#DairyNourishesLife

A World Well-Nourished:

Dairy's Role in Health and Sustainable Food Systems

February 7, 2019

NDC
NATIONAL DAIRY COUNCIL™

The U.S. Dairy Stewardship Commitment

NDC
NATIONAL DAIRY COUNCIL™

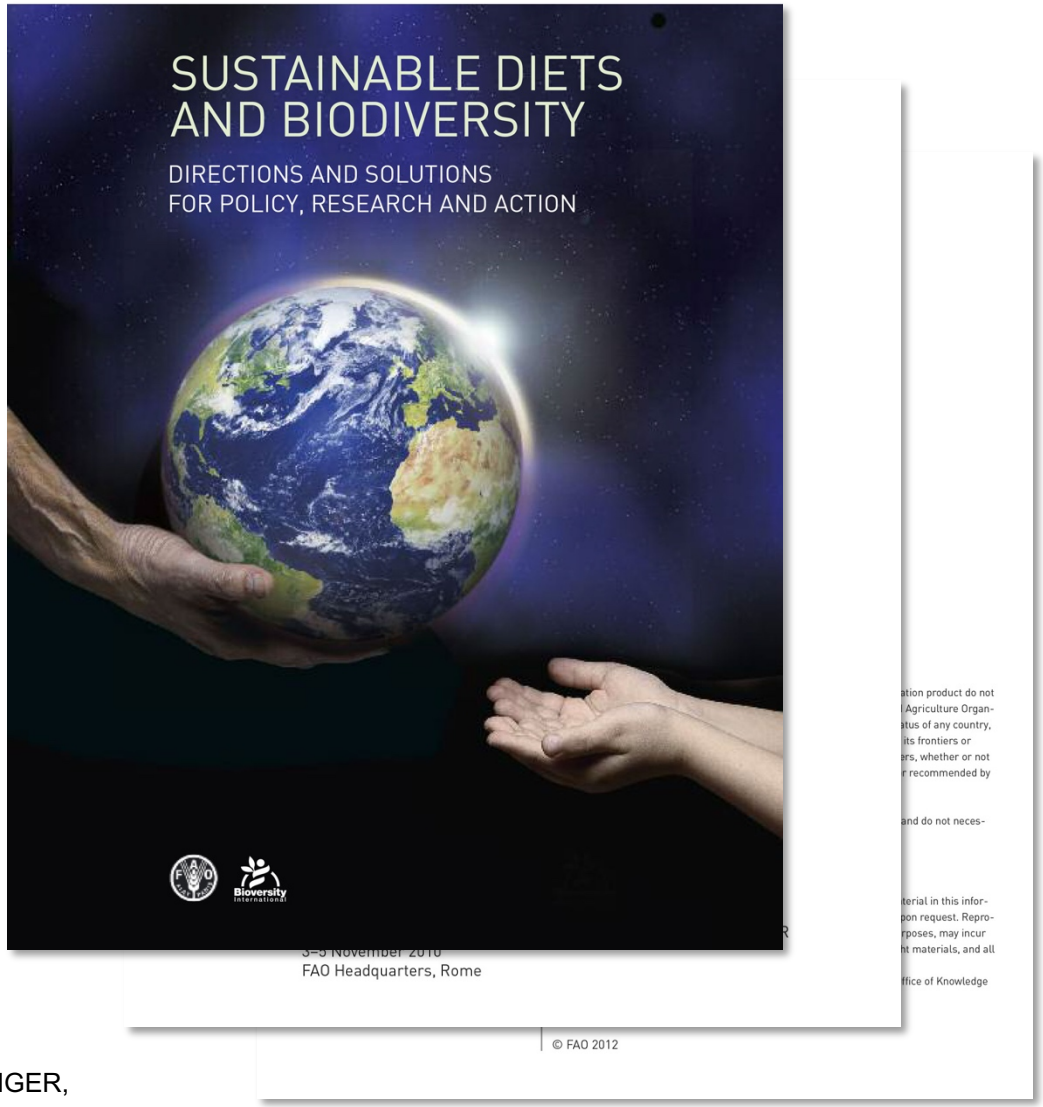
Bringing to life the dairy community's shared vision of a healthy, happy, sustainable world, with science as our foundation

Global Spotlight on Nutrition and Sustainability

UNITED NATIONS DECADE OF
ACTION ON NUTRITION
2016-2025

FAO Definition of Sustainable Diets

- Low environmental impacts
- Contribute to food and nutrition security & to healthy life
- Protective and respectful of biodiversity & ecosystems
- Culturally acceptable
- Accessible
- Economically fair & affordable
- Nutritionally adequate
- Safe & healthy
- Optimize natural and human resources



Proceedings of the International Scientific Symposium, BIODIVERSITY AND SUSTAINABLE DIETS UNITED AGAINST HUNGER, 3–5 November 2010, FAO Headquarters, Rome

People are Asking…

Is this good for my body?

Is this good for the planet?

Is this good for the animals?

Today's Presenters:

Good for the Planet

Frank M. Mitloehner, PhD
Professor and Air Quality
Extension Specialist
Department of Animal
Science, UC Davis
@GHGguru

Good for the Animals

Juan Tricarico, PhD
Vice President
Sustainability Research
National Dairy Council

Good for the Body

Katie Brown, EdD RDN
Senior Vice President
Sustainable Nutrition
National Dairy Council
@KatieBrownRDN

In Only 70 Years, We've Reduced our Impact…

90% less land

65% less water

76% less manure

63% less GHG

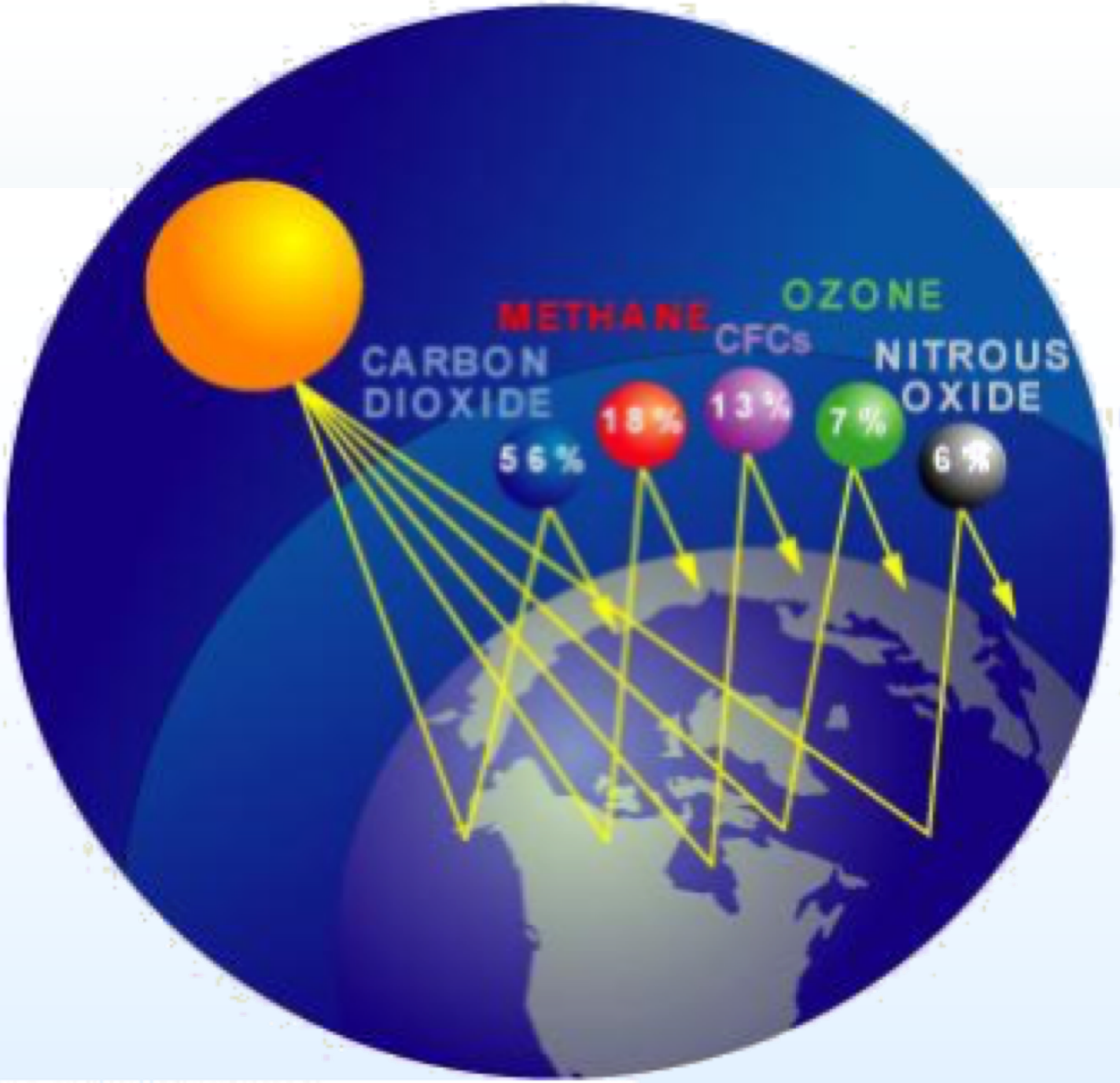
The dairy community has a voluntary commitment to further reduce GHG 25% by 2020

US Dairy Stewardship Commitment

Capper J. Cady A. Bauman D. 2009. The environmental impact of dairy production; 1944 compared with 2007. Journal of Animal Science. 87:2160-2167

Good for the Planet

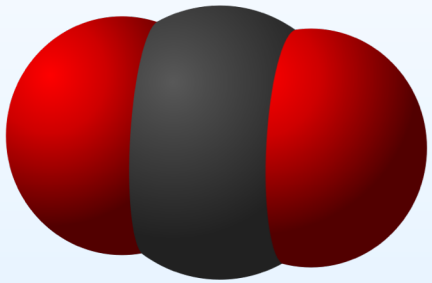
Frank M. Mitloehner, PhD
Professor Dept Animal Science UC Davis
@GHGguru


METHANE
OZONE
CFCs
CARBON DIOXIDE
NITROUS OXIDE
56%
18%
13%
7%
6%

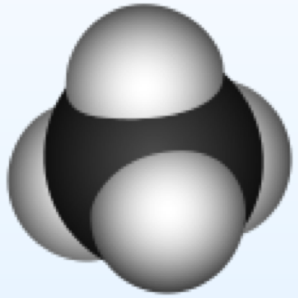
GHG & GWP

Global Warming Potential (GWP) of Main GHG

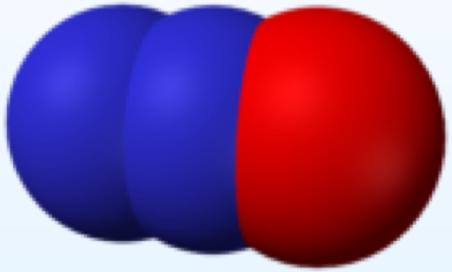
- Carbon Dioxide, CO_2 1
- Methane, CH_4 28
- Nitrous Oxide, N_2O 298



