43045	MIN MAID	JUICE ORANGE CONC 5+1	4	90 OZ	1091
52221	AUNT JEM	FRNCH TOAST STICKS OVENABLE FZ	2	5 LB	1035
39276	SNDW MKR	TURKEY BRST	2	9.71 LB	1011
76957	TYSON	CHICKEN WING JUMBO APPROX 105	2	5 LB	931
307212	PIERCE	CHICKEN BRST NUGGET BTTRD FZ	2	5 LB	929

Guidelines are available on the SIMAP resources tab

Categorize items & calculate weights

18 food categories

Calculate weights, for example:

20 lb/pack x 5264 packs purchased = 105,280 lb eggs
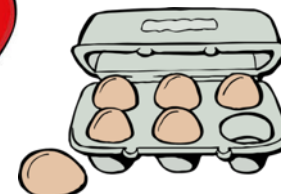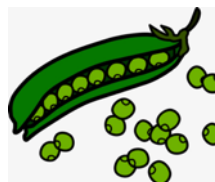
1 **REQUIRED food data entry:**

- Date range
- Label (descriptive text)
- **Food category 1**
- **Weight**
- Unit (kg, lb)

2 **OPTIONAL food data entry:**

- Vendor name
- Organic
- Local
- Food category 2 & 3 (multi-ingredient)
- Dollars
- Confidence level
- Notes

3 FOOD SCALING FACTORS

For more information:

- User's Guide (Resources tab)
- Food Template (Resources tab)

Two options for entering food data into SIMAP:

1) Enter food data manually into SIMAP

SCOPE 1

Stationary Fuels ▾

    Cogen Efficiencies and Outputs

Transport Fuels

Fertilizer

Animals

Refrigerants & Chemicals

SCOPE 2

Add Food

Home / Food Data / Add

Date Range *

2016-07-01	2017-06-30
E.g., 2018-10-09	E.g., 2018-10-09

Label *

Weight *

2) Import food data collection template

Food data entry									
Required field in SIMAP									
MM/DD/YYYY	MM/DD/YYYY	Text entry	Number	kilogram, pound, or US gallon	Yes or No	Yes or No	Select from drop-down	Select from drop-down	Select from drop-down
Start date*	End date*	Label*	Weight*	Unit*	Organic	Local	Category 1*	Category 2	Category 3

Download on 'Resources' tab

SCOPE 1

Stationary Fuels
   Cogen Efficiencies and Outputs

Transport Fuels

Fertilizer

Animals

Refrigerants & Chemicals

SCOPE 2

Utility Consumption

Renewable Energy

SCOPE 3

Commuting

Business Travel & Study Abroad

Student Travel to/from Home

Food

Paper

Waste & Wastewater

SINKS

Compost

Non-Additional Sequestration

Offsets

CALCULATION FACTORS

Emission Factors

Food Conversion Factors

Food Conversion Factors

This table provides conversion factors used in the food calculations. The nitrogen content is based on the protein content of food (protein is 16% nitrogen), "Conventional" describes the food production nitrogen loss factors used for conventional food, "Organic" describes the food production nitrogen loss factors used for organic food, "Miles" describes the average number of miles that food type travels to be consumed, "Waste" is the average % of food waste by food category, and "Truck capacity" is used to calculate how many trips are necessary to deliver your food. These factors cannot be edited in the current version of SIMAP, but please let us know if you would like to modify any of them.

