Local and Regional Food Systems in Sustainable Diets

Nicole Tichenor Blackstone, Ph.D.
Assistant Professor
Division of Agriculture, Food and Environment
Friedman School of Nutrition Science and Policy
Tufts University
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Figure 2: Environmental impacts of the healthy diet patterns in the 2015–20 Dietary Guidelines for Americans for a 2000 kcal per day diet

The diet pattern with the highest impact in each category is 100% and impacts of other diet patterns are relative to it. MED = healthy Mediterranean-style. US = healthy US-style. VEG = healthy vegetarian.

Blackstone, et al., *in press*
Three perspectives

(Garnett 2014, *J Clean Prod*)

Demand restraint

Efficiency oriented

Food systems transformation

“the problems we face are socio-economic rather than simply technical or a consequence of individual decisions. Environmental sustainability can only be achieved through structural change” (pg. 13)
What is “local” or “regional”?

- Distance or geography

- Marketing channel
  - Direct
  - Intermediated

- Perceived attributes (Johnson et al. 2013)
  - Improved food quality and/or safety
  - Sourced from small-scale farms
  - Fair, just, ecologically friendly

- Regional includes local, but larger and more comprehensive (Clancy and Ruhf, 2010)
State of local and regional in US

Approximately 8% of farms are using direct and intermediated channels

Total local food sales (2012): $6.1 B

- Most (about 70%) are through intermediated channels
- 51% produce, about 30% animal products

Low et al. 2015, *Trends in U.S. Local and Regional Food Systems*
How might local and regional food systems contribute to sustainable diets?

Economic viability

Access & health

Environment
Economic viability: farms

Higher net revenue for local versus mainstream chains (King et al. 2010)

Higher survival rates for farms using direct marketing, across scales (Low et al. 2015)

Table 5
Business survival rates 2007-12 by initial farm size and marketing arrangement

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<tr>
<td>$1-9,999</td>
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<tr>
<td>Survival rate, 2007-12</td>
<td>0.453</td>
<td>0.549***</td>
<td>0.416</td>
<td>0.507***</td>
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<td>Observations</td>
<td>484,211</td>
<td>51,535</td>
<td>177,392</td>
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<td>$10,000-49,999</td>
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<tr>
<td>Survival rate, 2007-12</td>
<td>0.581</td>
<td>0.667***</td>
<td>0.521</td>
<td>0.611***</td>
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<td>Observations</td>
<td>268,758</td>
<td>23,729</td>
<td>68,053</td>
<td>7,647</td>
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<td>$50,000-249,999</td>
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<td>Survival rate, 2007-12</td>
<td>0.656</td>
<td>0.738***</td>
<td>0.593</td>
<td>0.649***</td>
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<td>Observations</td>
<td>194,563</td>
<td>11,270</td>
<td>35,364</td>
<td>2,661</td>
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<td>$250,000+</td>
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<tr>
<td>Survival rate, 2007-12</td>
<td>0.728</td>
<td>0.791***</td>
<td>0.66</td>
<td>0.704***</td>
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<td>Observations</td>
<td>178,515</td>
<td>5,460</td>
<td>27,115</td>
<td>800</td>
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<td>All</td>
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</tr>
<tr>
<td>Survival rate, 2007-12</td>
<td>0.553</td>
<td>0.609***</td>
<td>0.474</td>
<td>0.543***</td>
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<td>Observations</td>
<td>1,126,047</td>
<td>91,984</td>
<td>307,924</td>
<td>33,278</td>
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</tbody>
</table>

Notes: Asterisks denote rejection of the null hypothesis that the difference in means is zero at the (*) 10%; (**) 1%; and (***) 0.1% statistical significance levels. Sample includes all operations with positive sales in 2007. The survival rate is defined as the share of 2007 Census respondents with positive sales who reported positive sales in the Census in 2012.

Economic viability

Market access for small and midscale producers

302 food hubs in US

46% of hubs (n = 66) of a hub’s producers and suppliers are considered beginning farmers or businesses, meaning they began business in the last 10 years (see page 21).

