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An Overview of FEDS: The Food Environment Data System

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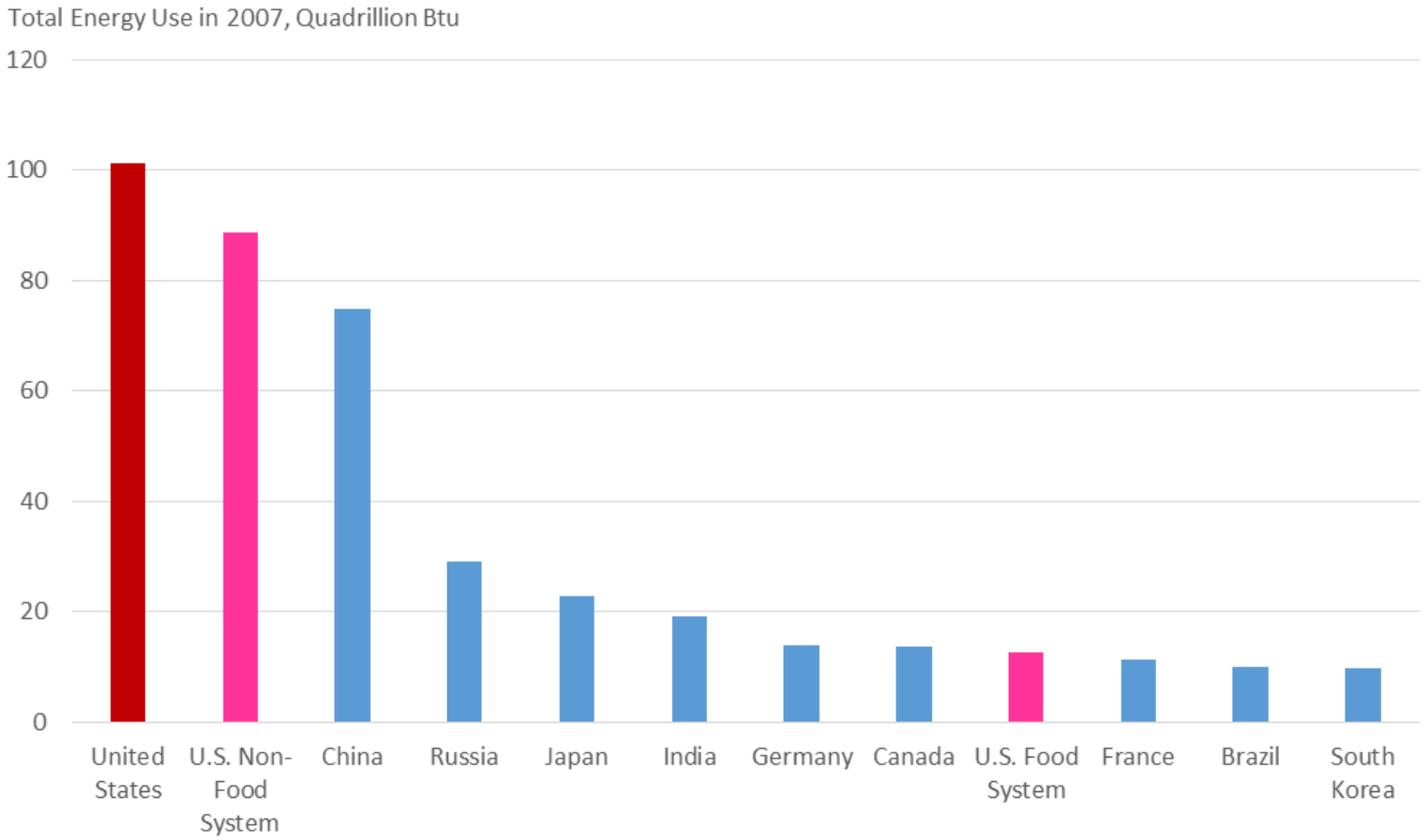
The Findings and Conclusions in This Preliminary Presentation Have Not Been Formally Disseminated by the U. S. Department of Agriculture and Should Not Be Construed to Represent Any Agency Determination or Policy.

Do diet choices affect more than just health outcomes?

