Local and Regional Food Systems in Sustainable Diets

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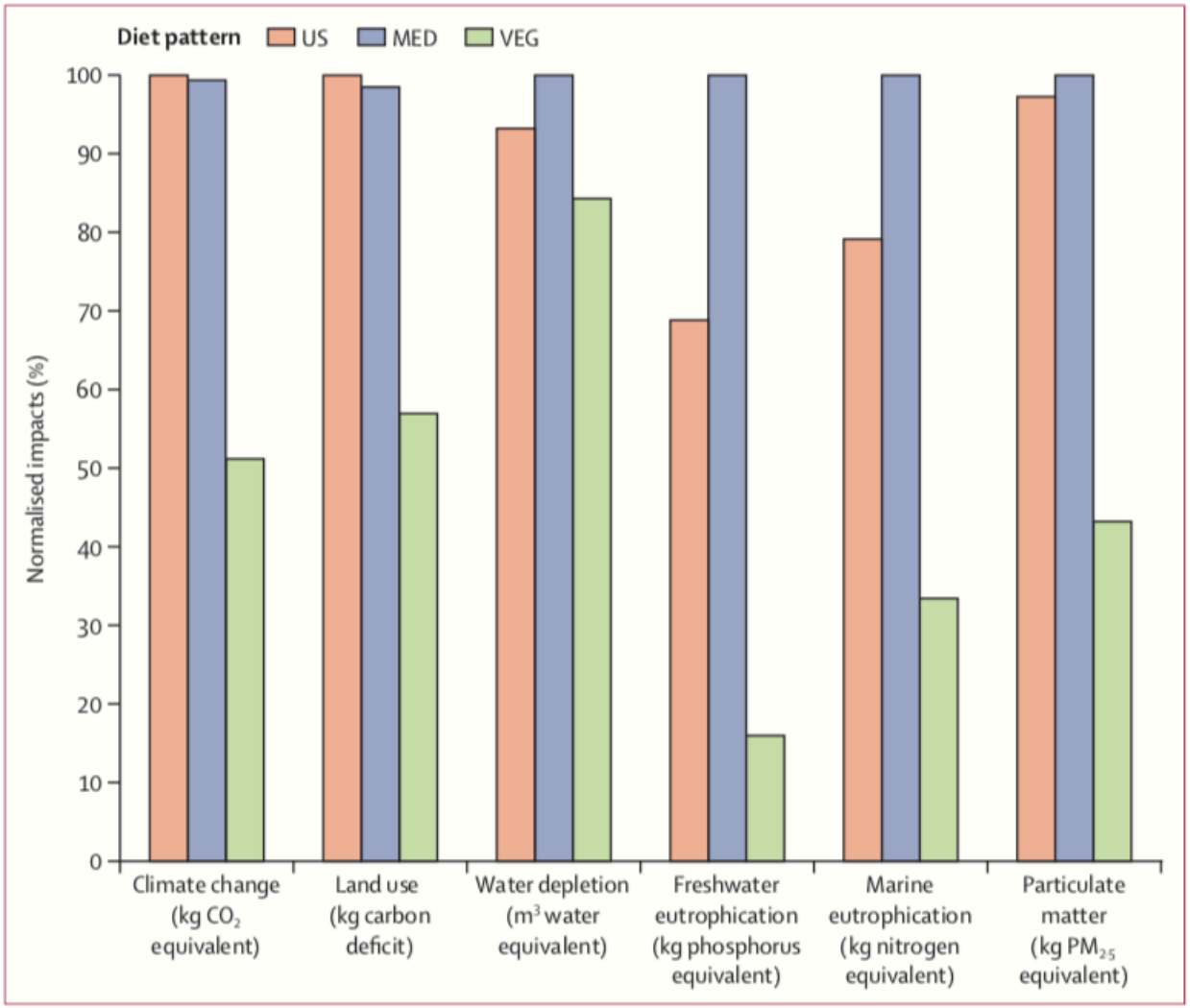