CO2 – Carbon Dioxide

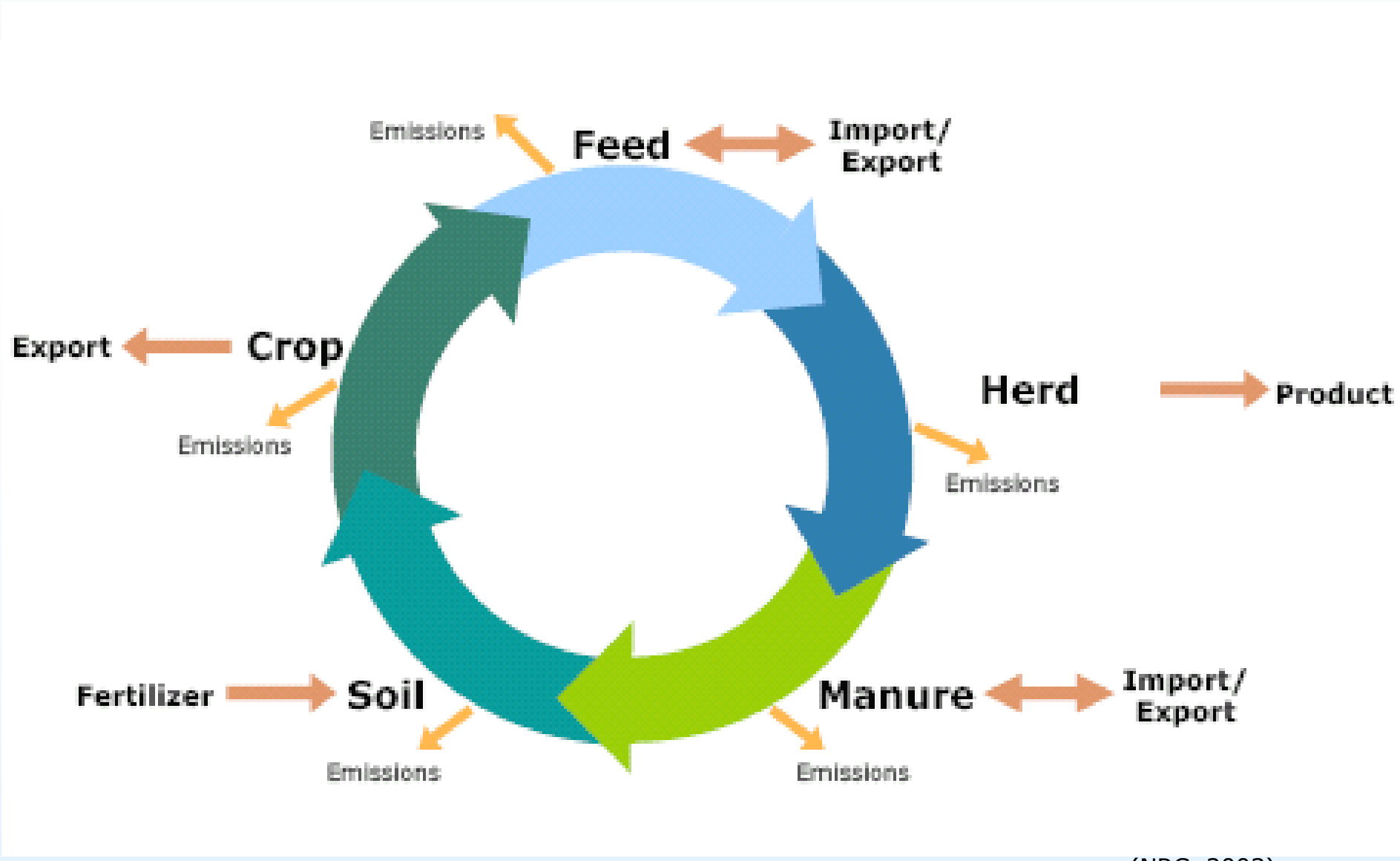


CH4 – Methane



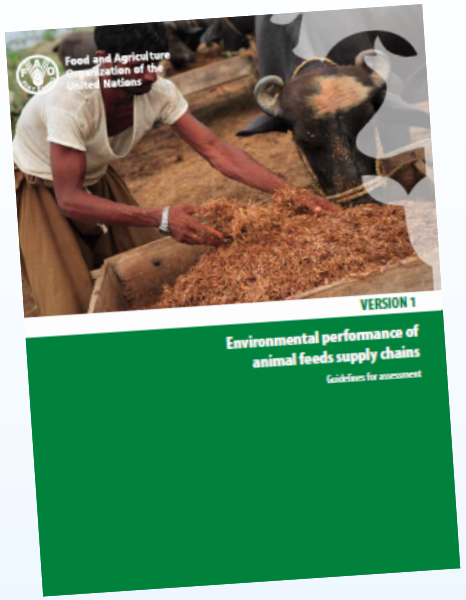
N2O – Nitrous Oxide

Life Cycle Assessment



(NRC, 2003)

Livestock Environmental Assessment and Performance Partnership (LEAP)



- Internationally agreed sector-level methodologies and guidance to allow
  - transparent,
  - robust,
  - and fair measurement of the environmental performance of livestock supply chains

- FAO / LEAP LCA Guidelines officially released

Farm to Table

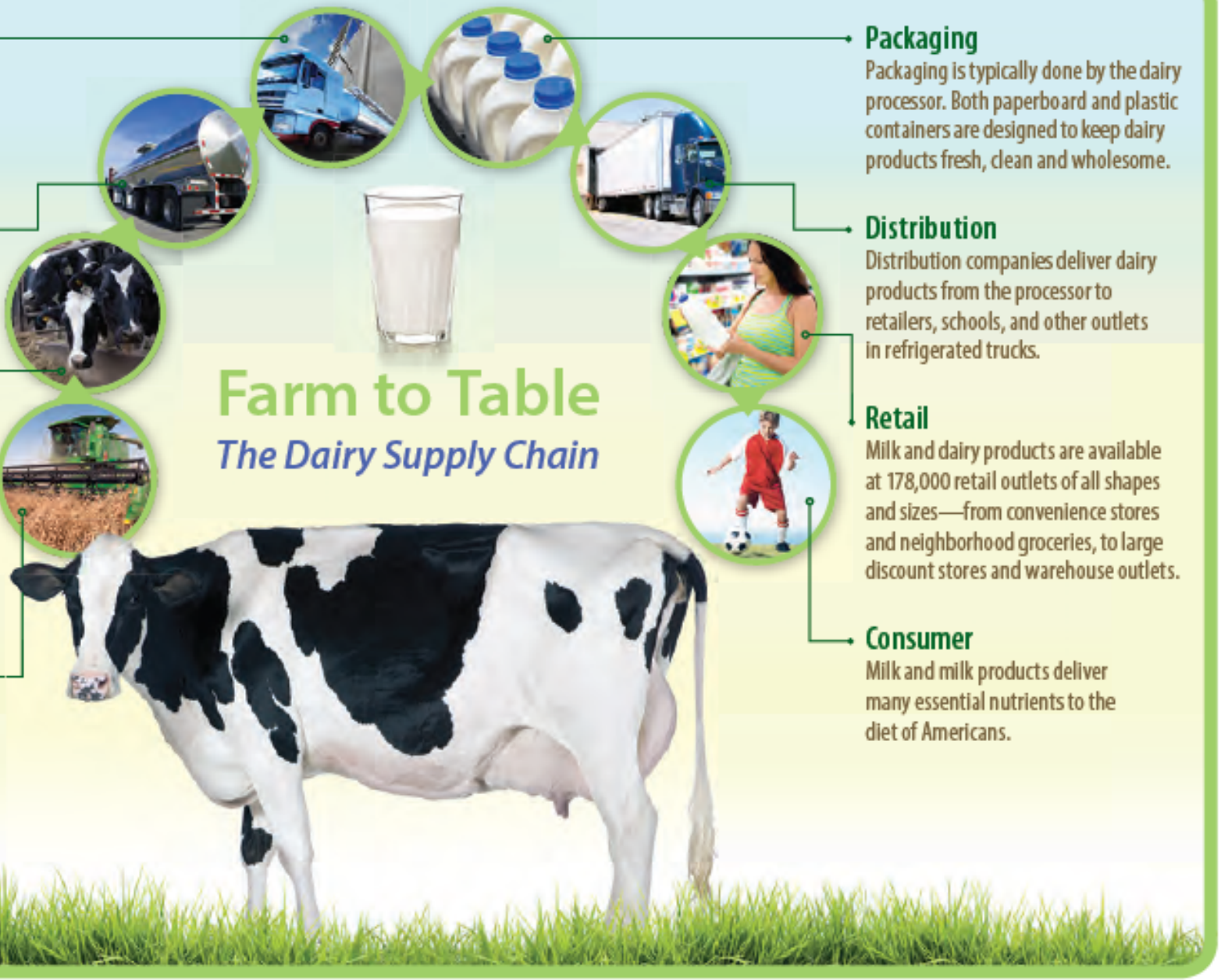
The Dairy Supply Chain

Processing
There are more than 1,000 U.S. processing plants that turn milk into cheese, yogurt, ice cream, powdered milk and other products.

Milk Transport
Milk is transported from farm to processing company in insulated tanker trucks. The average truck carries 5800 gallons of milk and travels approximately 500 miles round trip.

Milk production
Dairy cows are housed, fed and milked on dairy farms across the country. On average, a cow in the United States gave about 21,345 pounds of milk in 2012.

Production of feed for cows
The dairy supply chain begins with growing crops such as corn, alfalfa hay and soybeans to feed dairy cows. About 35 percent of feed is grown on the farm by dairy farmers; the rest is purchased from other farmers.



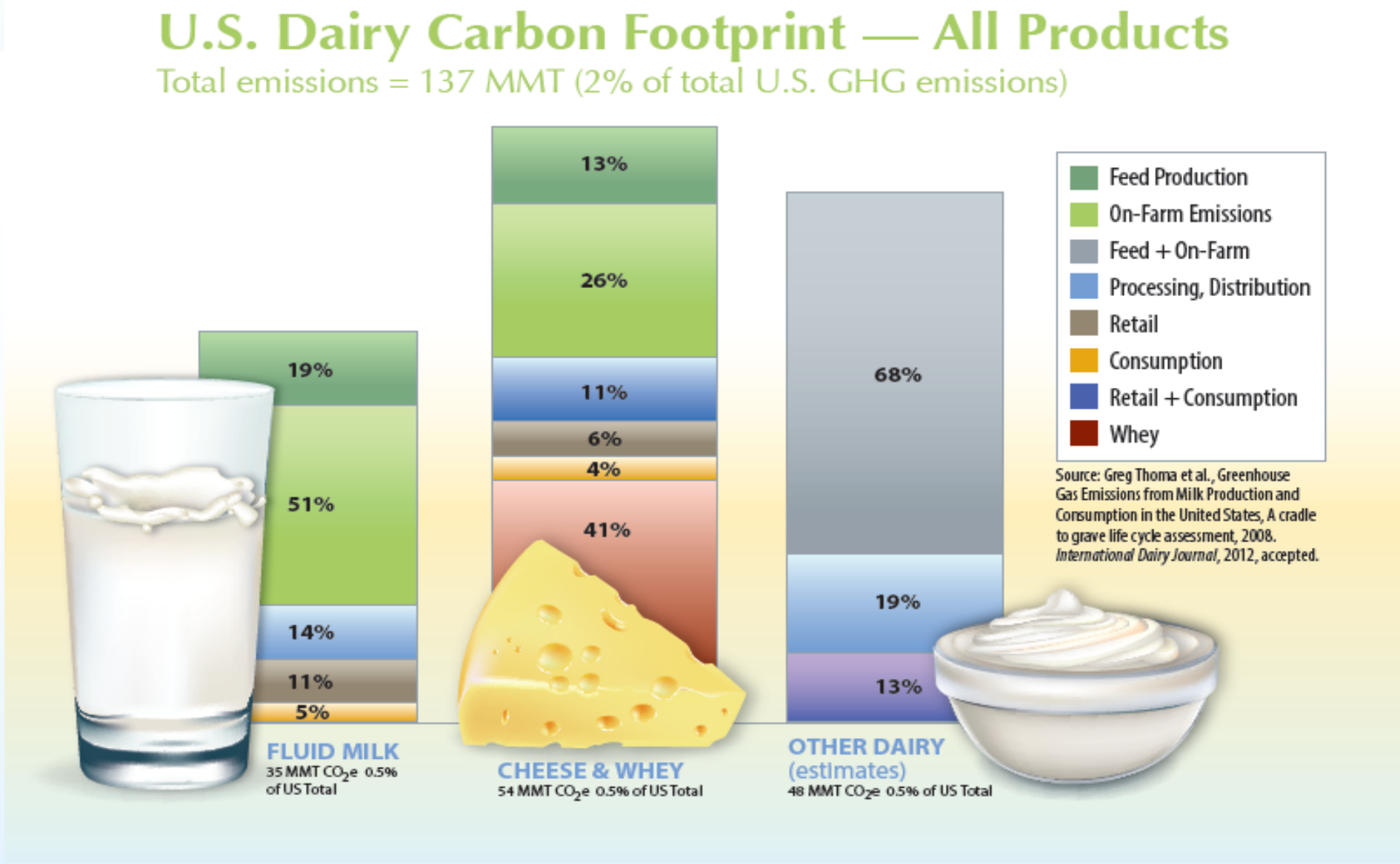
Packaging
Packaging is typically done by the dairy processor. Both paperboard and plastic containers are designed to keep dairy products fresh, clean and wholesome.