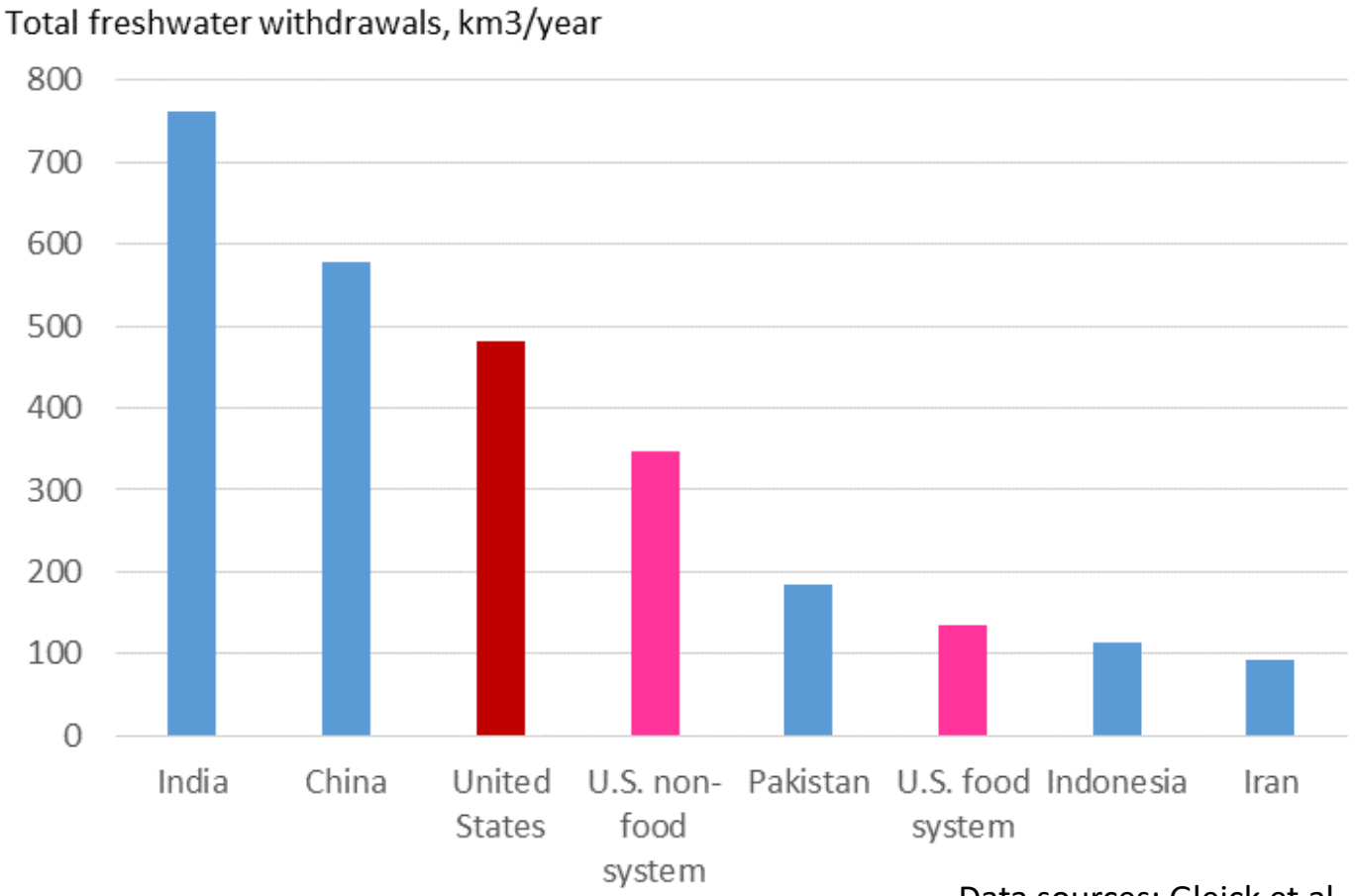
Will resource scarcities threaten our food security?

Energy use in the U.S. food system is on par with Canada's total energy budget



Source: Rehkamp & Canning, 2017

Water use in the U.S. food system is on par with Indonesia's total water budget



Data sources: Gleick et al., 2014; Rehkamp & Canning, 2018

How do we measure resource use in the food system?

Food-Environment Data System (FEDS)

- Environmental input-output (EIO) model
  - All transactions throughout the U.S. economy
  - Direct and indirect resource use
- Monetary or environmental flows
  - U.S. dollars, fossil fuels, greenhouse gas emissions, freshwater, land, labor