89% of hubs (n = 89) source mostly or exclusively from small to mid-sized farms and ranches (see page 23).

68% of hubs (n = 89) report that that their purchases from small to mid-sized farms have increased over the life of the hub (see page 23).

Hubs are primarily sourcing from rural farms and ranches — 86% of farms supplying food hubs are rural (n = 95; see Figure 30).

82% of hubs say increasing small and mid-sized farmers’ and ranchers’ access to markets is strongly related to their mission (n = 129).

82% of hubs say ensuring producers and suppliers receive a fair price is related to their mission (n = 128).

Colasanti et al., 2018, 2017 National Food Hub Survey
Access and health: F&V

Produce prices may be lower at farmers markets than retail, on average (Low et al. 2015)

Local food interventions have increased F&V consumption in elementary schools, willingness to try and like F&V in preschool (Graziose and Ang, 2018; Izumi et al. 2015)
Environment

Transportation

Farming: beef in the Northeast example

System-level issues: produce example
Transportation

• In some cases, transportation footprint *increases* with local (Low et al. 2015; Nicholson et al. 2015)
  • *Lower fuel efficiency per unit product* (King et al. 2010)

• Regional may offer efficiency advantages relative to local (Nicholson et al. 2015)

• At the same time...
Figure 1. Average weekly household GHGEs per SAE by supply chain stage. (n = 4723 households).

Figure 1, Boehm et al., 2018
Beef in the Northeast example

Consumer interest in local meat

Cultural and economic significance of dairy in region

Dairy sector: produces milk and beef

- Lower footprint in multiple dimensions compared to regional grass-fed, lower land use than US conventional (Tichenor et al. 2017)
- But, high reliance on corn-based feeds
Beef in the Northeast example

A food waste solution?

• Can create high-energy feed from retail food waste (Froeschel et al. 2014)
• Potential supply: 1.1 B kg yr\(^{-1}\) (Buzby et al. 2014)
• CT, MA, RI, VT, NYC landfill bans
  • *Competition with anaerobic digesters, which produce bioenergy*

What happens if we feed food waste to cattle instead of an anaerobic digester?
Net benefits of shifting food waste to feed

Blackstone et al., in prep
Northeast beef

“Leftovers” approach for regional beef in the Northeast likely has environmental benefits

• Recycling food waste into feed should be prioritized, after reduction and recovery

Feasibility needs to be assessed

• Markets, logistics, policies, innovation (ReFED 2016)
• Additional species
Environment: system-level issues

Increasing fruit and vegetable consumption as part of sustainable diets...

• Leafy greens: 95% from CA and AZ
• Broccoli: 92% from CA
• Celery: 95% from CA
• Garlic: 100% from CA
• Processing tomatoes: 94% from CA
• Strawberries: 79%
• Grapes: 89%
Water use impact of F&V

Blackstone, et al., *in press*
Environment: system level

Increasing production in current production centers may exacerbate water stress

Geographically concentrated production increasingly vulnerable with climate change

Local and regional as potential mechanisms
Questions

How do we further integrate the potential contributions of local and regional food systems into sustainable diets research in meaningful ways?

Role in circular economies?

Social and cultural potential?

Resilience?

Other structural issues?
Conclusion
Economic viability: communities

Examples of positive, in many cases small, economic impacts

Broad conclusions not yet possible (Low et al. 2015)

• Lack of national data
• Methodological limitations
Image: Niles et al. 2017
How do we measure sustainable diets?

113 studies in final review
• 71 included GHGs
• 18 included local or seasonal
• “Food miles” or seasonality of production

A Systematic Review of the Measurement of Sustainable Diets

Andrew D Jones, Lesli Hoey, Jennifer Blesh, Laura Miller, Ashley Green, and Lilly Rink Staples

School of Public Health and Natural Resources and Environment, and College of Architecture and Urban Planning, University of Michigan, Ann Arbor, MI