Distribution
Distribution companies deliver dairy products from the processor to retailers, schools, and other outlets in refrigerated trucks.

Retail
Milk and dairy products are available at 178,000 retail outlets of all shapes and sizes—from convenience stores and neighborhood groceries, to large discount stores and warehouse outlets.

Consumer
Milk and milk products deliver many essential nutrients to the diet of Americans.

Dairy is ~2% of Total US Greenhouse Gas Emissions

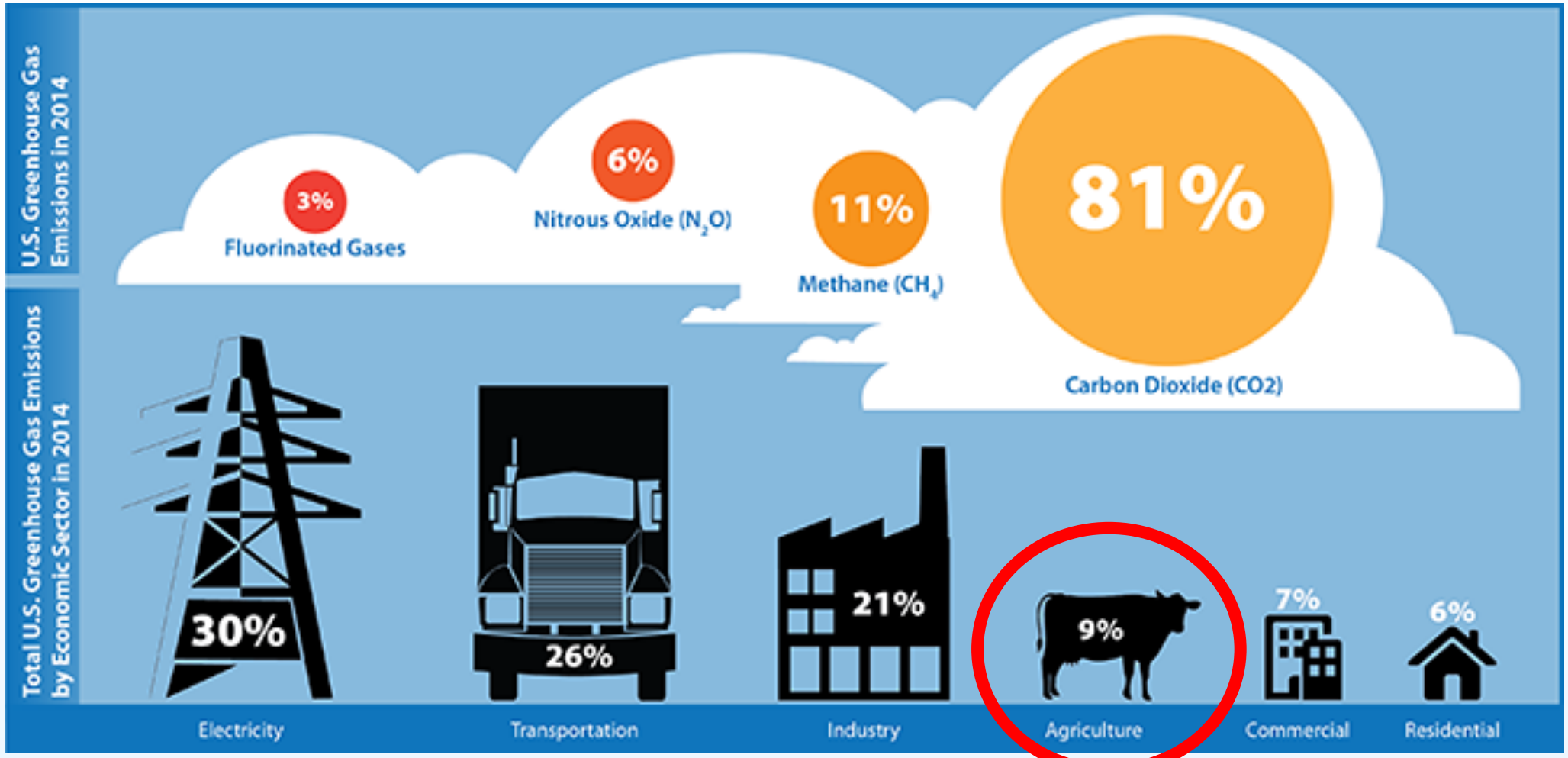


Source: G. Thoma et al. Volume 31, Supplement 1, Pages S1-S100 (April 2013)

Key finding: Dairy uses ~5.1% of U.S. water withdrawal

Henderson, A., Asselin, A., and Heller, M., et al., U.S. Fluid Milk Comprehensive LCA. University of Michigan &University of Arkansas, 2012.

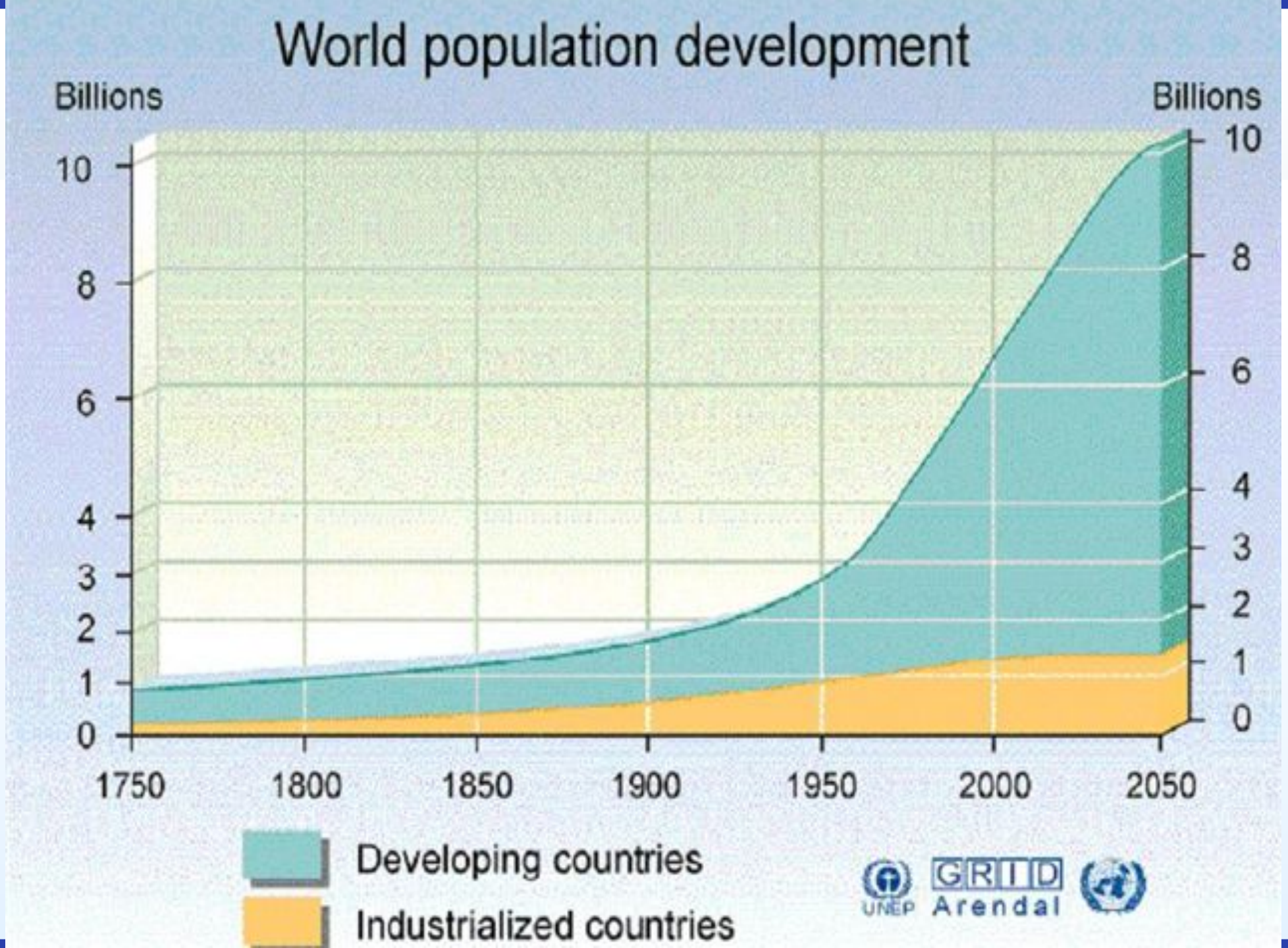
National-Level U.S. GHG Inventory



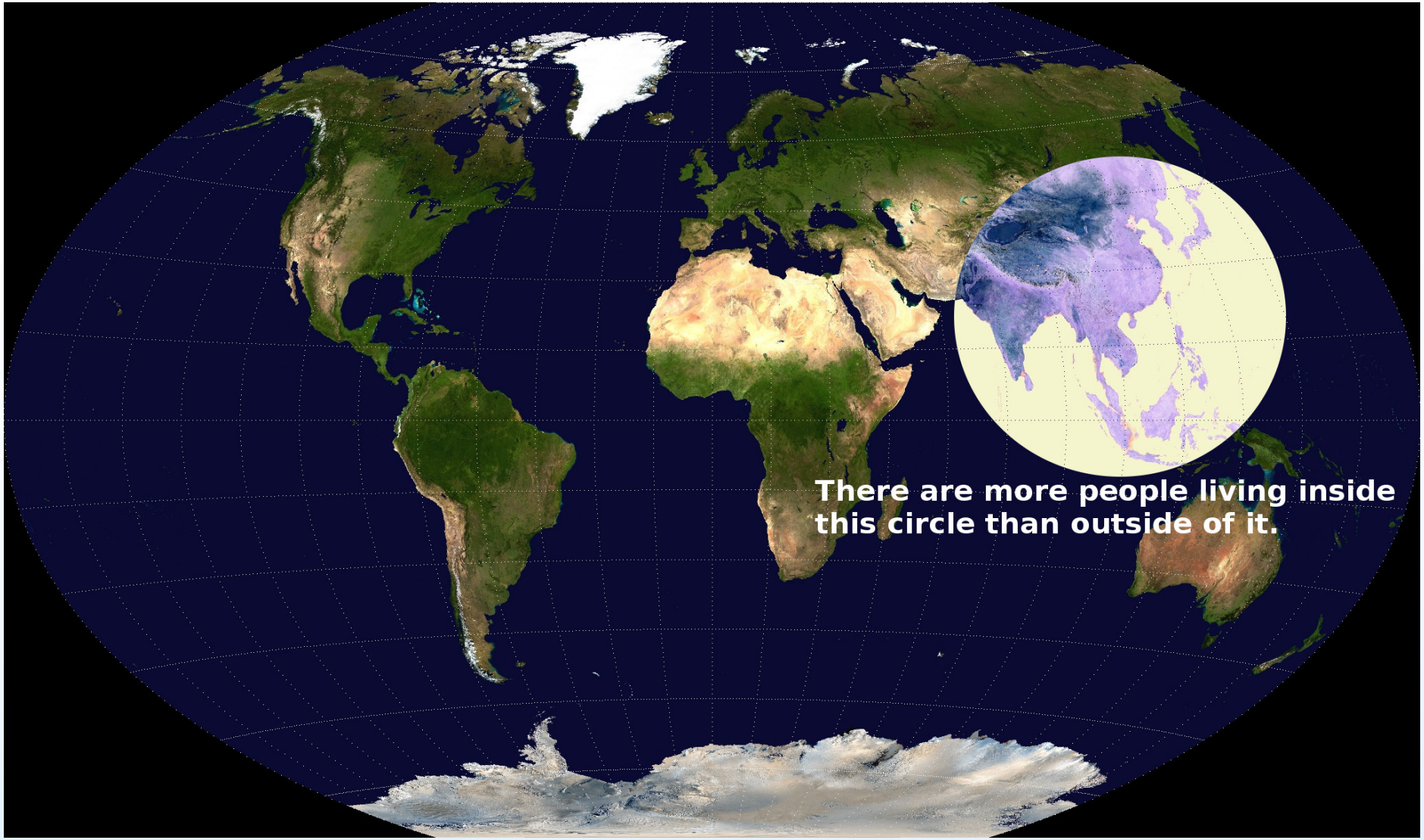
Source: EPA (2016)