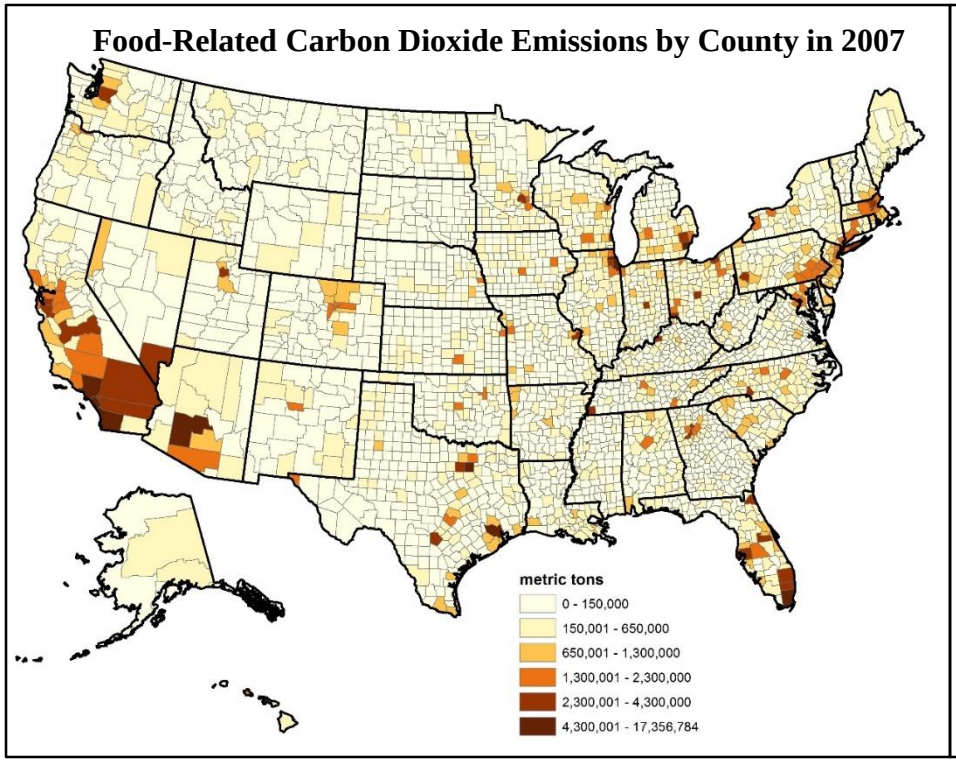
Image sources: Gettyimages; USDA

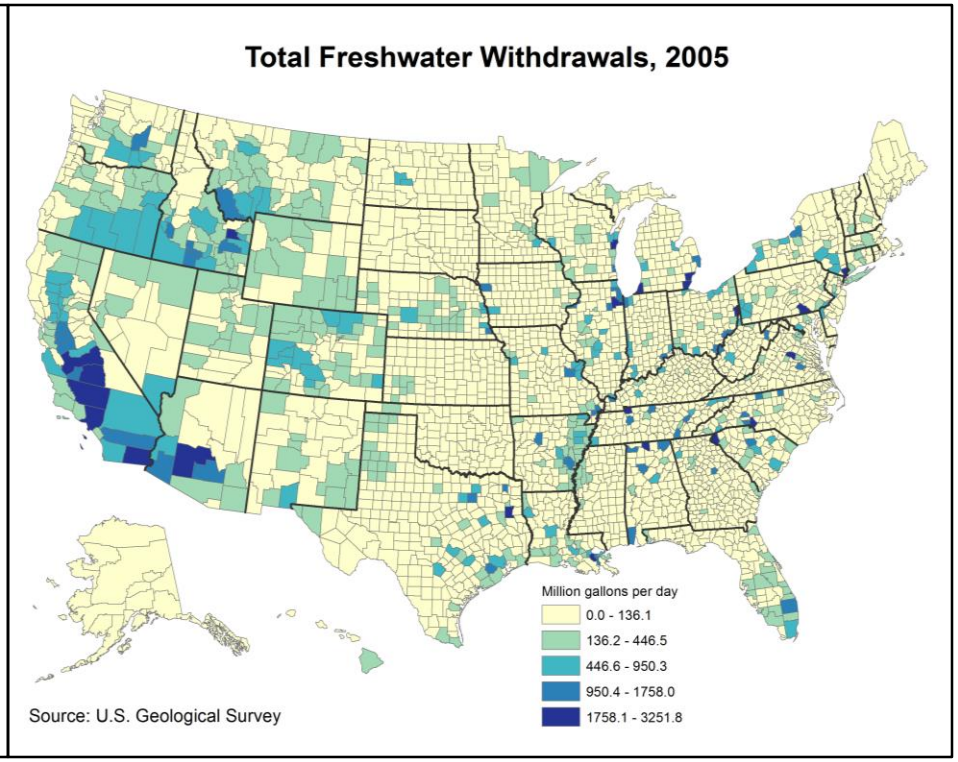
Unique attributes of FEDS

- Methodology adopted by the United Nations Statistical Commission
  - Adaptable to other countries
- Focus on U.S. food system
- Data development to look at resource use over time
- Additionally…

Image source: USDA

County-level Data





Source: Canning et.al., 2017

Life-cycle analysis covering each food system stage

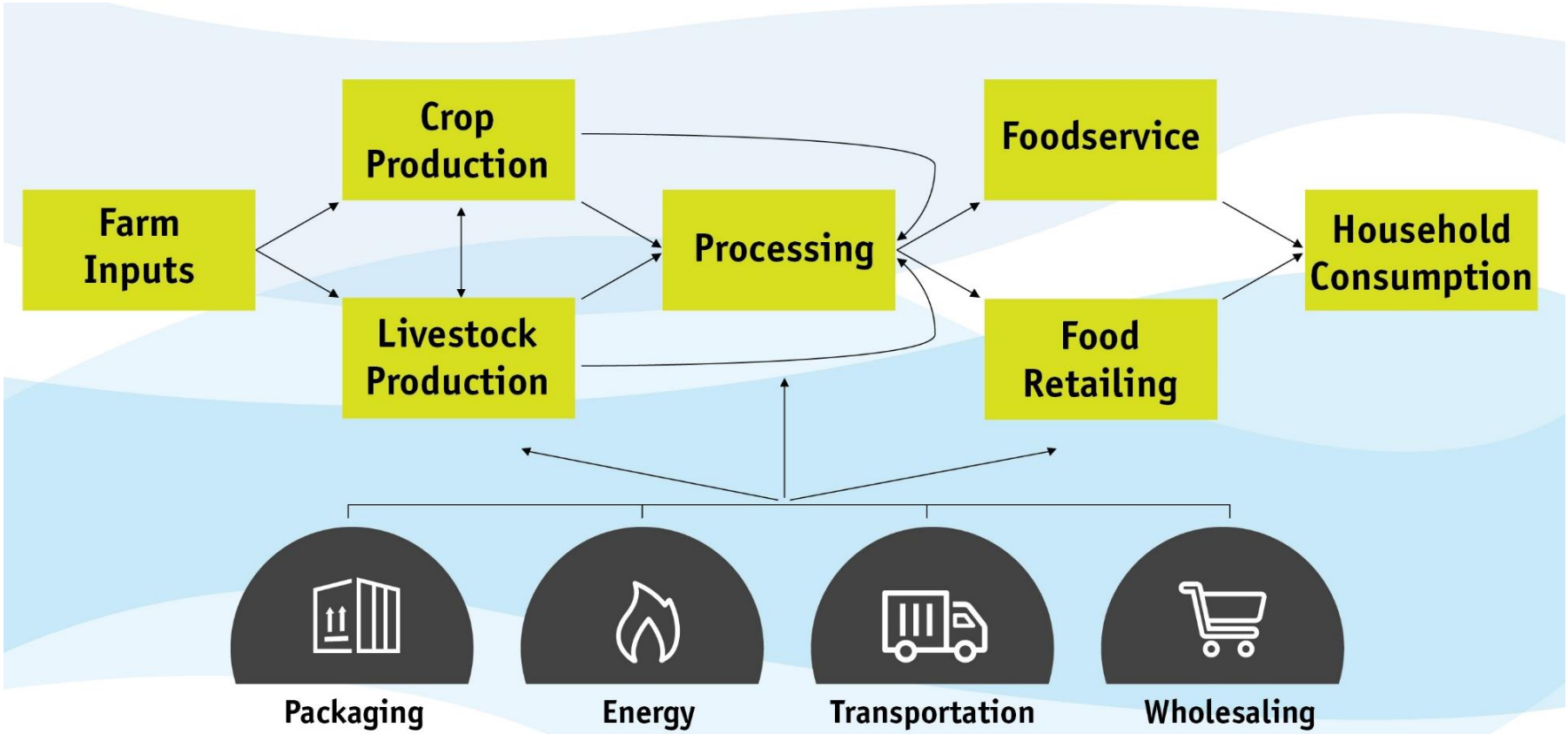
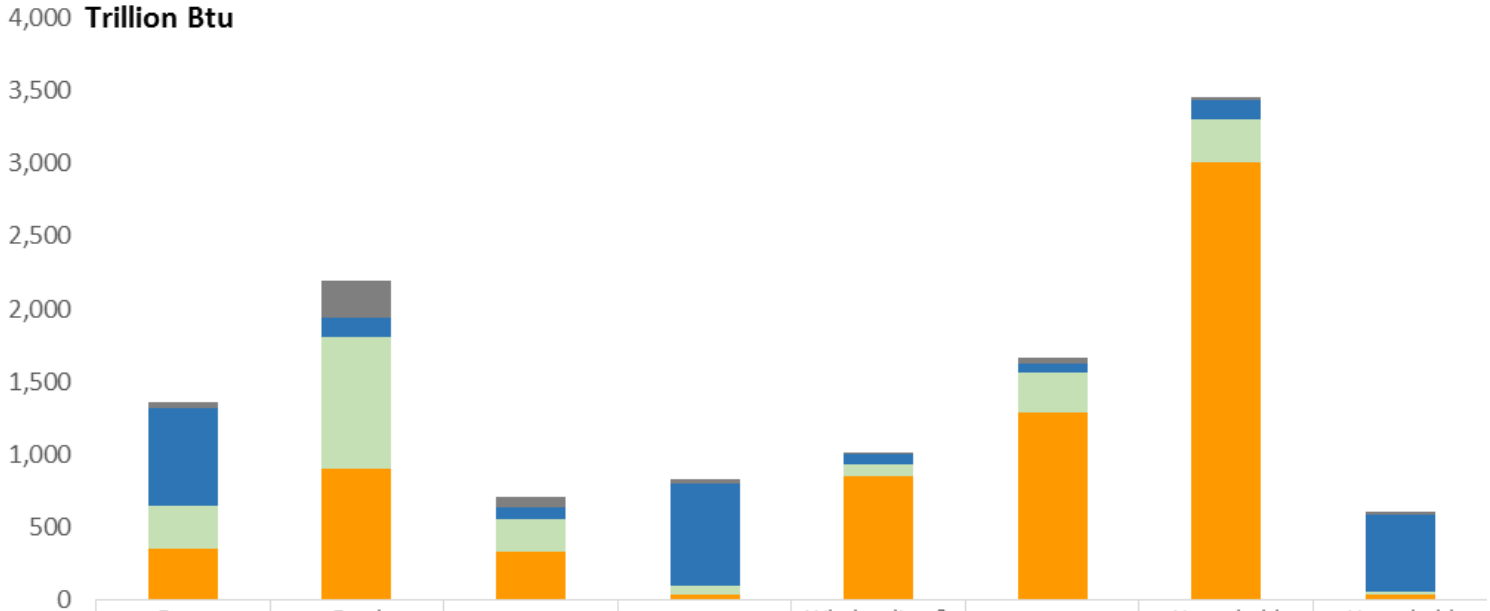