ABSTRACT
Sustainability has become an integral consideration of the dietary guidelines of many countries in recent decades. However, a lack of clear metrics and a shared approach to assessing the multiple components of sustainable diets has hindered progress toward generating the evidence needed to ensure the credibility of new guidelines. We performed a systematic literature review of empirical research studies on sustainable diets to identify the components of sustainability that were measured and the methods applied to do so. Two independent reviewers systematically searched 11 databases and other sources with the use of a uniform set of search terms. In total, 113 empirical studies were included in the final review. Nearly all of the studies were focused on high-income countries. Although there was substantial homogeneity in the components of sustainability measured, the estimated greenhouse gas emissions (GHGEs) of various dietary patterns were by far most commonly measured (n = 71 studies). Estimating the GHGEs of foods through various stages of production, use, and recycling with the use of the Life Cycle Assessment approach was the most common method applied to measure the environmental impacts of diets (n = 40 studies). Many components of sustainable diets identified in existing conceptual frameworks are disproportionately underrepresented in the empirical literature, as are studies that examine consumer demand for sustainable dietary alternatives. The emphasis in the literature on high-income countries also overlooks the production and dietary alternatives most relevant to low- and middle-income countries. The proposed 3 methodological and measurement approaches to how diet is measured and how it is measured to more completely to the existing multidimensional, multiscale conceptual framing of sustainable diets. Adv Nutr 2016;7:611–64.

Keywords: sustainable diets, sustainability, food systems, dietary patterns, dietary guidelines

Introduction
The concept of a “sustainable diet” was proposed more than 3 decades ago in reference to a diet that adheres to dietary guidelines for maintaining long-term health while simultaneously avoiding excessive degradation and consumption of natural resources (1). Expanding on this conceptualization, in 2010, a group of international experts proposed the following definition: “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.” (2). This definition includes 10 different components and numerous additional subcomponents (3, 4). Many of these elements require further disaggregation to fully understand the complexity that each encompasses (e.g., “protective of ecosystems” may include protection of multiple ecosystem goods and services, including genetic resources, nutrient cycling, provision of habitat, regulation of pests and disease, and aesthetic values). Nonetheless, this broad definition provides a useful conceptual framework for situating the multiple components of sustainability. The breadth and generality of the framework, however, do not allow for easy translation of these components into operationalized metrics of sustainable diets. However, the need for well-defined, interdisciplinary metrics of the sustainability of diets is increasingly clear. Sustainability has recently become an integral consideration of the dietary guidelines of many European countries and more recently in Brazil and Qatar (5–9). Numerous governmental, nongovernmental, multilateral, and research institutions

Jones et al. 2016 Adv Nutr
Reflections on local and regional food systems

“...local food systems can help to create a diversity of organizational forms (new markets and networks) that have a high degree of flexibility (latitude to accommodate change)...These new food systems emerge from the creation of new relationships between producers and consumers, with support from educators, policy makers and community leaders. These systems are decentralized and rooted in particular places and communities.”

(Hendrickson, 2015, J Environ Stud Sci)
Reflections on local and regional food systems

“An ideal regional food system describes a system in which as much food as possible to meet the population’s food needs is produced, processed, distributed, and purchased at multiple levels and scales within the region, resulting in maximum resilience, minimum importation, and significant economic and social return to all stakeholders in the region”

(Clancy and Ruhf, 2010, *Choices*)
Very small, but growing

Figure 1
Increase in local & regional marketing channels

Since 2007, growth in--

- Farmers’ markets (2014)
- Regional food hubs (2014)
- School Districts with farm to school programs (2011-12 school year)

Percent change

Sources: USDA, Agricultural Marketing Service, Food Nutrition Service; National Farm to School Network.

Low et al. 2015
Access and health: F &V

Community gardening and direct-to-consumer associated with greater FV consumption in some states (Barnidge et al. 2013; Jilcott Pitts et al. 2014)

Local food interventions have increased F&V consumption in elementary schools, willingness to try and like F&V in preschool (Graziose and Ang, 2018, Prev Chronic Dis; Izumi et al. 2015, J Acad Nutr Diet)
Access and health: F & V

Prices of some produce items tend to be lower, on average at farmers markets compared to retail outlets (Low et al. 2015)

Farmers markets may increase access but cannot assume this effect is equal across high vs low-income and white vs non-white communities (Lowery et al. 2016)