Version: 2017

Food Category	Nitrogen Content	Conventional virtual N factor (kg N loss / kg N food)	C footprint (kg eCO2 / kg food)	Food transport distance (miles)	Local food transport (miles)	Food waste	Truck capacity (kg)
Meat: Chicken	0.02782	4.2	5.05	950	250	0.15	22700
Meat: Pork	0.02825	4.7	6.87	950	250	0.15	22700
Meat: Beef	0.02916	11.3	26.45	950	250	0.15	22700
Dairy & eggs: Milk	0.00633	3.1	1.34	250	250	0.15	22700
Dairy & eggs: Eggs	0.01855	3.3	3.54	250	250	0.15	22700
Dairy & eggs: Cheese	0.03010	3.1	9.78	250	250	0.15	22700
Seafood: Fish	0.02871	2.5	3.83	950	250	0.39	22700
Vegetable products: Liquids	0.00144	3.4	1.03	800	250	0.37	22700
Vegetable products: Sugars	0.00051	3.4	0.93	800	250	0.37	22700
Vegetable products: Coffee and tea	0.01640	3.4	0.36	800	250	0.37	22700
Vegetable products: Potatoes	0.00359	1.4	0.21	1500	250	0.35	22700
Vegetable products: Beans	0.01442	0.41	0.78	1500	250	0.05	22700
Vegetable products: Oils	0.00059	0.41	1.63	800	250	0.05	22700
Vegetable products: Grains	0.01482	0.93	0.86	1350	250	0.28	22700
Vegetable products: Vegetables	0.00284	2.8	0.73	1500	250	0.37	22700
Vegetable products: Spices	0.00881	2.8	0.73	800	250	0.37	22700
Vegetable products: Nuts	0.02969	0.41	1.17	1500	250	0.05	22700

Emissions factors for food

Crops

Meat & animal products

Product footprints, normalized to beef

Carbon (kg CO$_2$-eq)   Nitrogen (g N)

Leach et al. 2016
Heller & Keoleian 2014
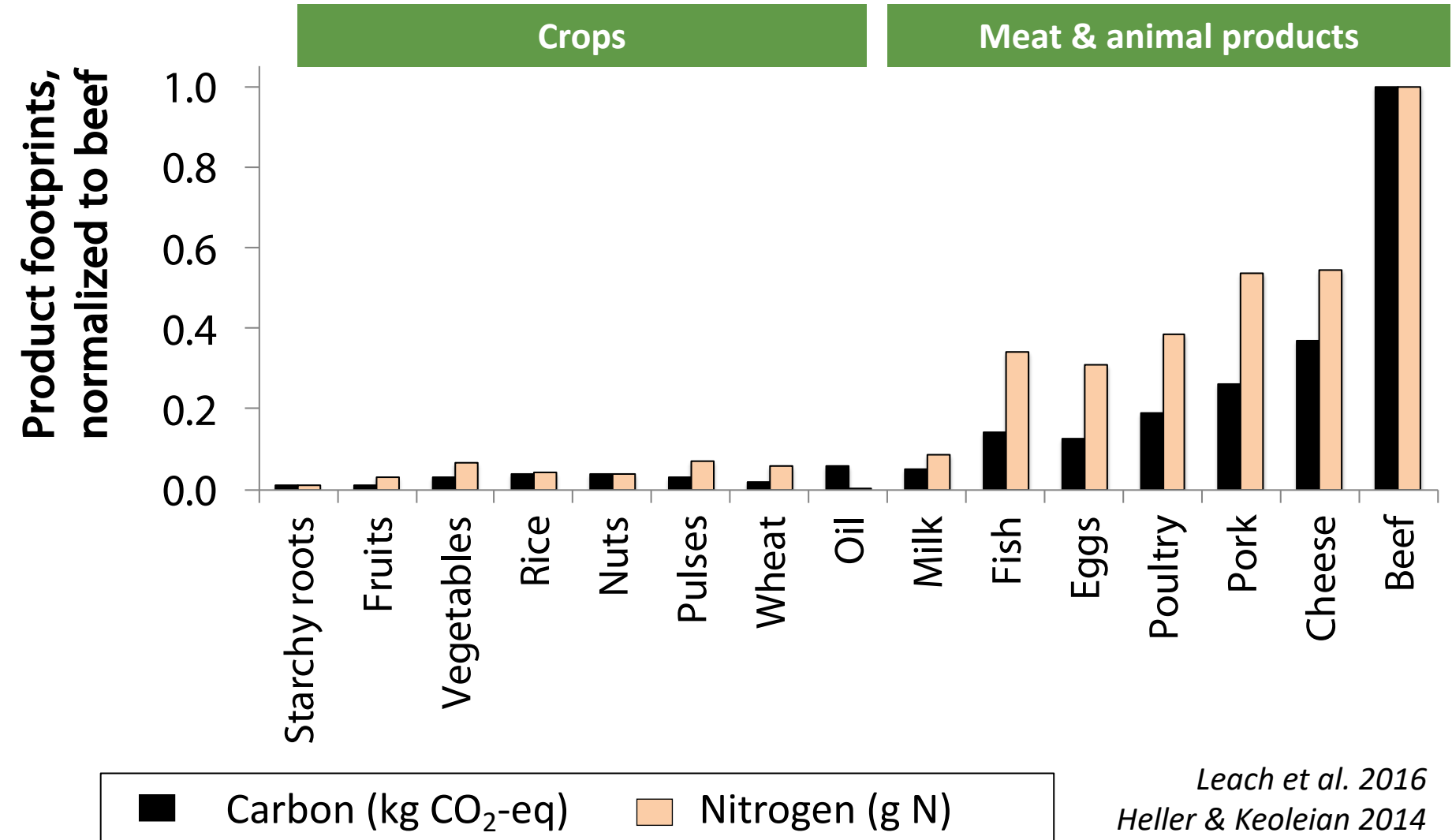
Consistent trends across C & N footprints