***Figure 2*: Environmental impacts of the healthy diet patterns in the 2015–20 Dietary Guidelines for Americans for a 2000 kcal per day diet**

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

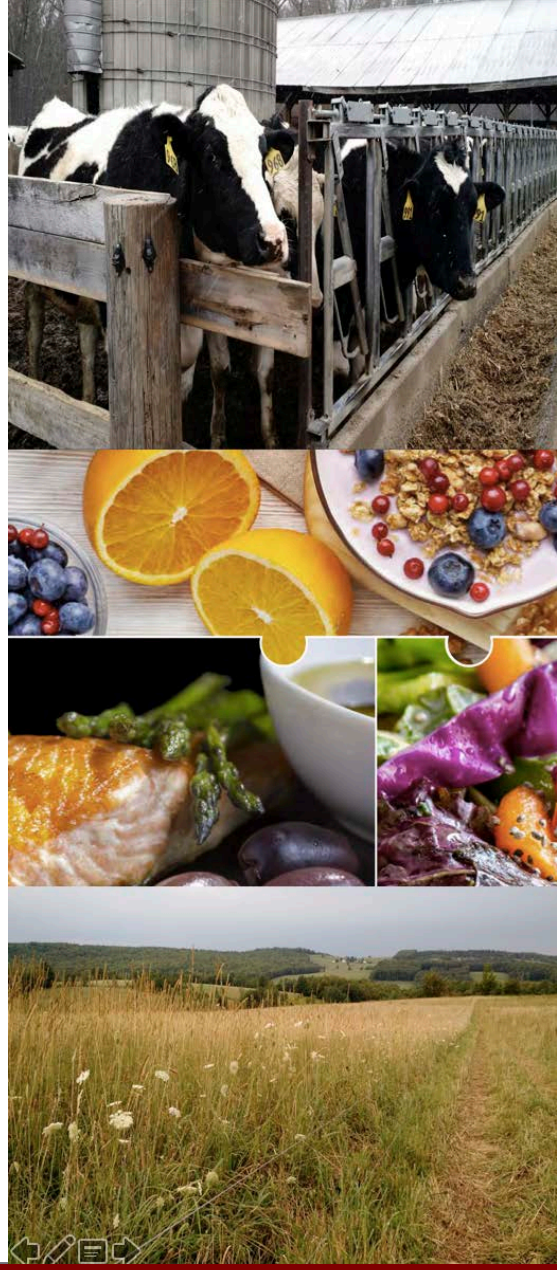
Low et al. 2015, *Trends in U.S. Local and Regional Food Systems*

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

	All operations		Beginning farmer in 2007	
2007 sales category	No direct sales in 2007	Direct sales in 2007	No direct sales in 2007	Direct sales in 2007
$1-9,999				
Survival rate, 2007-12	0.453	0.549***	0.416	0.507***
Observations	484,211	51,535	177,392	22,170
$10,000-49,999				
Survival rate, 2007-12	0.581	0.667***	0.521	0.611***
Observations	268,758	23,729	68,053	7,647
$50,000-249,999				
Survival rate, 2007-12	0.656	0.738***	0.593	0.649***
Observations	194,563	11,270	35,364	2,661
$250,000+				
Survival rate, 2007-12	0.728	0.791***	0.66	0.704***
Observations	178,515	5,450	27,115	800
All				
Survival rate, 2007-12	0.553	0.609***	0.474	0.543***
Observations	1,126,047	91,984	307,924	33,278