Emissions from ALL (plant and animal) agriculture practices; excluding land-use change and fuel combustion

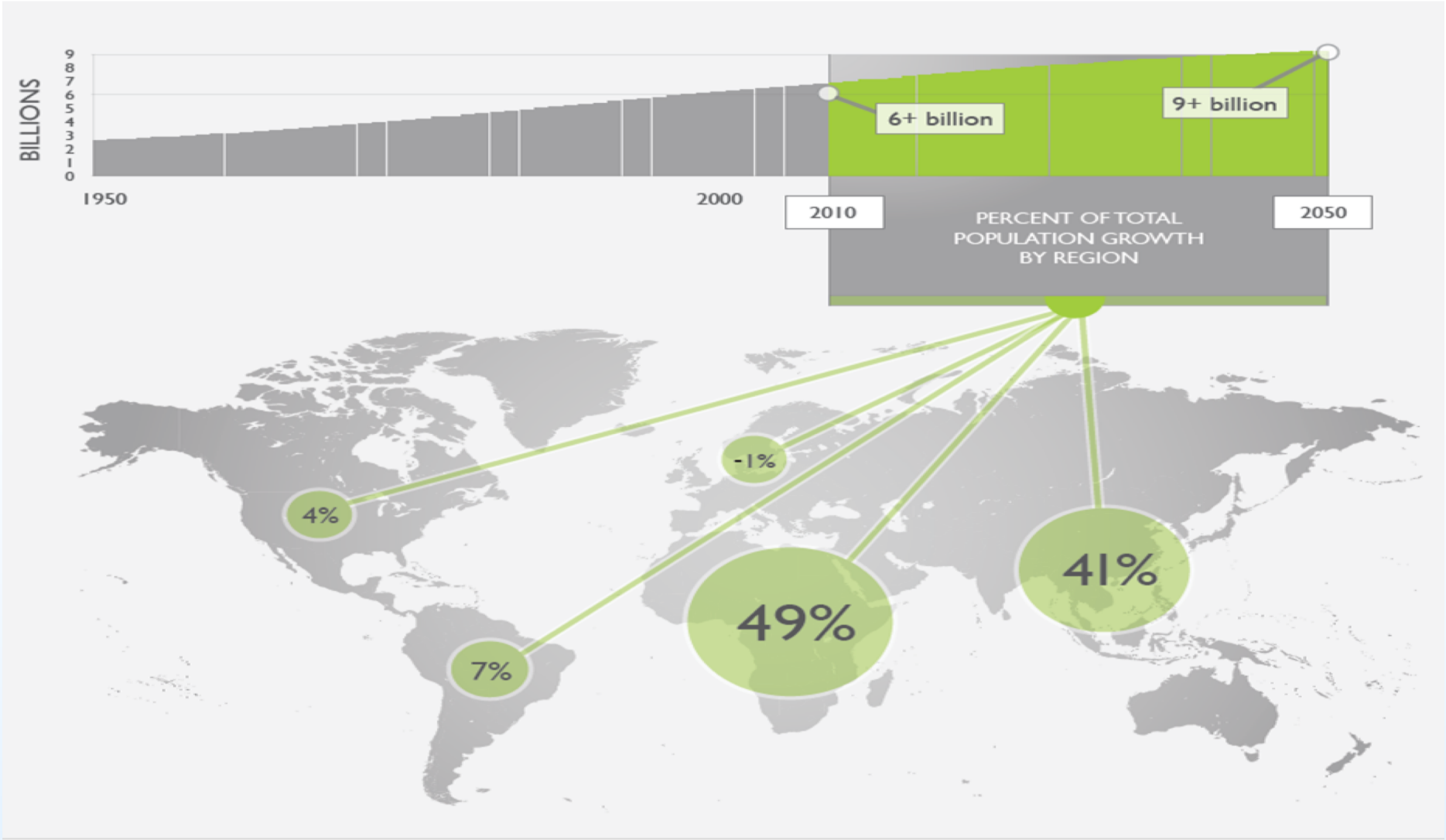
National Geographic


World population development
Billions
Billions
10
8
6
4
3
2
1
0
1750
1800
1850
1900
1950
2000
2050
Developing countries
Industrialized countries
UNEP
GRID
Arendal

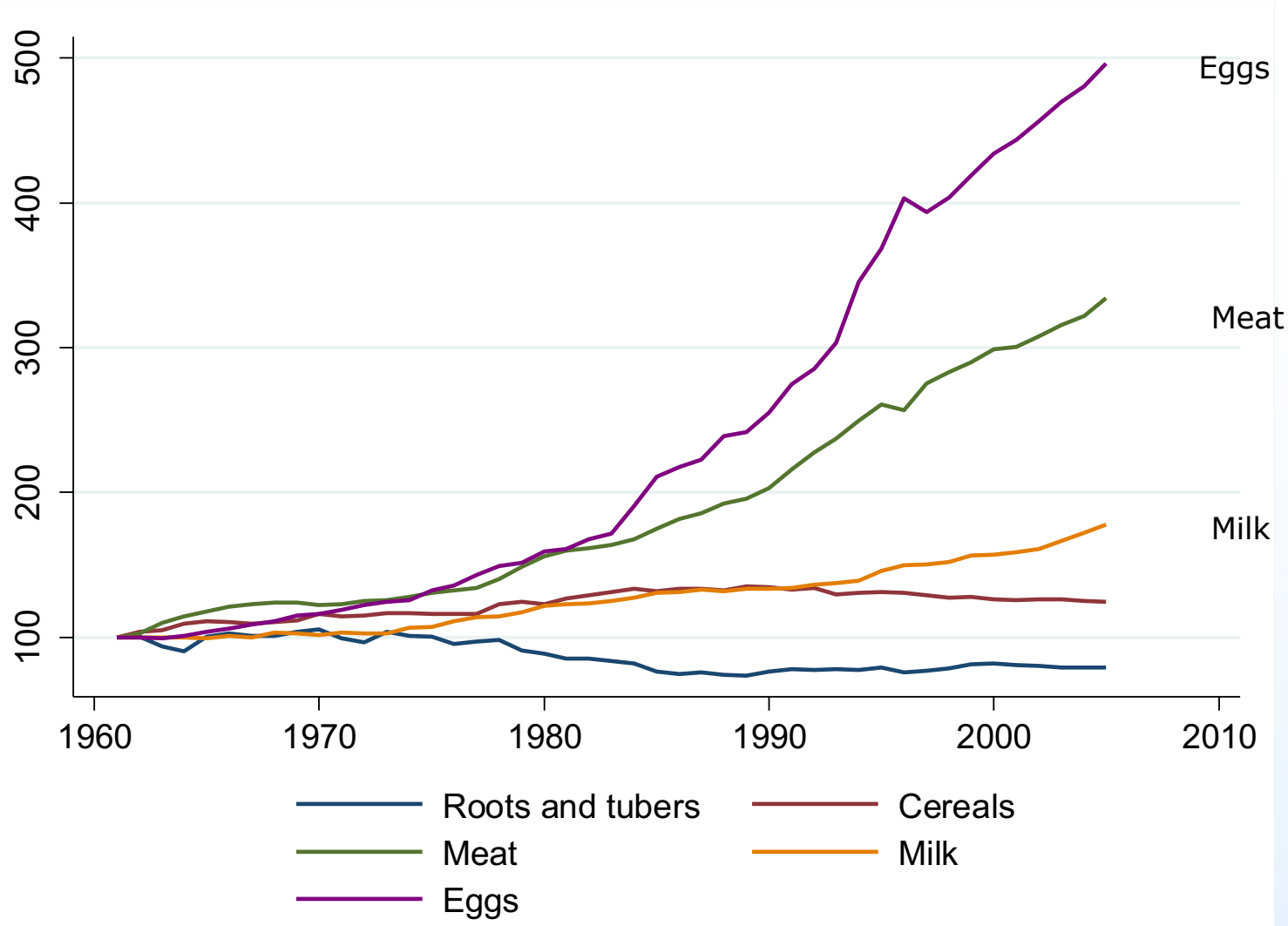
4.5 Billion + population of USA in 10 years