Tips for collecting your food data set

- Do you have **other relevant data sets** (e.g., AASHE STARS, Real Food Challenge)?

- **Dining manager**: Have multiple meetings with your dining manager.

- **System bounds**: Food data sets can be large! Scale a smaller data set, such as:

  - % of purchases (if $ is available)

  - A shorter time period (Ideally at least 2 months)

  - Major dining locations

Tips for processing & entering food data set

Calculate food weights using:

- Information in the purchase records

- Online resources, such as: USDA Food Composition Database

- Ask us! We have common conversion factors.

Using the food uploader:

- **Do not change the uploader:** Changing the template can result in upload issues.

- **Correct errors**: Correct any that are noted in SIMAP after upload. A common error is a duplicate text label; all text labels must be unique.

- **Confirm it uploaded**: Compare your total food weight in your data set to the total food weight in the Food Report (Reports tab).

- **Delete data**: If you need to start over, delete your food data set on the Data Mgmt tab.

All-new SIMAP Food Report

Select the food report option on the SIMAP Reports tab

All-new SIMAP Food Report

Food weight
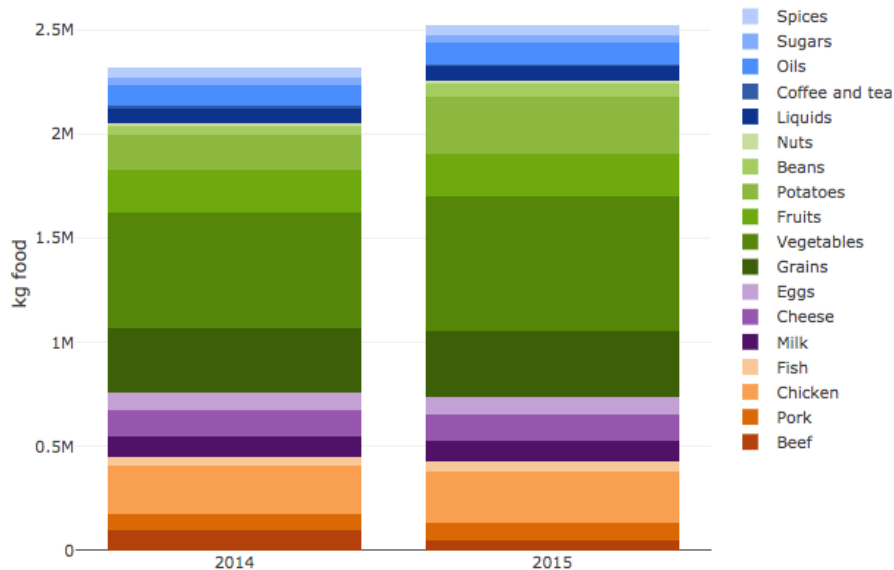
Nitrogen footprint
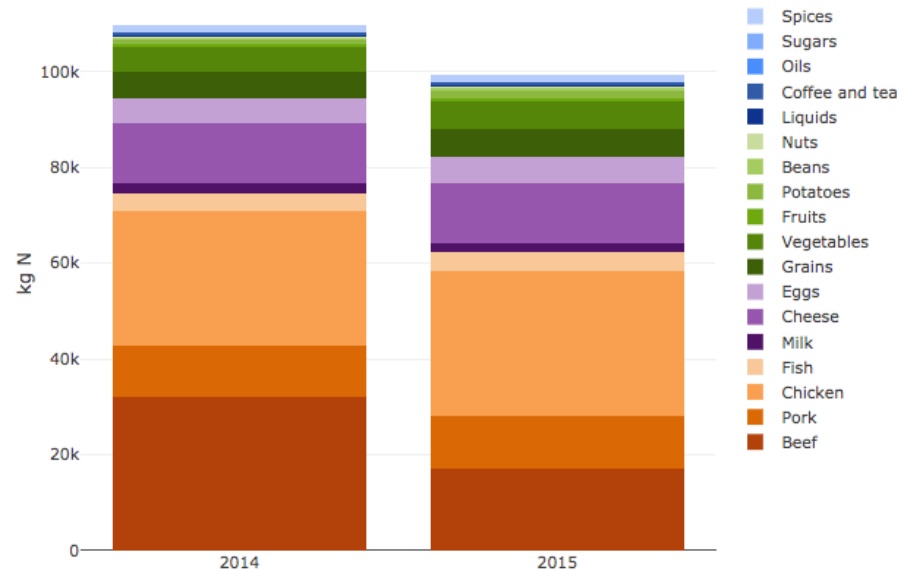
Results shown by category and are grouped by colors:
Meat (orange), animal products (purple),
primary plant products (green), and secondary plant products (blue)