Image design: Lori Fields, USDA-ERS

What are the resource requirements of current American diets?

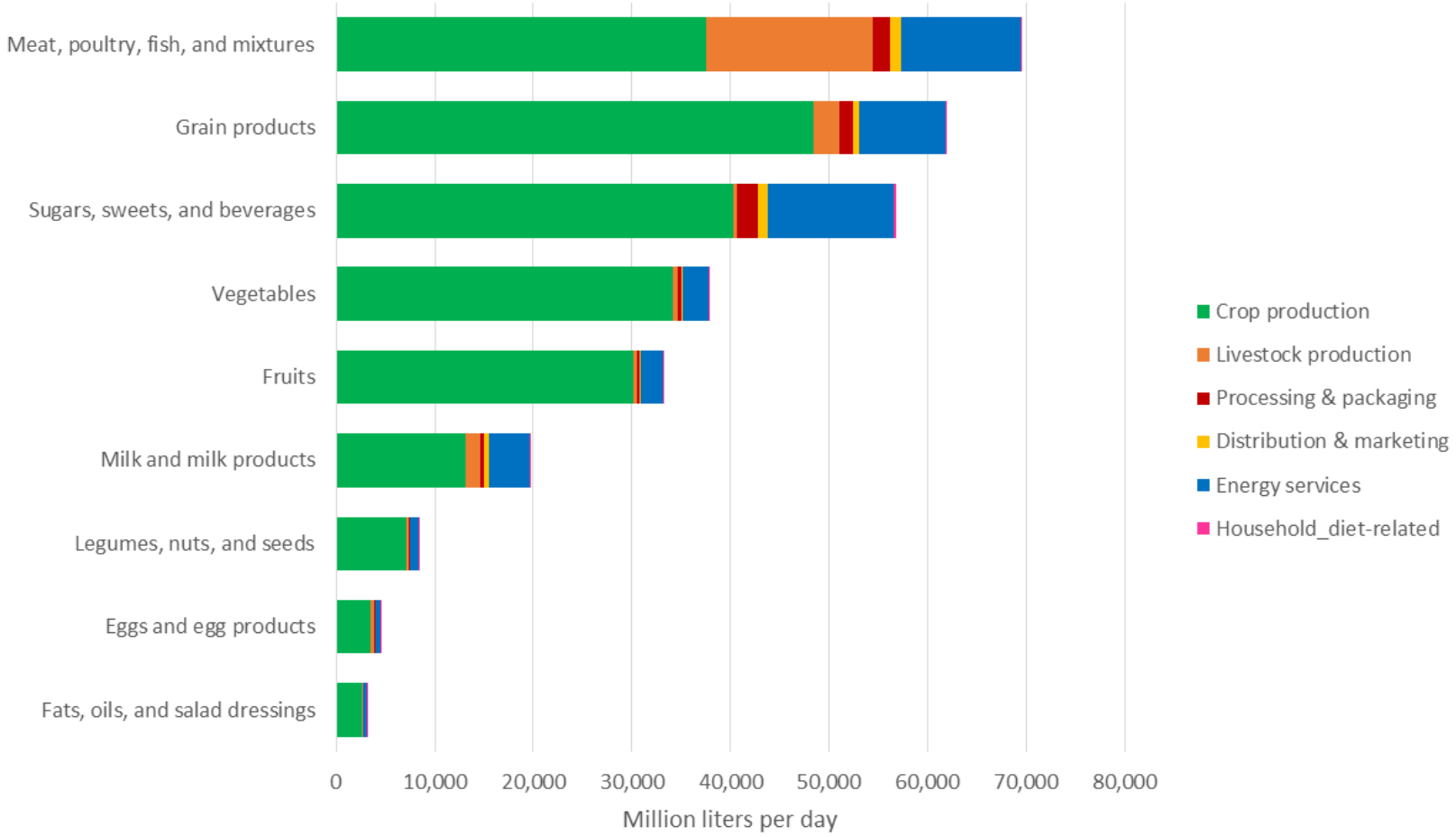
Electricity was the most used energy commodity by the U.S. food system, 2012



