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

Total freshwater withdrawals, km3/year

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

Food-Related Carbon Dioxide Emissions by County in 2007

Total Freshwater Withdrawals, 2005

Source: Canning et al., 2017
Life-cycle analysis covering each food system stage

Diagram showing the life-cycle stages:
- Farm Inputs
- Crop Production
- Livestock Production
- Processing
- Foodservice
- Food Retailing
- Household Consumption
- Packaging
- Energy
- Transportation
- Wholesaling

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

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

<table>
<thead>
<tr>
<th>Diet name</th>
<th>Diet description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Realistic Healthy Omnivore</strong></td>
<td>Represents the least change from current American diets while meeting the Dietary Guidelines; this diet is most representative of Americans currently following the Guidelines</td>
</tr>
<tr>
<td><strong>Realistic Healthy Vegetarian</strong></td>
<td>Represents the least change from current American diets while meeting the Dietary Guidelines, but eliminating meat, poultry, and seafood</td>
</tr>
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<td><strong>Efficient Healthy Omnivore</strong></td>
<td>Identifies the potential for resource conservation while still meeting the Dietary Guidelines</td>
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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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- **Slide 18**: Preliminary results from Hitaj et al.