Using the results

Data to back up other food sustainability initiatives:

Carbon & Climate Commitments

Second Nature

stars
a program of aashe

real food challenge

MENUS of CHANGE
The Business of Healthy, Sustainable, Delicious Food Choices

Communication, education, and outreach

- Food labels!

Sustainability Rating
★ ★ ★ ★ ☆

- Nitrogen footprint reduction goal

Food scenarios template

Food Projections & Solutions Template

SIMAP
SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

UNH Sustainability Institute

Updated: 8 June 2018

What this template provides

You can use this template to project your SIMAP carbon and nitrogen footprint results to a projection year. You can then run the following food scenarios: vegetarian meal replacement, up to 4 food category replacements, custom food replacement, and local food replacement, and diverting food waste.

How to use this template

Enter SIMAP data tab

Copy-paste your exported data from SIMAP. This will be used for your baseline C and N footprint and food calculations. See the tab for detailed instructions.

Select projections and scenarios tab

Select how you would like to project your data. There are different selections for non-food data and food data.

Select your scenario input data (e.g., % vegetarian meals, % replacement of food categories).

View projections and scenarios tab

CARBON SCENARIOS: Food choice

Scenarios analyzed within 2014 footprint
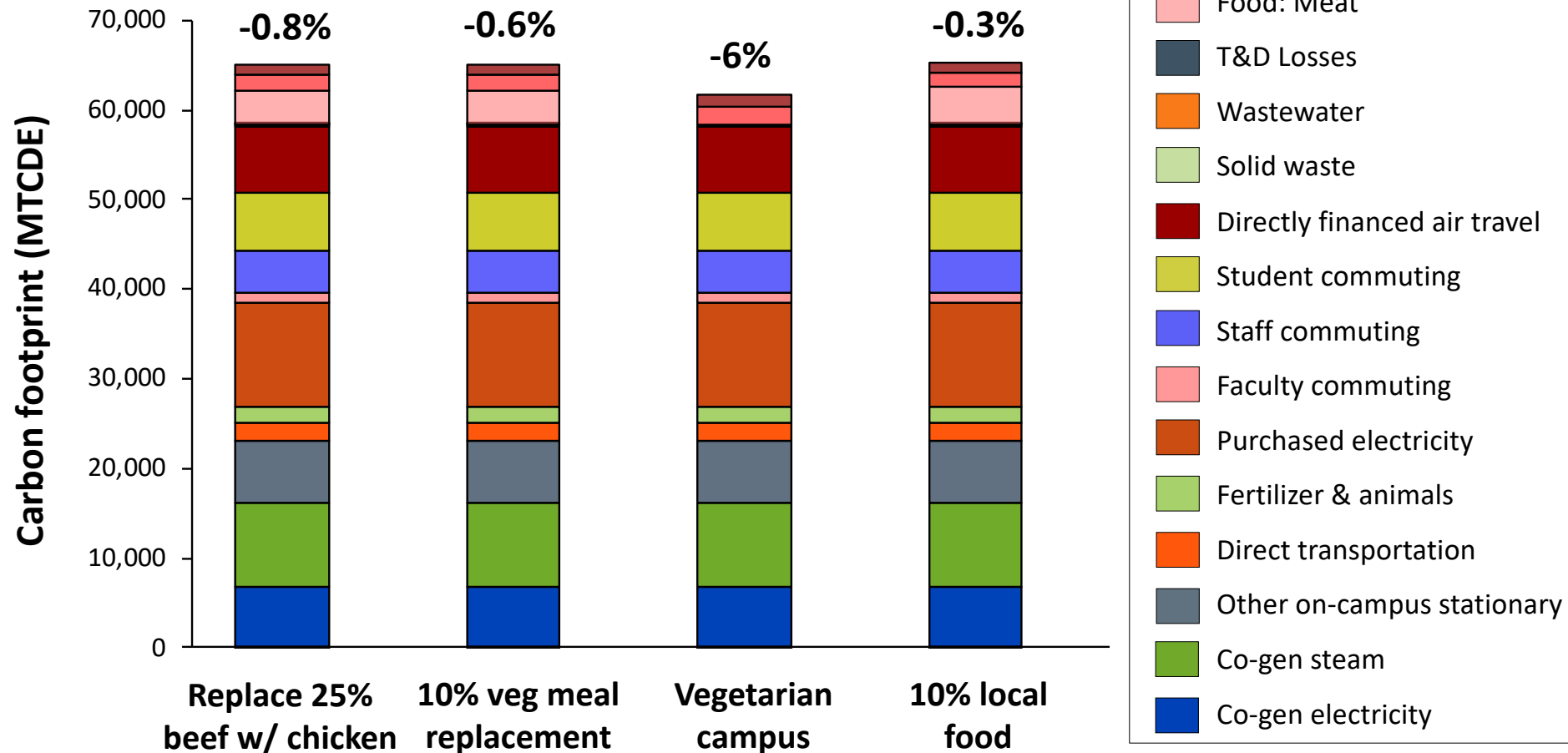
University of Virginia's Nitrogen Action Plan
Elizabeth (Libby) Dukes

UVA's Nitrogen Footprint
Tracking, Reducing, and Goal Setting

Baseline year calculation
(Leach thesis)

1st tracking calculation

3rd and 4th tracking calculations

Reduce reactive nitrogen emissions 25% below 2010 levels by 2025.

2013

2016

2019

...And beyond!