	Farm production	Food processing	Packaging	Transportation	Wholesaling & retailing	Foodservice	Household foodservice	Household transportation
Total food-related	1,360	2,199	712	833	1,019	1,666	3,455	611
Other energy	42	257	76	31	17	38	26	24
Petroleum products	668	133	75	698	66	64	124	525
Natural gas	292	902	229	67	87	273	303	26
Electricity	358	906	332	36	849	1,291	3,003	36

Source: Canning & Rehkamp, 2017

Meats in current (2007) American diet use the most water



Data Source: Rehkamp & Canning, 2018

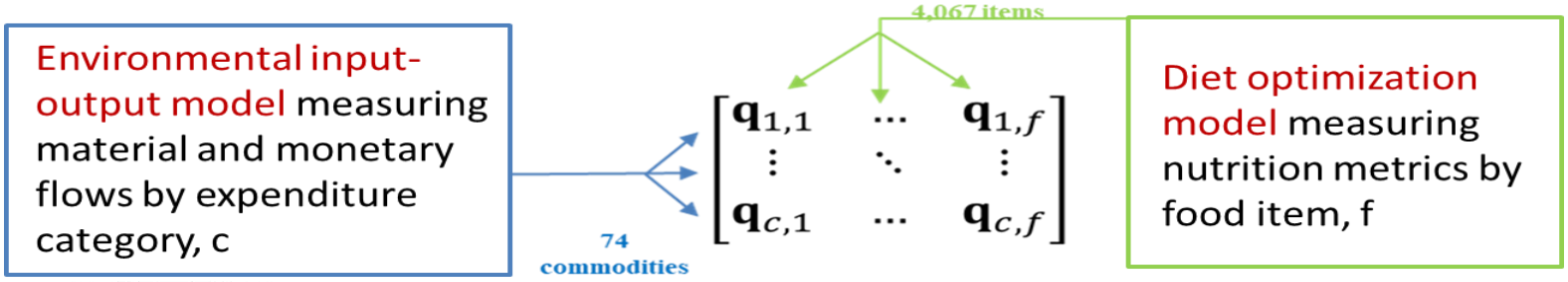
If Americans begin to eat healthier, how will they transition and what will these diets look like?

Model-derived diet scenarios

Diet name	Diet description
Realistic Healthy Omnivore	Represents the least change from current American diets while meeting the Dietary Guidelines; this diet is most representative of Americans currently following the Guidelines
Realistic Healthy Vegetarian	Represents the least change from current American diets while meeting the Dietary Guidelines, but eliminating meat, poultry, and seafood
Efficient Healthy Omnivore	Identifies the potential for resource conservation while still meeting the Dietary Guidelines
Efficient Healthy Vegetarian	Identifies the potential for resource conservation while still meeting the Dietary Guidelines, but eliminating meat, poultry, and seafood