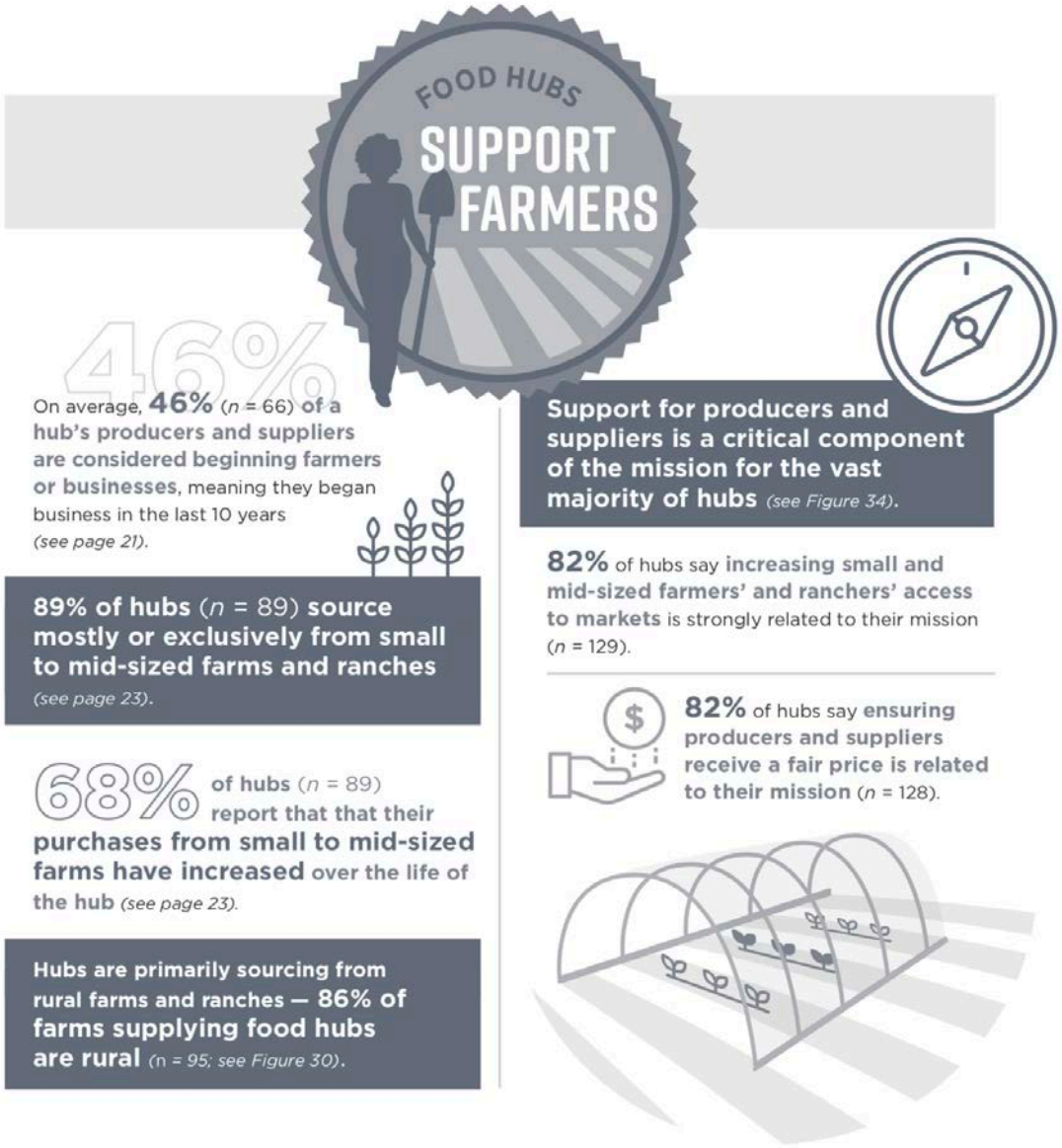
Notes: Asterisks denote rejection of the null hypothesis that the difference in means is zero at the (*) 10%; (**) 1%; and (***) 0.1% statistical significance levels. Sample includes all operations with positive sales in 2007. The survival rate is defined as the share of 2007 Census respondents with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

Source: USDA, NASS, Census of Agriculture, 2007, 2012.