2010

2014

2017 & 2018

2025

UVA N reduction goal set by BOV

2nd tracking calculation

UNIVERSITY OF VIRGINIA NITROGEN ACTION PLAN
V1.0 April 2019

UVA's Nitrogen Action Plan
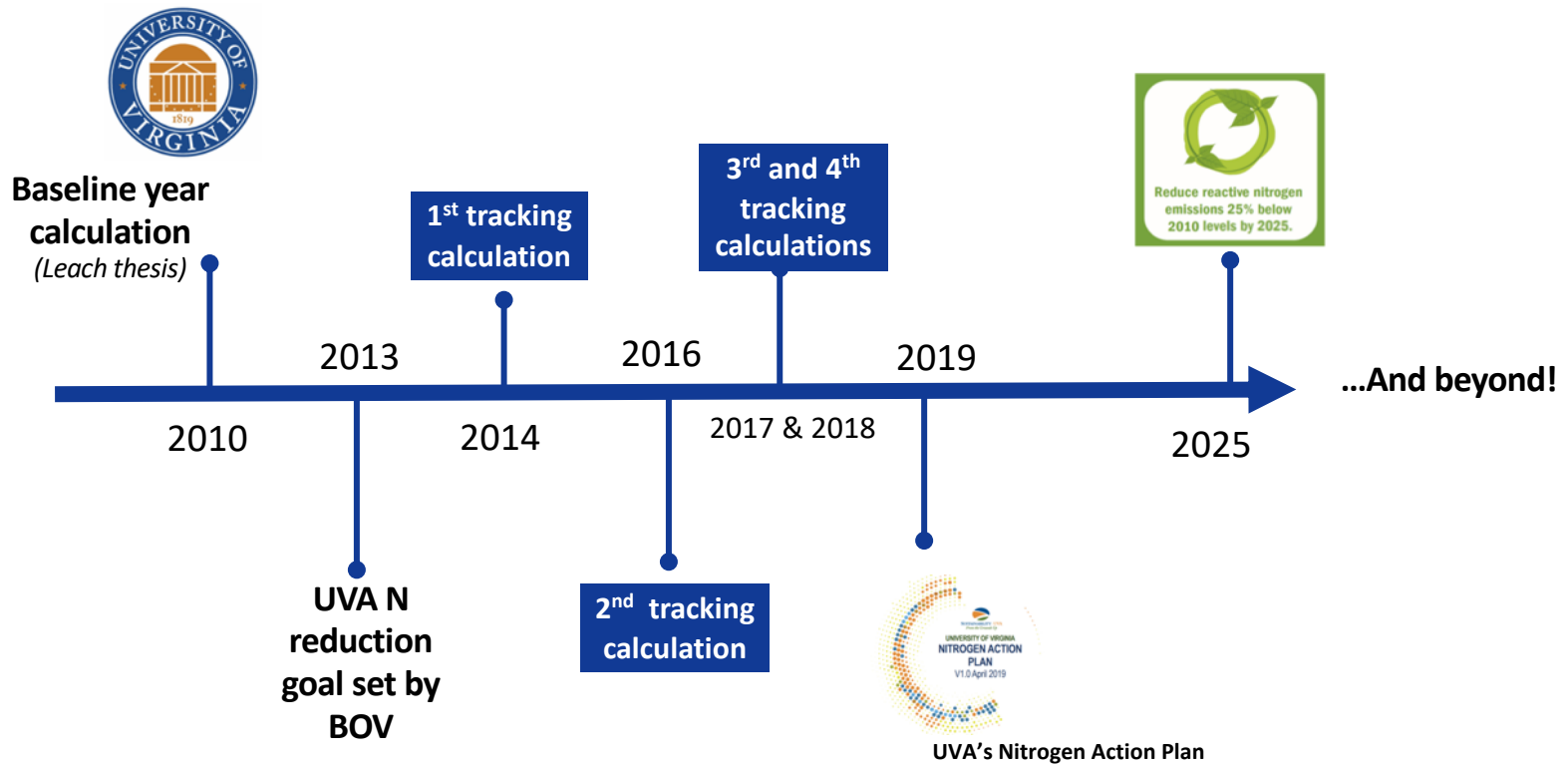
UVA's Current Nitrogen Footprint