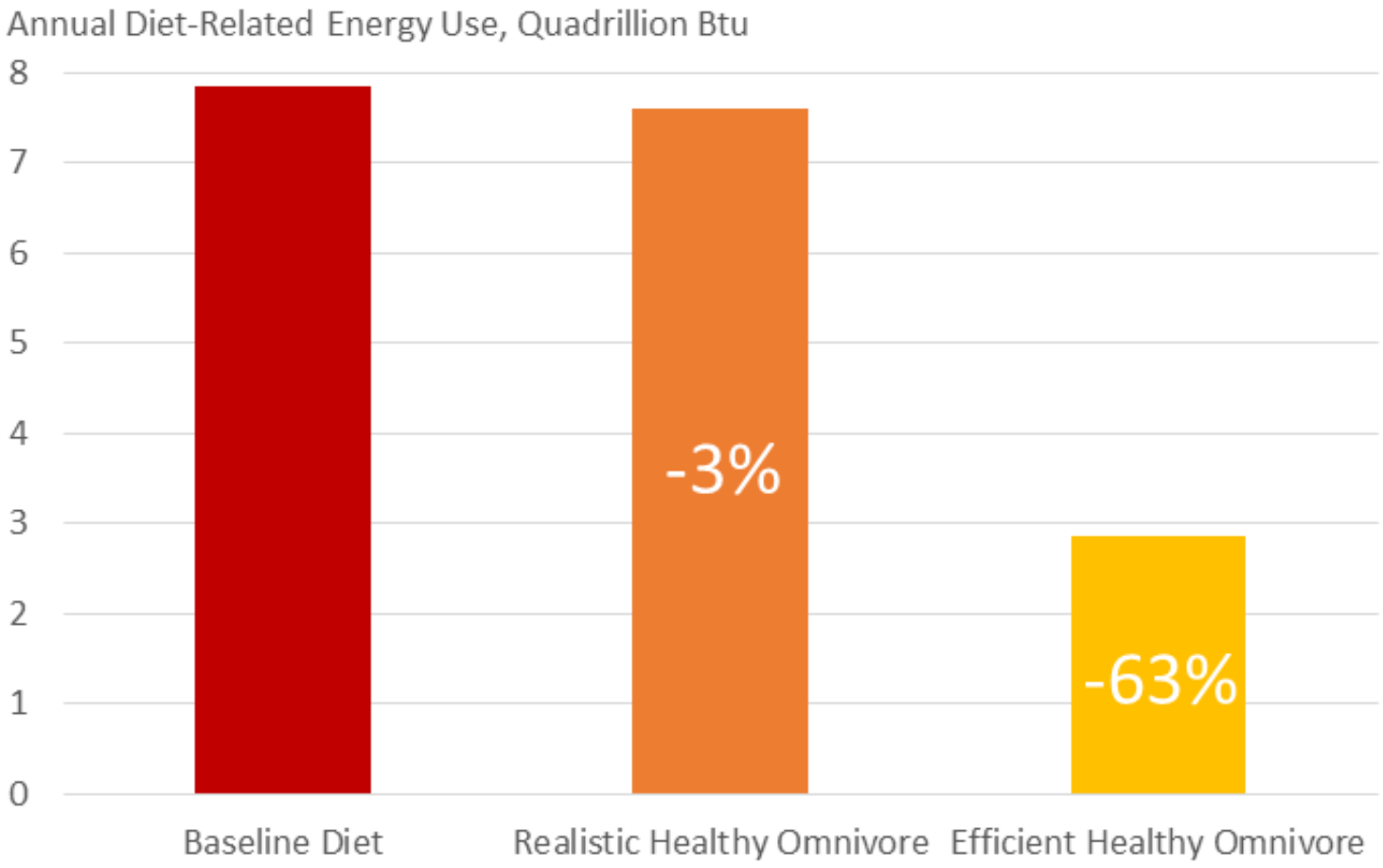
Integrated sustainable diet analysis

1. Diet optimization model:
   - Compile data on current diets, their nutritional attributes, and costs
   - Identify all nutrition and food pattern targets for meeting dietary guidelines
   - Develop objective functions for policy relevant healthy diets
2. Translate food choices of each diet, as consumed, to the food commodity 'purchase orders' that facilitate each diet (Q-matrix).
3. For each diet 'purchase order', trace these purchases back to the primary resources used, via the multiregional environmental input-output model (MEIO).



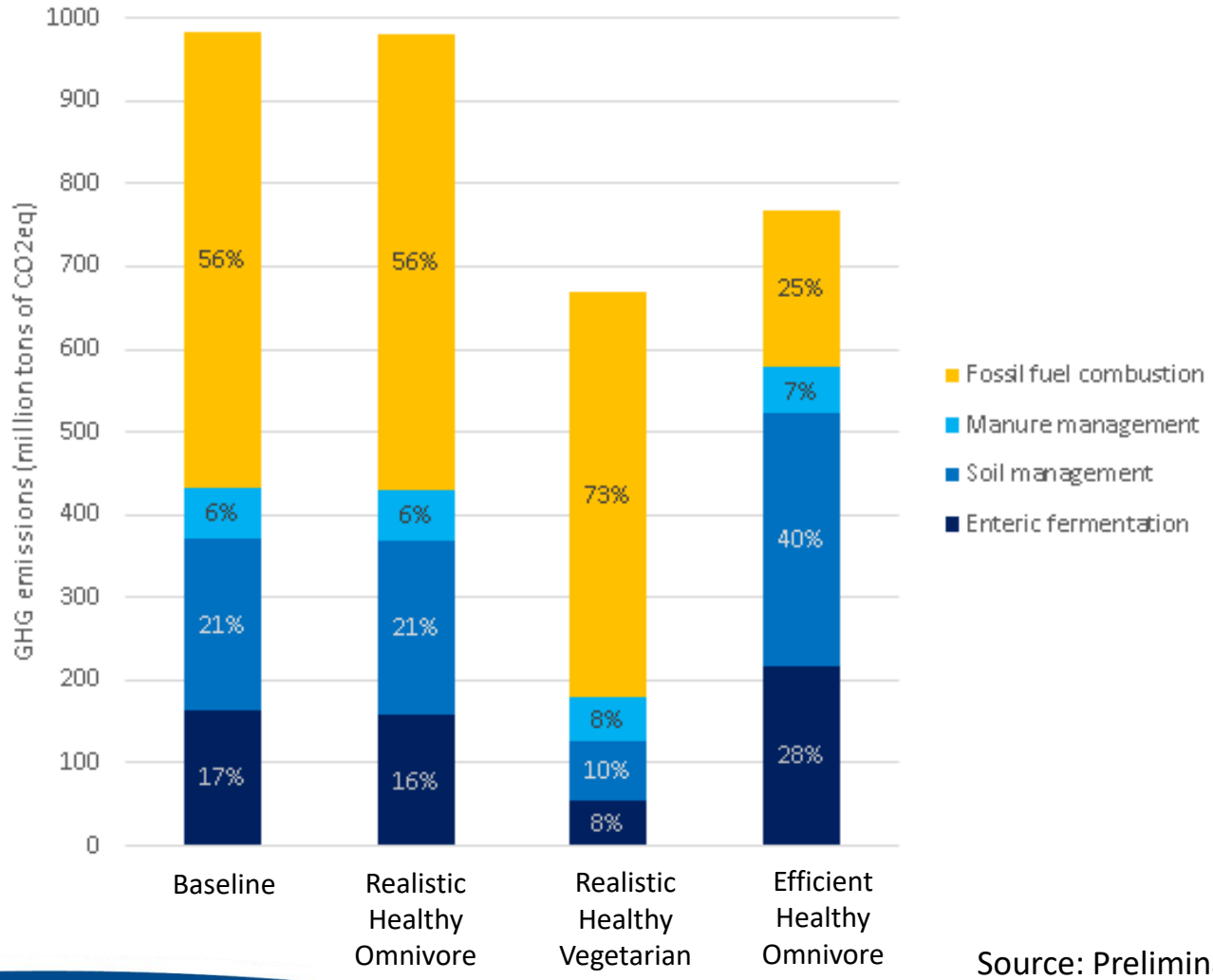
How do resource requirements change in the healthy diet scenarios?