Today and Tomorrow's Markets

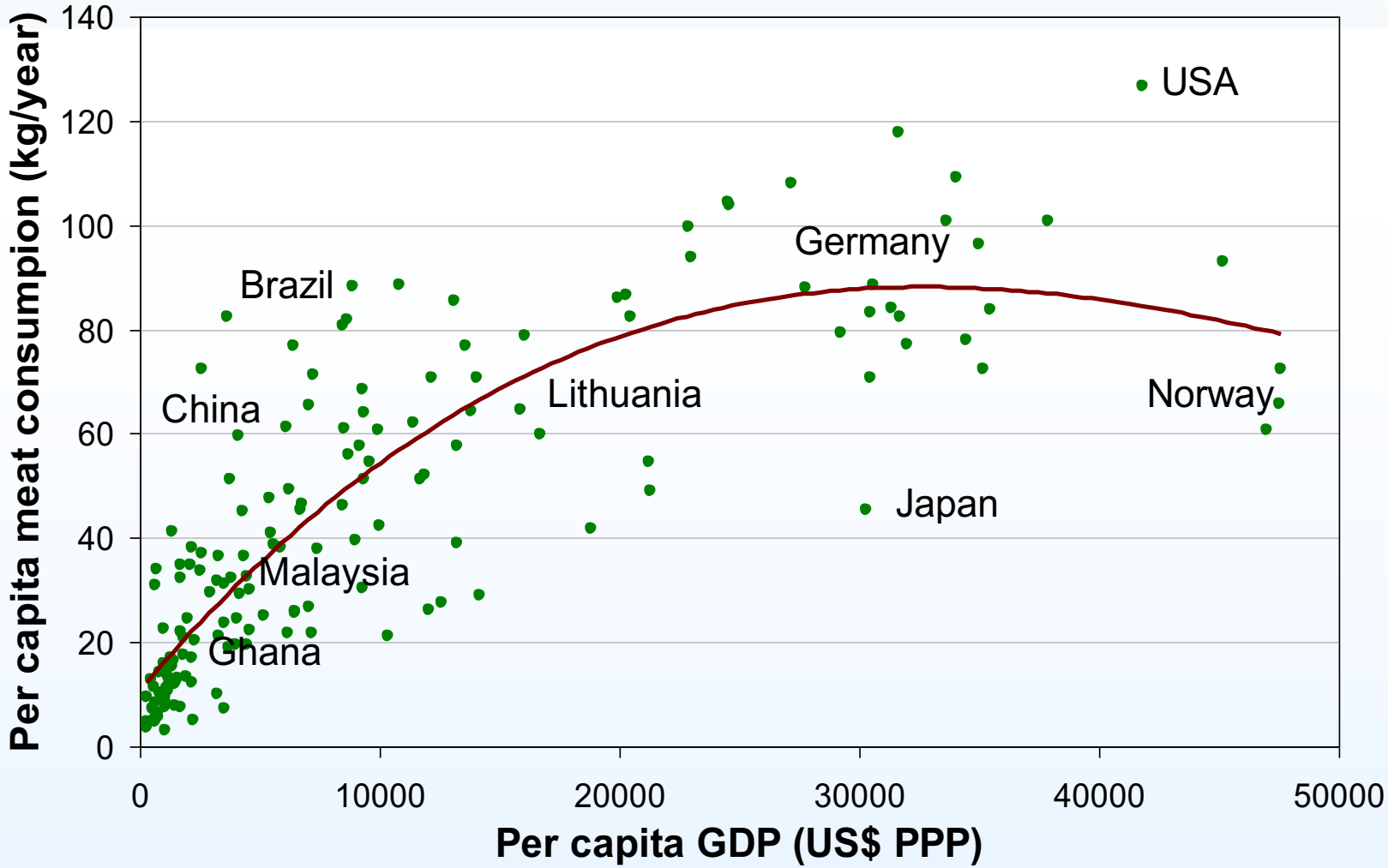


Consumption is growing rapidly in developing countries



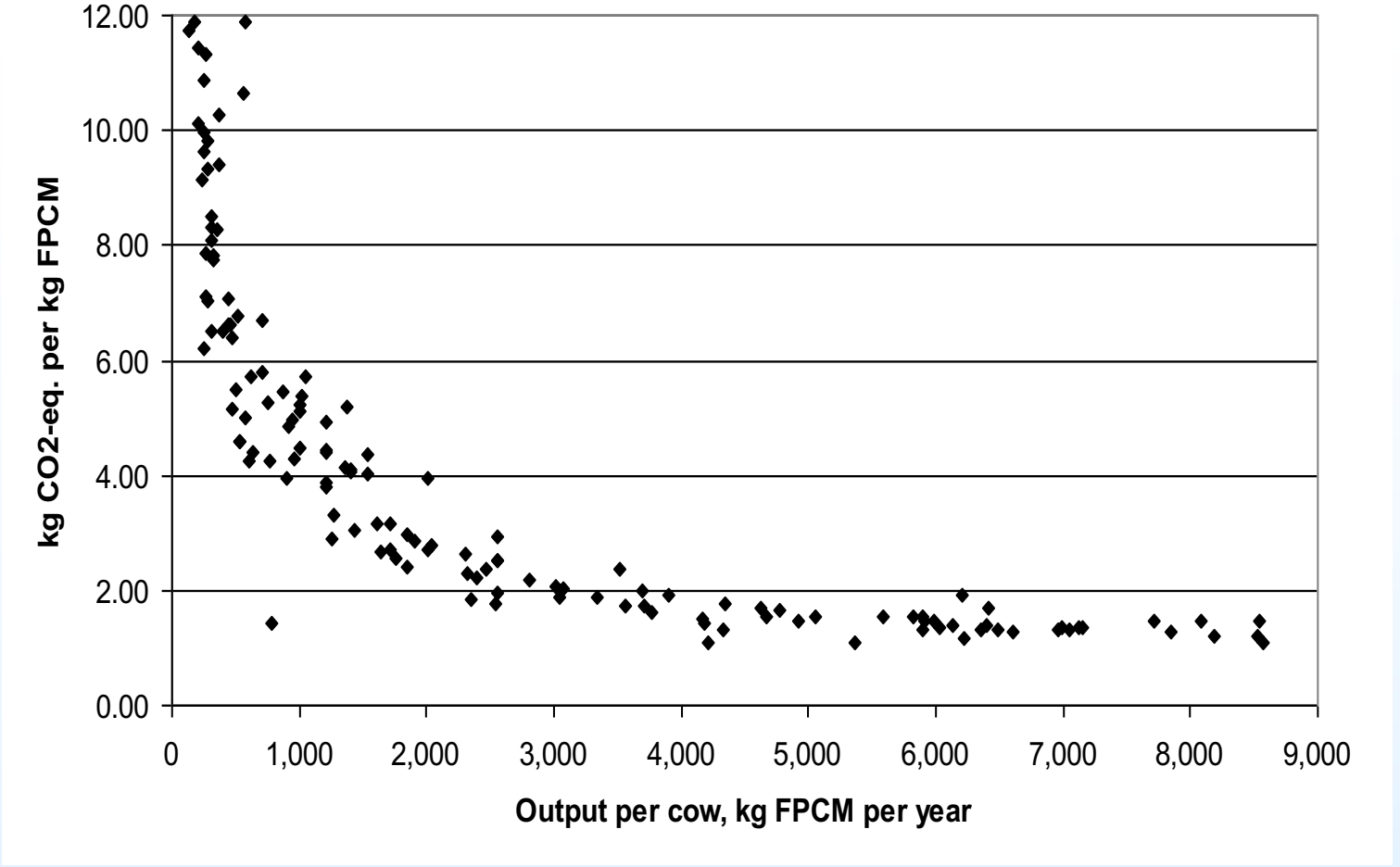
Per caput consumption of major food items in developing countries – kg per caput per year (index numbers 1961=100)

... driven by incomes ...

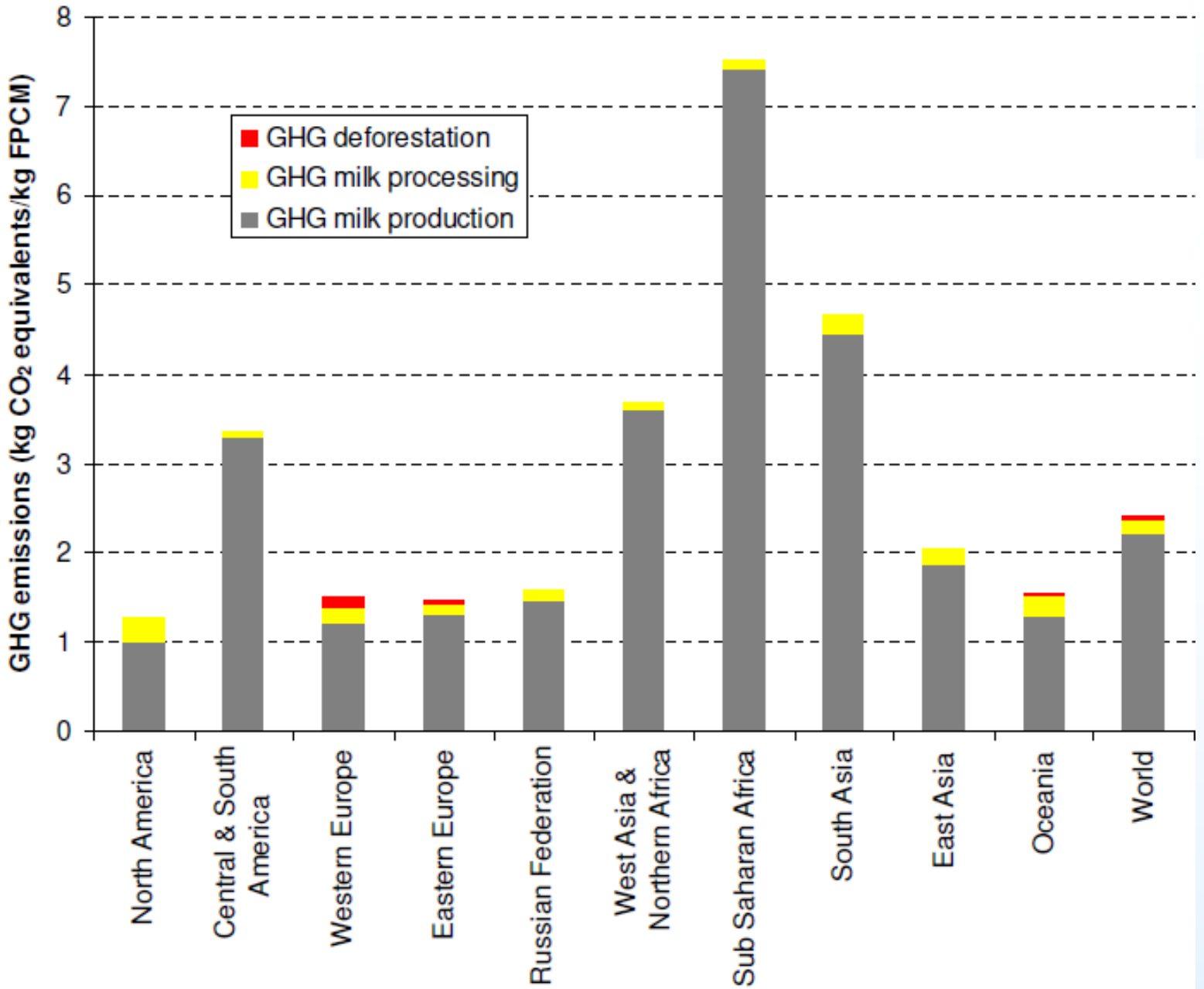


Per capita GDP and meat consumption by country, FAO, 2005.

Relationship between total greenhouse gas emissions and milk output per cow

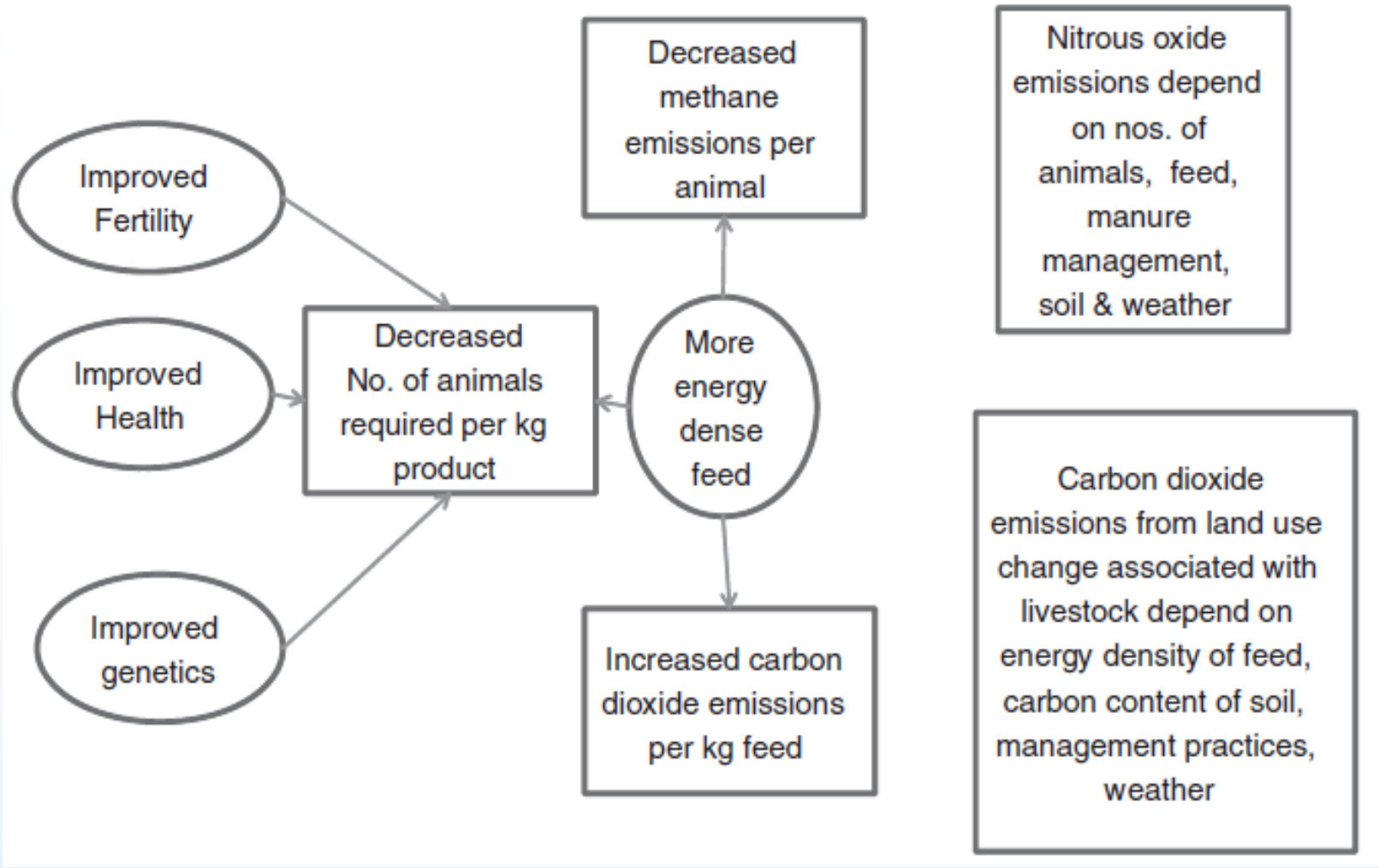


H. Steinfeld, 2015


GHG deforestation
GHG milk processing
GHG milk production
GHG emissions (kg CO_2 equivalents/kg FPCM)
0
1
2
3
4
5
6
7
8
North America
Central & South America
Western Europe
Eastern Europe
Russian Federation
West Asia & Northern Africa
Sub Saharan Africa
South Asia
East Asia
Oceania
World