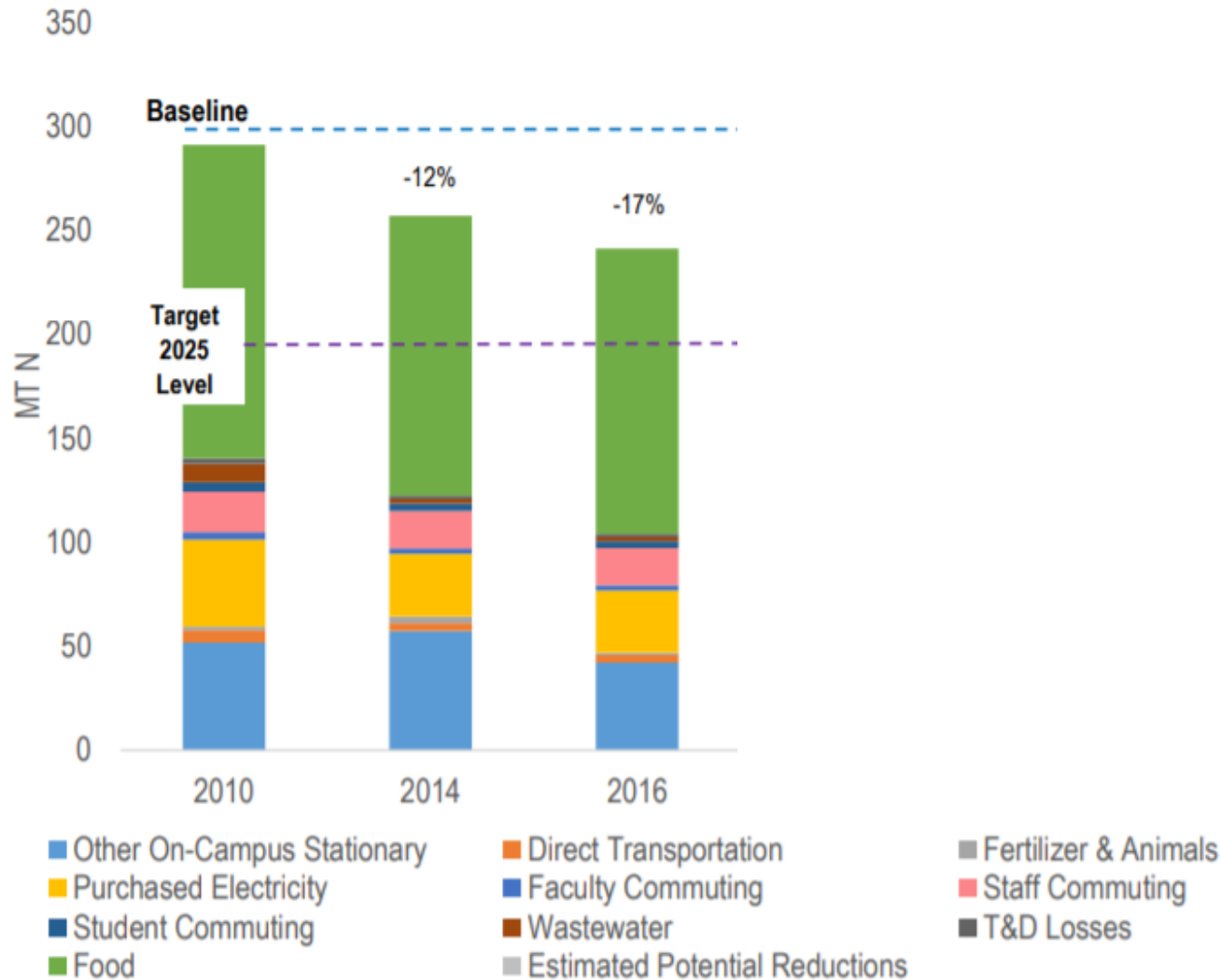
UVA's Nitrogen Footprint in 2025
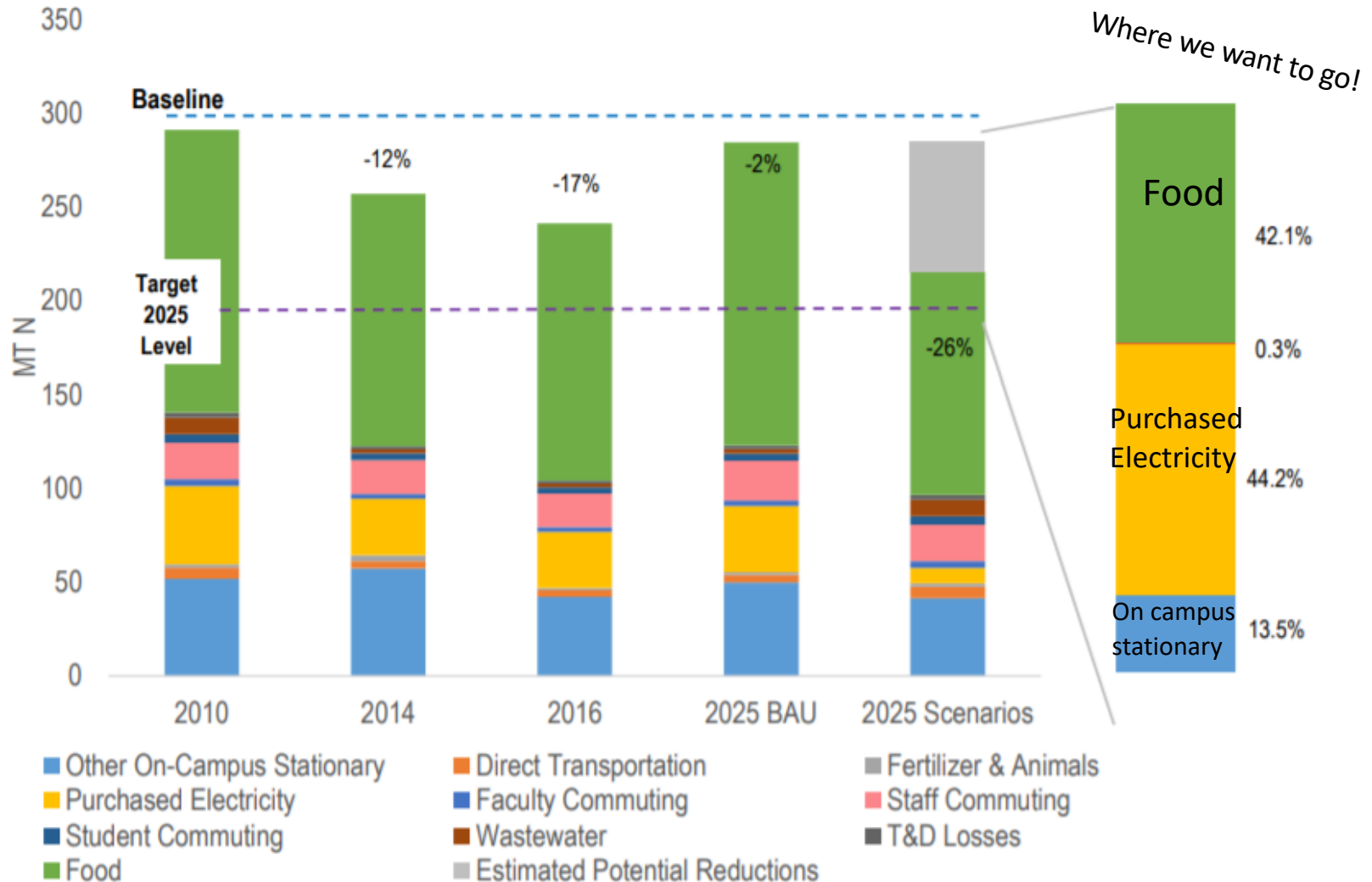
How do we get there? ……