Healthy diet scenarios reduce energy use relative to Baseline Diet



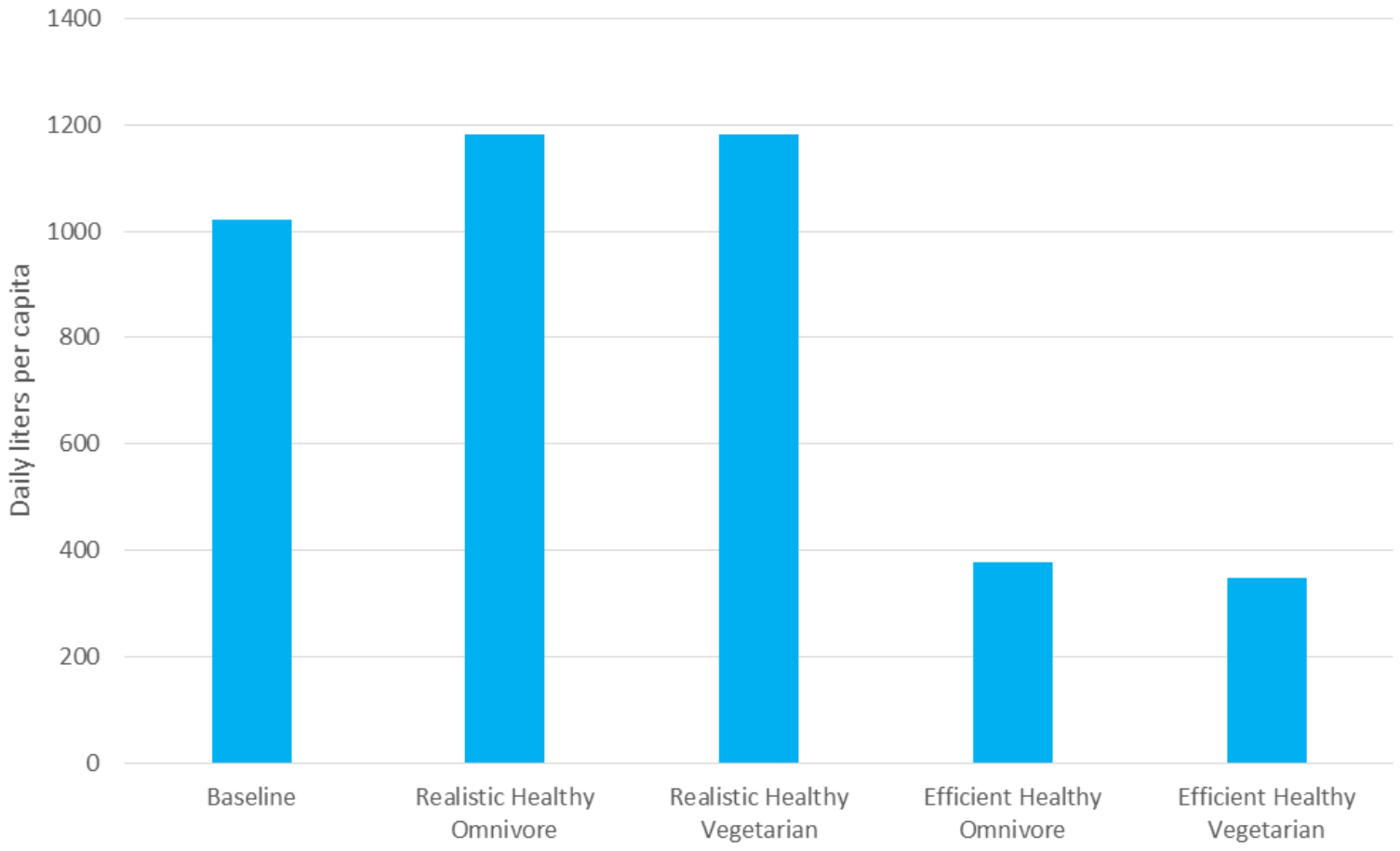
Data Source: Canning et al., 2017 with author updates

GHGE by diet and emissions source



Source: Preliminary results from Hitaj et al.

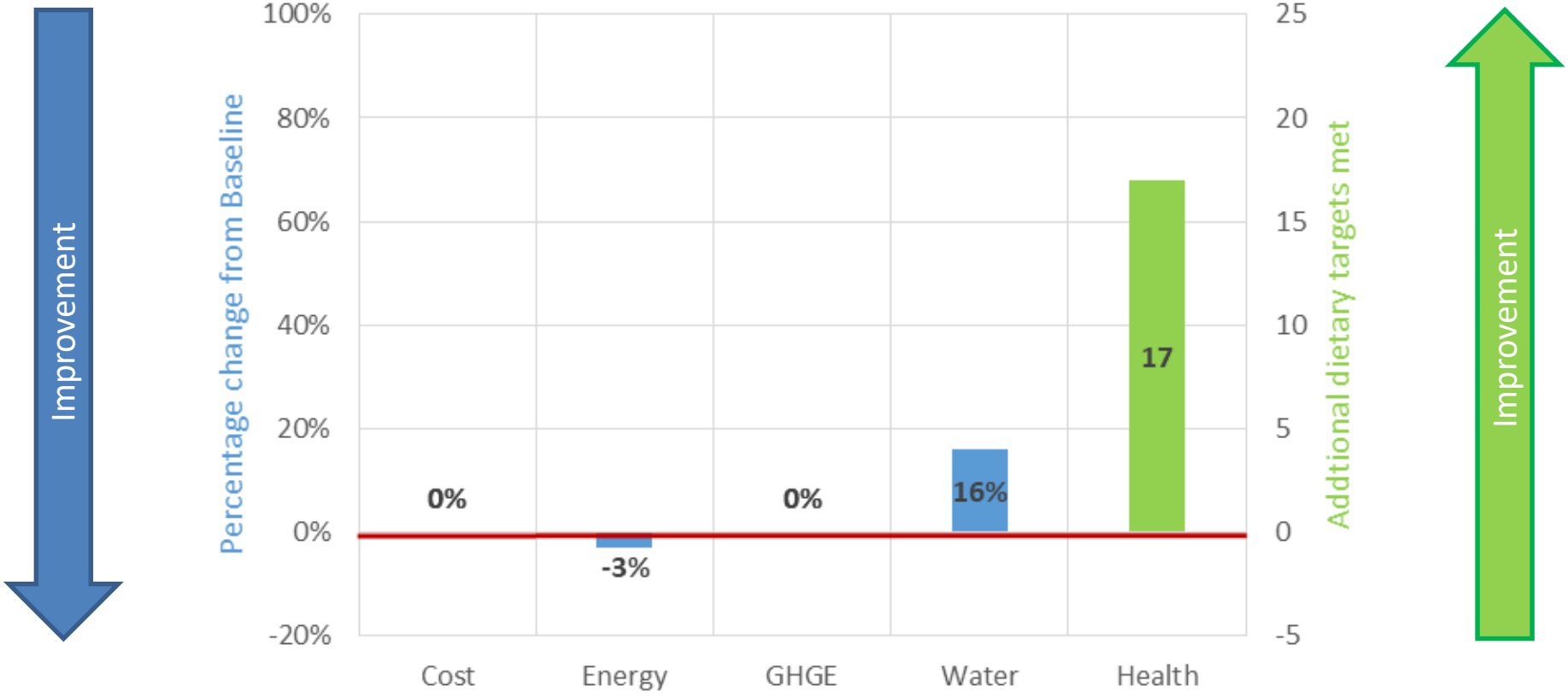
Diet-related water use for the Baseline and healthy diet scenarios