FAO (2010)

Mitigation: interventions to improve productivity



Gill et al. (2010)

US Dairy Trends

- In 1950, there were 25 million dairy cows in the US, vs 9 million today
- With 16 million fewer cows (1950 vs 2018), milk production nationally has increased 60 percent
- The carbon footprint of a glass of milk is 2/3 smaller today than it was 70 years ago

Methane Enteric Emission Research

Manure Methane Benchmarking Research

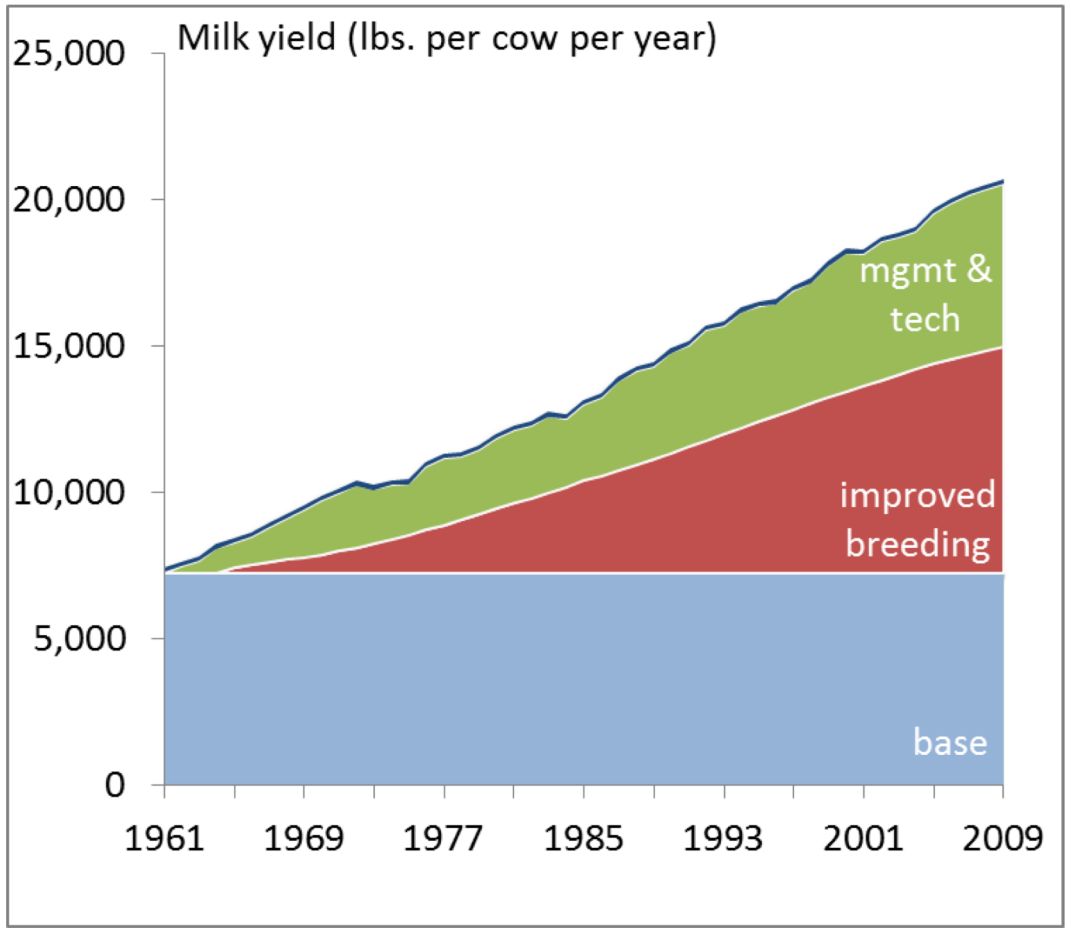

THE · UNIVERSITY · OF · CALIFORNIA ·
A
LET THERE BE
LIGHT
1868

Good for Animals

Juan Tricarico, PhD
VP Sustainability Research, NDC

Innovation is the Historical Driver of U.S. Productivity and Reduced Environmental Impact

U.S. yield increase: 1961-2009



- Milk production per cow in the U.S. has increased 280 lbs. per year since 1961
- The increase was driven by *innovation* (dairy cow breeding, housing, management, feeding)
- American dairy farmers improved milk (food) production while using less natural resources thus protecting the environment

USDA-NASS, http://www.nass.usda.gov/Data_and_Statistics/Quick_Stats_1.0/index.asp, Last accessed 25OCT10
USDA-ARS-AIPL, http://aipl.arsusda.gov/eval/summary/trend.cfm, Last accessed 26,OCT10

FARM Animal Care Program

Farmers

Assuring

Responsible

Management

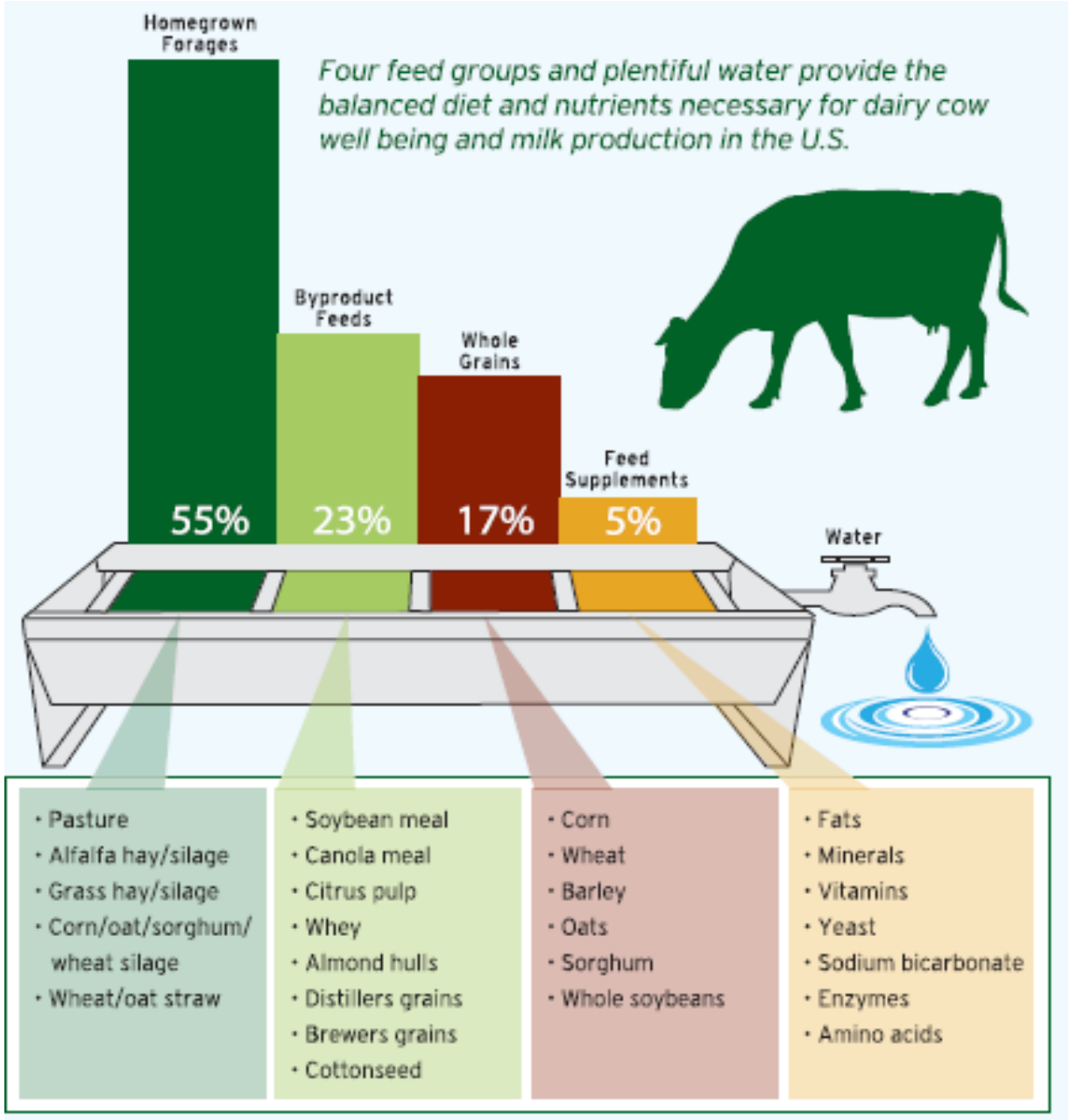
~98% of U.S. milk comes from farms participating in the FARM Program

Dairy Cows Contribute to the Nutrient Cycle of the Food System

Cows Have Specific Nutrient Needs Based on Life Stage

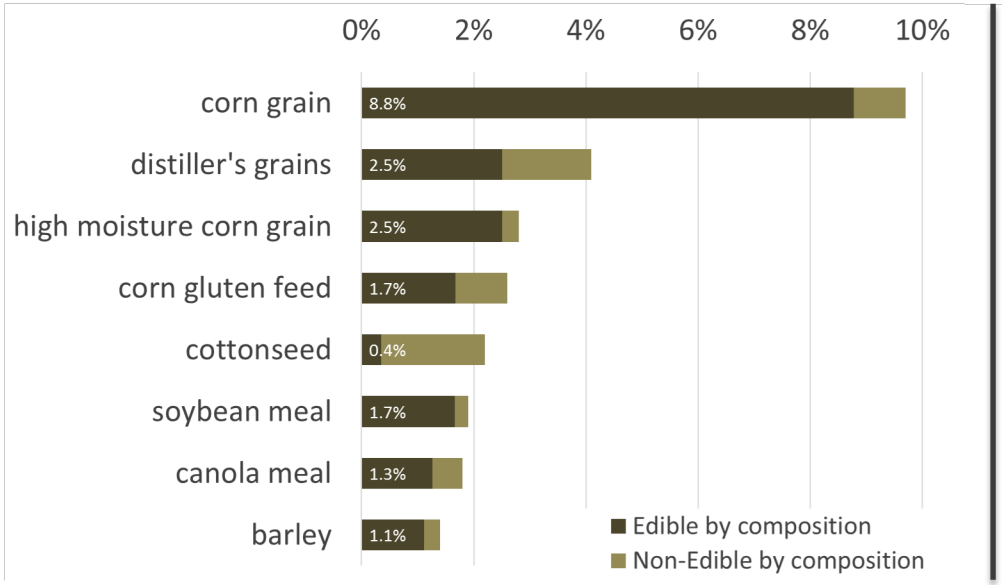
Customized Cow Nutrition

- ✓ Start with analysis of available forages
  - Dairy cows require fiber to ensure rumen function
- ✓ Forages or roughage are coarse or bulky feeds
  - Whole plants including leaves and stems
  - High fiber content (30% and above)
- ✓ Concentrates included to provide balance; they are concentrated sources of energy, protein or other nutrients
- ✓ Use software to balance the diet
  - Match nutrient supply to specific nutrient requirements for each animal class


Homegrown Forages
Four feed groups and plentiful water provide the balanced diet and nutrients necessary for dairy cow well being and milk production in the U.S.
Byproduct Feeds
Whole Grains
Feed Supplements
55%
23%
17%
5%
Water
• Pasture
• Alfalfa hay/silage
• Grass hay/silage
• Corn/oat/sorghum/ wheat silage
• Wheat/oat straw
• Soybean meal
• Canola meal
• Citrus pulp
• Whey
• Almond hulls
• Distillers grains
• Brewers grains
• Cottonseed
• Corn
• Wheat
• Barley
• Oats
• Sorghum
• Whole soybeans
• Fats
• Minerals
• Vitamins
• Yeast
• Sodium bicarbonate
• Enzymes
• Amino acids

