Towards Sustainable Food Systems: Metrics and Considerations with Examples from the Dairy Sector

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The Challenge

70% of world population will live in cities by 2050

70% of suitable agricultural lands is already in use or under protection

52% of projected world population could be exposed to severe water scarcity by 2050

Food production will need to increase by 70% to feed the world by 2050

Global middle class will triple by 2030

Triple burden of malnutrition impacts all countries

- One person in three is malnourished worldwide
- ~815 million people are undernourished
- 1.9 billion adults are overweight or obese

Nutrition and food systems, HLPE, 2017
The state of food security and nutrition around the world, FAO, 2017
The rise of non-communicable diseases

Non-communicable diseases are responsible for 3 out of 5 deaths worldwide

- Preventable
- Huge cost to governments
- Rapid expansion from developed markets to emerging markets
Focus on nutrition and food systems

Rome Declaration on Nutrition

- Multiple challenges of malnutrition to inclusive and sustainable development and to health
- A common vision for global action to end all forms of malnutrition
- Commitment to action

The UN Decade of Action on Nutrition 2016-2025
Sustainable diets as defined by FAO

“Sustainable Diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.”

FAO and Biodiversity International 2012


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Gustafson et al. Sustainability. 2016
Nutrition and Food Systems

A report by the High Level Panel of Experts (HLPE) on Food Security and Nutrition

http://www.fao.org/3/a-i7846e.pdf
Food Systems: A Conceptual Framework

- Biophysical and environmental drivers
  - Natural resource capital
  - Ecosystem services
  - Climate change

- Innovation, technology and infrastructure drivers
  - Innovation
  - Technology
  - Infrastructure

- Political and economic drivers
  - Leadership
  - Globalization and trade
  - Conflicts and humanitarian crises
  - Food prices and volatility
  - Land tenure

- Socio-cultural drivers
  - Culture
  - Religions & rituals
  - Social traditions
  - Women’s empowerment

- Demographic drivers
  - Urbanization
  - Population growth
  - Changing age distribution
  - Migration & forced displacement

Food supply chains
- Production systems
- Storage and distribution
- Processing and packaging
- Retail and markets

Food environments
- Food availability and physical access (proximity)
- Economic access (affordability)
- Promotion, advertising and information
- Food quality and safety

Consumer behaviour
- Choosing where and what food to acquire, prepare, cook, store and eat

Diets
- Quantity
- Quality
- Diversity
- Safety

Nutrition and health outcomes
- Impacts
- Social
- Economic
- Environmental

Political, programme and institutional actions

Sustainable Development Goals

- Availability
- Access
- Utilization
Metrics to evaluate sustainability of food systems need to assess the multiple aspects.
Bringing to life the dairy community’s shared vision of a healthy, happy, sustainable world, with science as our foundation
The three pillars of sustainability underpin dairy’s role

Dairy is an important component of healthy, sustainable diets
Global Dairy Sector

1 billion people strong

6 billion consumers impacted

At the global level, milk contributes an average of

20% of the world’s agriculture lands are cared for by the dairy sector

5% of energy

10% of protein

9% of fat

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We commit to being leaders in sustainability, ensuring the health and well-being of our planet, communities, consumers and the industry.

113 companies & 180 professionals in the Sustainability Council

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Grounded in science

- Life cycle science establishes baseline environmental footprint for U.S. Dairy
- Peer-reviewed, published, and contributed to open-source National Agricultural Library
- Greenhouse gas emissions of milk = 17.6 lbs. CO2 per gallon
- Goal to reduce GHGe by 25% by 2020

U.S. Dairy is ~2% of U.S. GHGe, 5% total water withdrawal and <4% farmland occupation

https://dairygood.org/content/2017/2016-us-dairy-sustainability-report
Dairy cows contribute to the nutrient cycle of the food system

Contribute to food system

Provide Nutrient dense foods

Forages (grass)  By-Products

Human Edible

80% humans can’t eat

20% humans might eat
Reducing use of resources and lowering our impact

- American farmers have succeeded in improving efficiency while caring for the environment.
- Compared with 1944, the U.S. dairy industry now produces a gallon of milk using:
  - 90% less land
  - 65% less water

And producing:
- 75% less manure
- 63% smaller carbon footprint

Animal Care

~98% of U.S. milk comes from farms participating in the FARM Program
Dairy’s role in cardiovascular and metabolic health recognized by Dietary Guidelines for Americans Advisory Committees 2010 and 2015

“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
Milk and milk products are an economical source of nutrition

Average cost per serving

- Meat, poultry, fish: $0.63
- Fruit: $0.40
- Vegetables: $0.29
- Dry beans, legumes nuts: $0.26
- Milk, milk products: $0.26
- Eggs: $0.24
- Grains: $0.23
- Sugars, sweets, beverages: $0.23
- Fats, oils, salad dressing: $0.09

Milk’s essential nutrients can be hard to replace

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Percentage of DV</th>
<th>Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>50%</td>
<td>4 hardboiled eggs</td>
</tr>
<tr>
<td>Calcium</td>
<td>90%</td>
<td>36 1/2 cups of raw kale (about 7 bunches)</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>70%</td>
<td>2 1/2 cups kidney beans</td>
</tr>
<tr>
<td>Potassium</td>
<td>29%</td>
<td>3 small bananas**</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>90%</td>
<td>6.6 oz. of sardines (about 15 sardines)</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>80%</td>
<td>1 cup of almonds</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>60%</td>
<td>1 lb. pork chops, broiled (about 3, 6-oz. chops)</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>30%</td>
<td>2 cups of cooked green beans</td>
</tr>
</tbody>
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“...similar amounts of calcium can be obtained from fortified rice, soy and almond milks, and fortified juices, but absorption of calcium is less efficient from plant beverages...vitamin D and potassium amounts vary across these milk alternatives” (DGAC 2015)
Recommended dairy substitutes not always practical in terms of meals and quantities

“… 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.”

… and not widely consumed

2010 Dietary Guidelines Advisory Committee Report. Appendix E3.6
Adequate dairy intake projected to reduce health care costs

• U.S.
  Potential for more than $214 U.S. billion in health care cost savings over 5 years by increasing dairy to 3 to 4 servings per day\(^1\)

• Australia
  Estimated cost of direct health care spending attributable to low dairy product consumption in 2010–2011 was AUD$2.0 billion [U.S. equivalent of $2.1 billion]\(^2\)

\(^1\)McCarron and Heaney. Am J Hypertension 2004; 17:88-97
\(^2\)Doidge et al. J Nutr 2012: doe:10.3945/jn.111.154161
Systematic approach to evaluating nutrition and food systems sustainability is required

Need to think systemically!
- Across different domains of a food system
- Farm to consumer to farm
- Multiple food and nutrition systems (not one diet nor one farm system!)

Nascent research
- Limited number of studies
- Inconsistent or nuanced
- Trade-offs among the domains of sustainability will likely have to be made.
- Focusing on the environmental footprint of food as the sole standard for sustainable food patterns may run counter to human nutritional needs.
Policy created with limited data could produce unintended consequences
Thank you