Data Source: Rehkamp & Canning, 2018

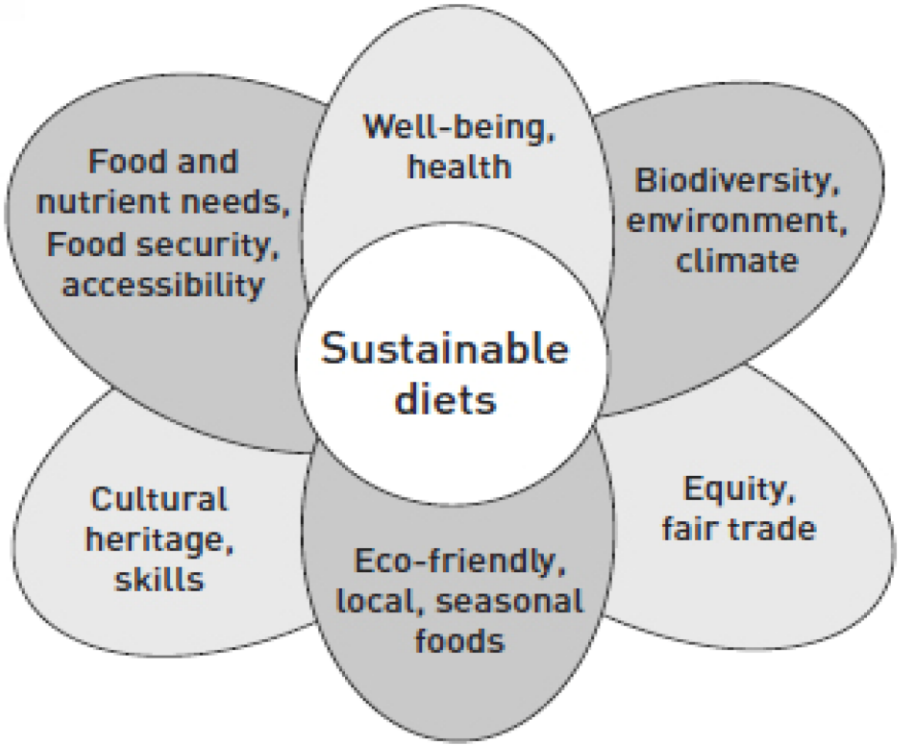
Where do we go from here?

Synthesis of Realistic Healthy Omnivore Diet



Data Sources: Canning et al., 2017;
Preliminary results from Hitaj et al.;
Rehkamp & Canning, 2018

Future directions: Synergies



- How will minimizing one resource impact others?
- Are there synergies in the types of food items that are less costly on the environment?
- What are the trade-offs?

Source: Burlingame & Dernini, 2012

Future directions: Data and modeling

- Develop a regular updated FEDS data product
- Build models that introduce consumer and producer feedback for policy analysis
  - Computable general equilibrium (CGE) models
    - Example: The potential impacts of food waste reduction policies on diets
  - Partial equilibrium spatial models
    - Example: Food value chain innovation study with multiple sustainability metrics

Thank you

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References and image credits

- **Slide 3:** Rehkamp, S. and P. Canning. 2017. The Potential for Healthier and Energy Efficient American Diets. Choices. Quarter 3. Available at: http://www.choicesmagazine.org/choices-magazine/submitted-articles/the-potential-for-healthier-and-energy-efficient-american-diets
- **Slide 4:** Gleick et al. 2014. The World's Water: The Biennial Report on Freshwater Resources. Volume 8, Table 2. Available at: http://worldwater.org/water-data/; Rehkamp, S. and Canning, P. 2018. Measuring Embodied Blue Water in American Diets: An EIO Supply Chain Approach. *Ecological Economics*. 147: 179-188. doi:10.1016/j.ecolecon.2017.12.028
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- **Slide 8:** Canning et al. 2017. The Role of Fossil Fuels in the U.S. Food System and the American Diet, ERR-224, U.S. Department of Agriculture, Economic Research Service; U.S. Geological Survey. 2005. Estimate Use of Water in the United States, County-Level Data for 2005. Available at: https://water.usgs.gov/watuse/data/2005/index.html
- **Slide 9:** Image design: Lori Fields, USDA-ERS
- **Slide 11:** Canning, P. and Rehkamp, S. 2017. The Relationship Between Energy Prices and Food-Related Energy Use in the United States, Amber Waves Feature Article, U.S. Department of Agriculture, Economic Research Service.
- **Slide 12:** Rehkamp, S. and Canning, P. 2018. Measuring Embodied Blue Water in American Diets: An EIO Supply Chain Approach. *Ecological Economics*. 147: 179-188. doi:10.1016/j.ecolecon.2017.12.028
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- **Slide 19:** Rehkamp, S. and Canning, P. 2018. Measuring Embodied Blue Water in American Diets: An EIO Supply Chain Approach. *Ecological Economics*. 147: 179-188. doi:10.1016/j.ecolecon.2017.12.028
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