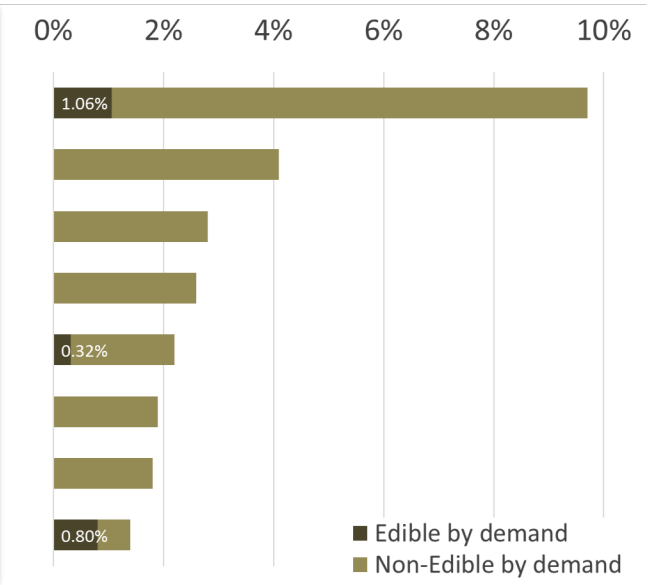
Cows and People are Not Competing for Food

FACT: 20% of what cows eat **could be eaten** by people



Excludes fiber (human-indigestible) and ingredients with more than 30% fiber

Reality: Only 2% **is eaten** by people based on food industry demand



Reflects food industry's response to consumer preferences and eating habits

Balancing Tradeoffs - Key to Sustaining Healthy People and a Healthy Planet

PNAS modeling study compared nutritional adequacy and greenhouse gas emissions from least-cost diets with and without animals

- 23% increase in total U.S. food supply, but mostly from corn and soybeans
- Need to eat more food to meet nutrient requirements due to the lower essential nutrient density in plant-based foods available
- Greater excess calories eaten by people
- Deficiencies in essential nutrients —calcium, vitamins A and B12, and arachidonic, EPA and DHA fatty acids
- Plant-only diets unable to support the nutritional needs without nutrient supplementation
- Only 2.6% reduction in total U.S. greenhouse gas emissions

http://dx.doi.org/10.1073/pnas.1707322114

Nourishing Cows = Nourishing People

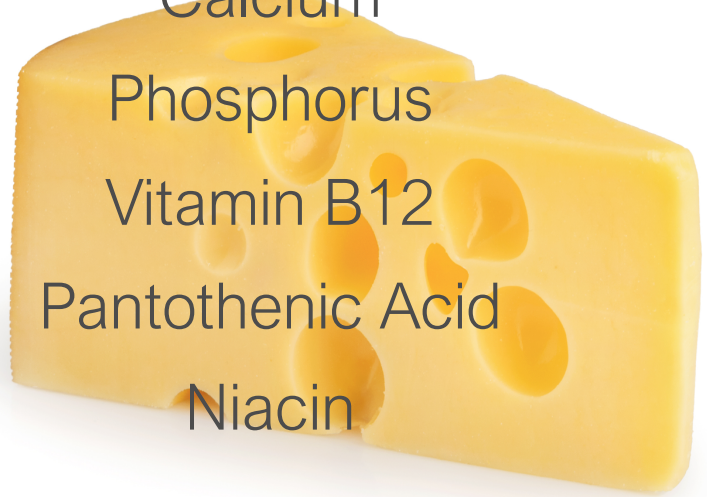
- Dairy cows' diets are primarily made up of foods people can't eat
- Dairy cows turn plants and by-products into high-quality protein, nutrient-rich milk to nourish people, because of their unique, 4-chambered stomach and digestive process
- Dairy cows make a net positive contribution to the food supply through milk and dairy foods in the United States

Good for the Body

Katie Brown, EdD
SVP Sustainable Nutrition, NDC
@KatieBrownRDN

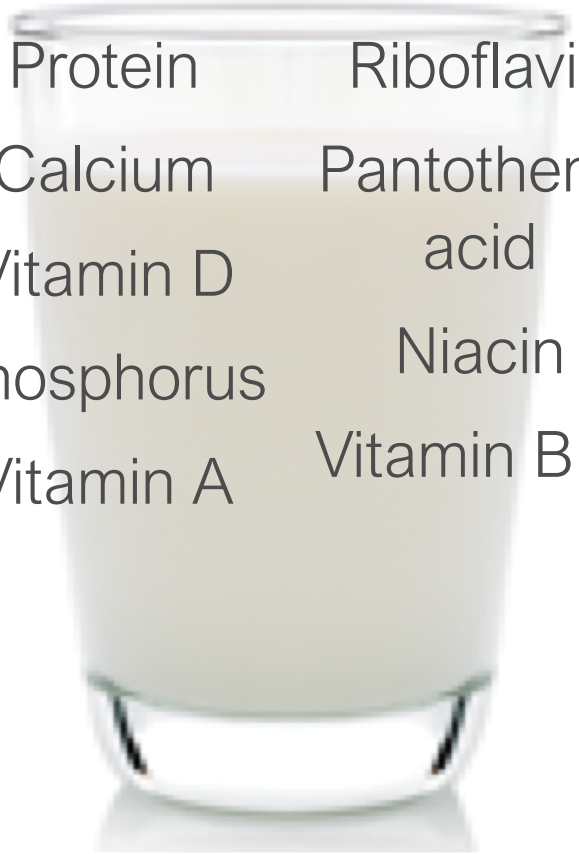
Cheese:
6 essential nutrients

Protein
Calcium
Phosphorus
Vitamin B12
Pantothenic Acid
Niacin



Milk:
9 essential nutrients

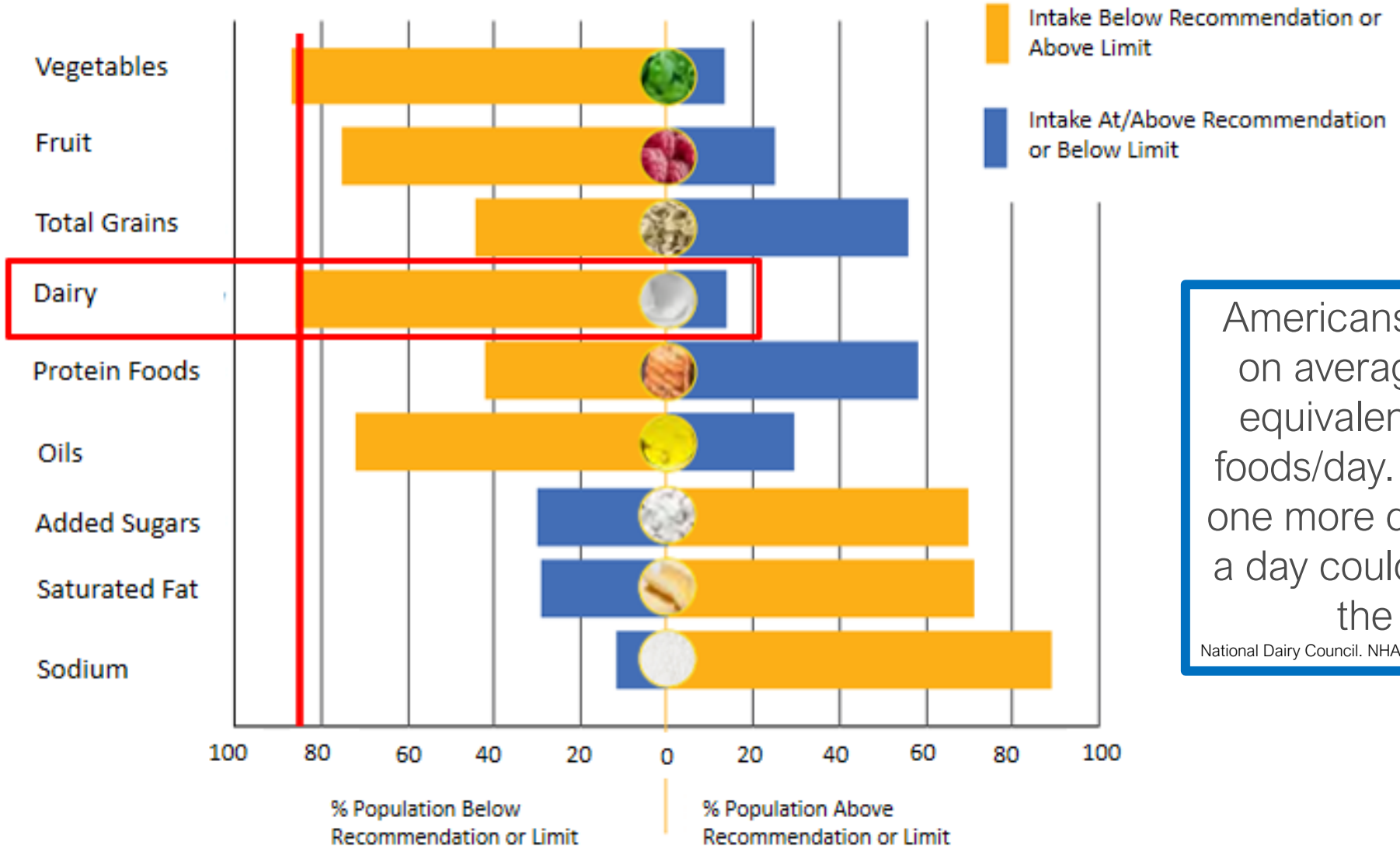
Protein
Calcium
Vitamin D
Phosphorus
Vitamin A
Riboflavin
Pantothenic acid
Niacin
Vitamin B12



Yogurt:
7 essential nutrients

Protein
Calcium
Phosphorus
Vitamin B12
Pantothenic Acid
Riboflavin
Zinc

Nearly 9 in 10 Americans Fall Short on Dairy Recommendations



Americans consume, on average, ≤2 cup equivalents of dairy foods/day. Adding just one more dairy serving a day could help close the gap.

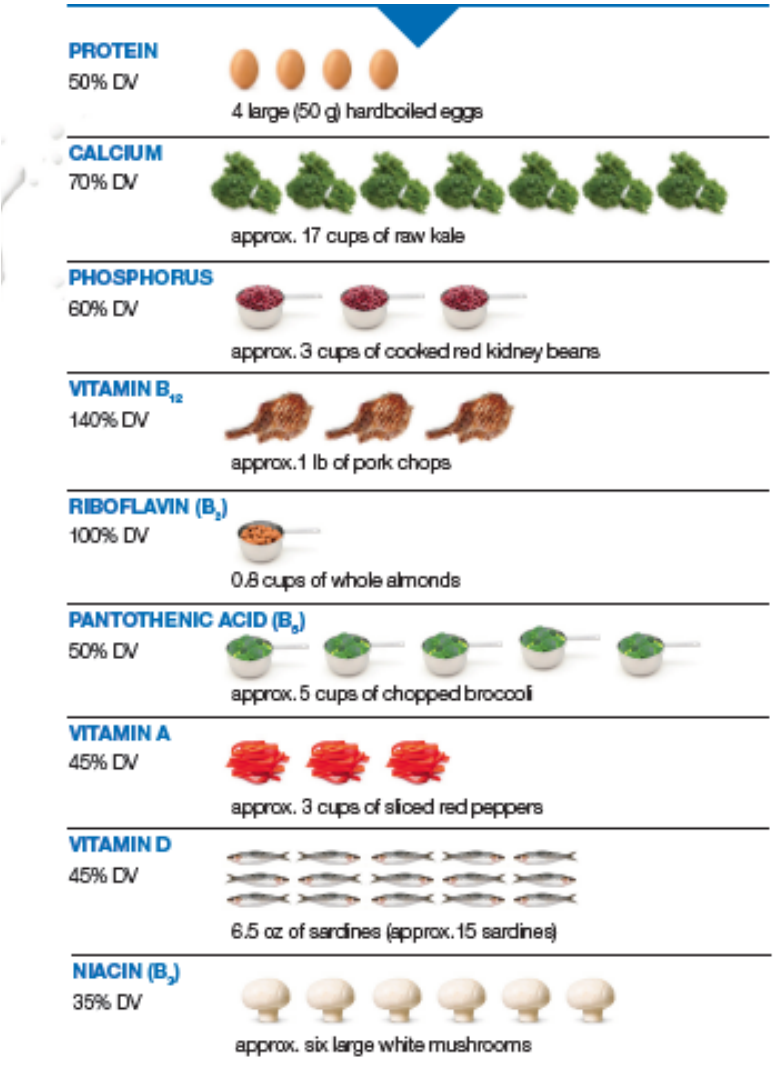
National Dairy Council. NHANES 2011-2014.