The UVA Nitrogen Action Plan!

Food: Sustainable Dining Initiatives

- **Plant Forward Fridays**
- **Castle dining facility converted from burger place to plant forward menu**
- **No-bull burgers in 3 retail locations and 1 dining hall**
- Blended burgers (80% beef 20% mushrooms) served in all dining halls
- Education on environmental impacts of high-protein diets

Food: Plant Forward Fridays

U.Va. Dining Launches New Plant-Forward Program

U.Va. Dining responds to students desires for healthier and more sustainable dining options with new programming

By Ashley Ewing | 02/06/2019

Projected 4% N footprint reduction

Food: The Castle

NEWS & TRENDS > COLLEGES & UNIVERSITIES

Sustainability is king at UVA's new Castle

A fresh menu, a chilled-out atmosphere and a 3 Star Green Restaurant certification are crown jewels in a move that took the Castle from late-night burger joint to a fortress of modern mindful eating.

Tara Fitzpatrick | Jun 27, 2019

Projected 1% N footprint reduction

Food: No-bull burgers

No-bull veggie burgers served in one residential dining hall and three retail locations!

Projected 0.5% N footprint reduction

Next Steps....

- Implement strategies in the Nitrogen (N) Action Plan

- Reach our 25% N footprint reduction goal by 2025

- Continue making plans to reduce the environmental impact of our university!

Special thanks to....

- University of Virginia Dining Services:
  - Brooke Kinsey and Matt Smythe
- University of Virginia Health System Dining
  - Corey DiLuciano
- University of Virginia Facilities Management
- University of Virginia Office for Sustainability
  - Andrea Trimble and Andrew Pettit
- University of Virginia Nitrogen Working Group
  - Rachel McGill, Alicia Zheng, and Jim Galloway

Summary

Why food matters

- Modern agriculture provides us with tremendous benefits

- … But we have to address many challenges to ensure that it is sustainable and just

How SIMAP can help

- Carbon and nitrogen footprint of your food purchases

- Outreach & education

- Track reductions over time

SIMAP
SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

www.unhsimap.org

Questions?

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