2015-2020 Dietary Guidelines for Americans

Dietary Intakes Compared to Recommendations. Percent of US Population Ages 1 & Older Who Are Below, At or Above Each Dietary Goal

3 Servings of Milk Deliver a Unique Nutrient Package

Three servings of milk provide the same level of nutrients found in these foods

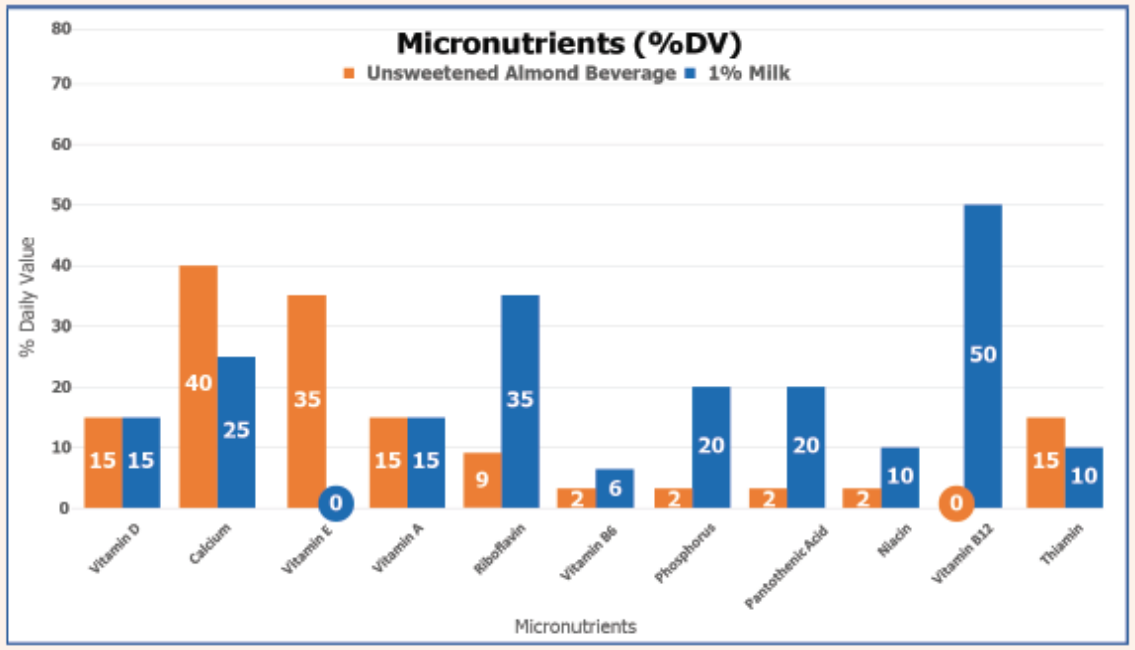


"… the **amount** of many potential alternatives to provide sufficient calcium would provide **too many calories** and/or **be a large amount to consume daily.**"

"…**bioavailability** of the calcium in vegetable products has not been addressed and **could pose a concern.**"

2010 Dietary Guidelines Advisory Committee Report. Appendix E3.6

https://www.nationaldairycouncil.org/content/2018/three-servings-of-milk-deliver-a-unique-nutrient-package



Good/Excellent Source

Unsweetened Almond:	Milk:
6 essential nutrients*	9 essential nutrients including protein*

Sodium

Unsweetened Almond:	1% Milk:
190 mg	105 mg

Low-fat milk: USDA NND SRR28 #01082. Alternative product: USDA NND SRR28 #14091
*New %DV conversions were done to align with the Final Rule: Revision of the Nutrition and Supplement Facts Labels for nutrients available on product Nutrition Facts panel

Visit nationaldairycouncil.org for flashcards on cow's milk and dairy alternative beverages

Nutritional Profile of Milk Compared to Unsweetened Almond Beverage

Calories

Unsweetened Almond	1% Milk
40 calories	100 calories

Macronutrients***

Per 8 oz.	Unsweetened Almond	1% Milk
Total Fat (g)	2.9	2.4
Saturated Fat (g)	0	1.5
Carbohydrate (g)	2	12
Sugars (g)	0	12
Added Sugar* (g)	0	0
Protein (g)	2	8

*Added sugar for alternatives was calculated based on comparison to 8 fl oz Unsweetened variety of each product
**Based on review of USDA NND SRR28 #45136688. All of these ingredients are safe for consumption
*** Nutrient composition based on USDA NND SRR28 #01082 and NND SRR28 #14091

Ingredients

1% Milk: 3 ingredients
Lowfat Milk, Vitamin A Palmitate, Vitamin D3

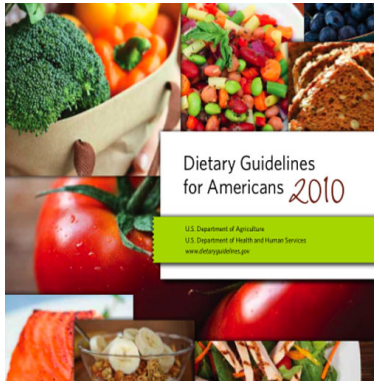
Unsweetened Almond: 14 ingredients**
Almondmilk (Filtered Water, Almonds), Natural Flavor, Sea Salt, Locust Bean Gum, Sunflower Lecithin, Gellan Gum, Calcium Carbonate, Vitamin E Acetate, Zinc Gluconate, Vitamin A Palmitate, Riboflavin (B2), Vitamin B12, Vitamin D2

Did You Know?

Milk contains 9 essential nutrients. Only vitamin A and D are added to milk.

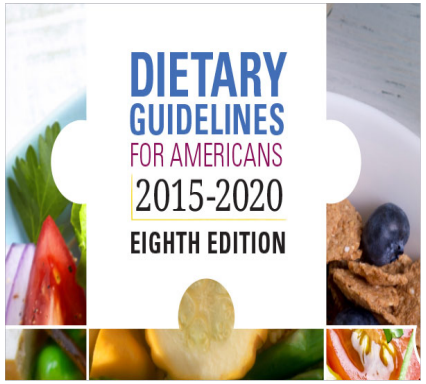
https://www.nationaldairycouncil.org/content/2018/how-milk-compares-to-various-plant-based-alternative-beverages

2005, 2010, 2015 Dietary Guidelines Recommend 3 Daily Servings of Dairy Foods for Those ≥9 years



"Moderate evidence also indicates that intake of milk and milk products is associated with a reduced risk of cardiovascular disease and type 2 diabetes and with lower blood pressure in adults."

2010 Dietary Guidelines Advisory Committee Report



"Consumption of dairy foods provides numerous health benefits, including lower risk of diabetes, metabolic syndrome, cardiovascular disease and obesity."

2015 Dietary Guidelines Advisory Committee Report

Growing Evidence: Dairy Food Consumption has a Neutral or Beneficial Association with Reduced Risk for Chronic Diseases

	Type of Studies	Total # studies (published 2009-2015)
Dairy and Cardiovascular Disease	**3** Meta-Analysis/Systematic Reviews	✓✓✓
	15 Prospective Cohort studies	✓✓✓✓✓✓✓✓✓✓✓✓✓✓✓
	0 Trials	
Dairy and Blood Pressure	**2** Meta-Analysis/Systematic Reviews	✓✓
	6 Prospective Cohort studies	✓✓✓✓✓✓
	10 Trials	✓✓✓✓✓✓✓✓✓✓
Dairy and Type 2 Diabetes	**5** Meta-Analysis/Systematic Reviews	✓✓✓✓✓
	14 Prospective Cohort studies	✓✓✓✓✓✓✓✓✓✓✓✓✓✓
	0 Trials	

55

Plant-based in Perspective

2015-2020 Dietary Guidelines For Americans Dietary Patterns are Plant-Based and Incorporate Animal Foods

Healthy US-style Pattern	Healthy Vegetarian Pattern	Healthy Mediterranean-style Pattern
3 servings LF/FF dairy foods per day	3 servings LF/FF dairy foods per day	2 servings LF/FF dairy foods per day

Dairy 3 → 2 cup eq/day
Seafood 8 → 16 oz eq/wk

https://health.gov/dietaryguidelines/2015/resources/2015-2020_Dietary_Guidelines.pdf

Plant + Animal Foods = Improved Nutrient Intakes

NHANES Modeling Study
N=17,387, ≥ 2 years

"Specific recommendations to increase low fat and nonfat dairy foods in conjunction to increasing healthy plant-based foods will help to close some of the nutrient gaps currently present among Americans of all ages."

Modeling Scenario	Improved Intakes	Insufficient Intakes
Double usually consumed plant-based foods	Magnesium Iron Folate Vitamin C Vitamin E	Calcium* Protein Vitamin A Vitamin D*
Double milk, cheese, yogurt	Calcium* Vitamin D* Vitamin A Protein Magnesium	

Cifelli et al. Nutrients 2016

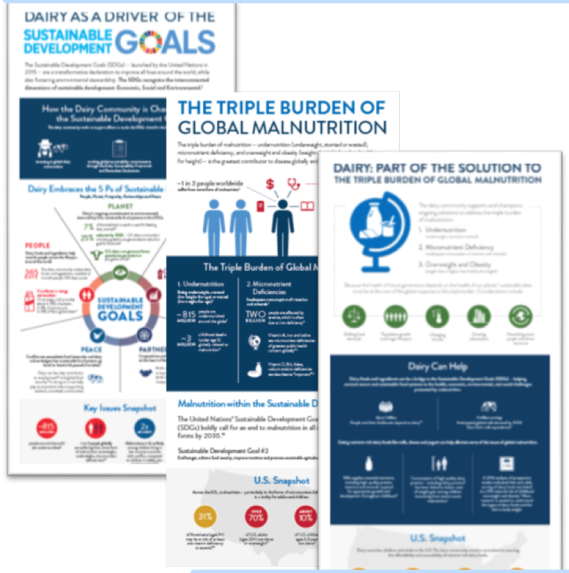
*NDC sponsored study

* = Nutrient of Public Health Concern

Host of Resources on nationaldairycouncil.org

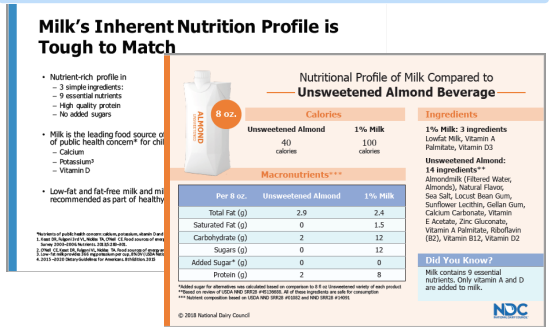
U.S. Dairy Sustainability Report

Dairy as a Driver of SDGs Infographics



10+ Science Summaries

Beverage Flashcards



Other Resources

Visit nationaldairycouncil.org to join

Dairy Nourishes NETWORK

Dairy Nourishes Network members will receive:

- Quarterly updates
- Advance notice of webinars
- Recipe ideas/meal tips
- Engaging contests
- Opportunities to be highlighted on NDC's social
- In-person educational and networking events

Questions?

Dairy's Role in Today's Health & Nutrition Trends
Today's Presenters:

Good for the Planet

Frank M. Mitloehner, PhD
Professor and Air Quality Extension Specialist, Department of Animal Science, UC Davis
@GHGguru

Good for the Animals

Juan Tricarico, PhD
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Good for the Body

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