Economic viability

Market access for small and midscale producers

302 food hubs in US



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…

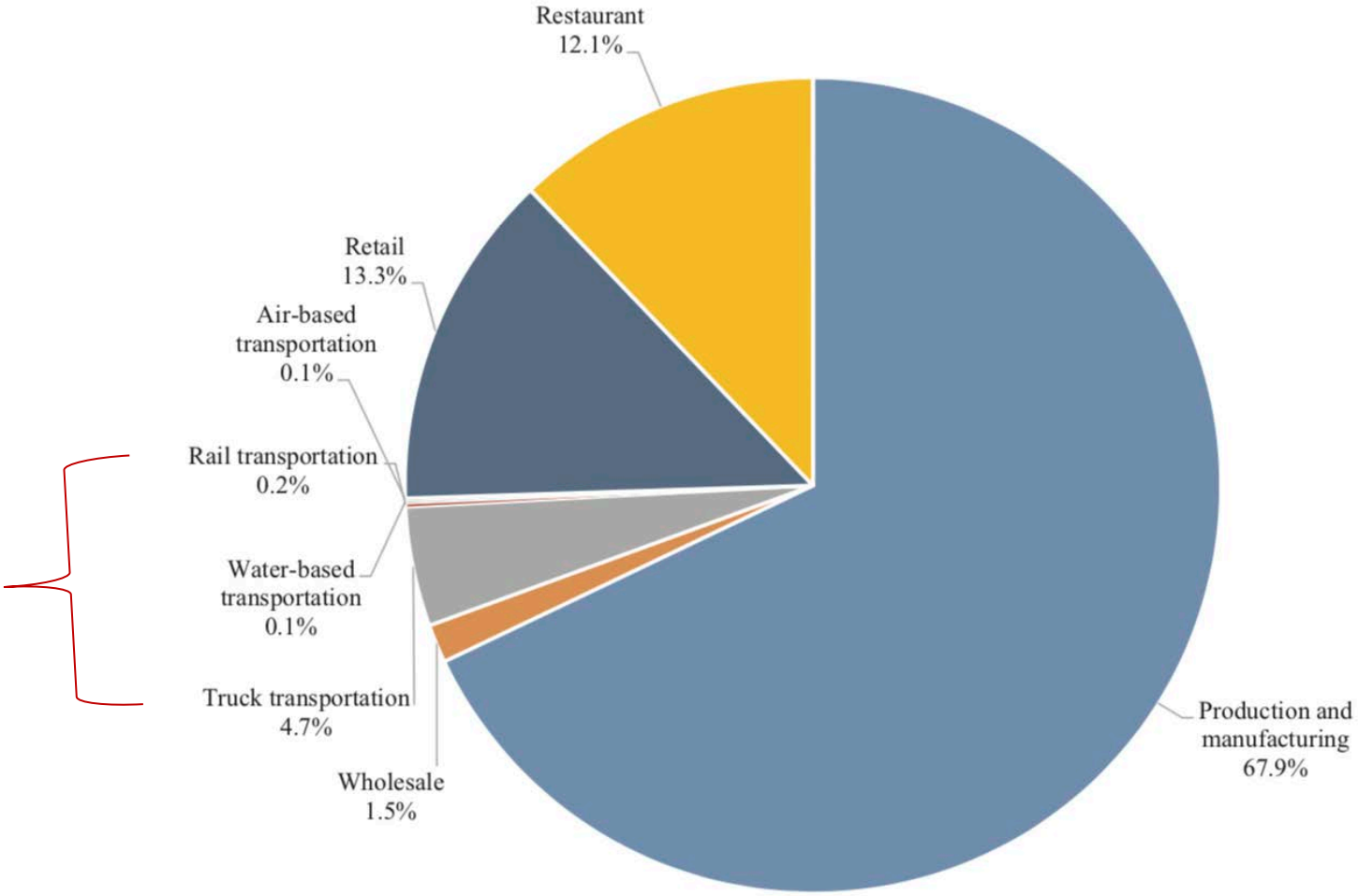


Fig. 1. Average weekly household GHGEs per SAE by supply chain stage. (n = 4723 households).

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*

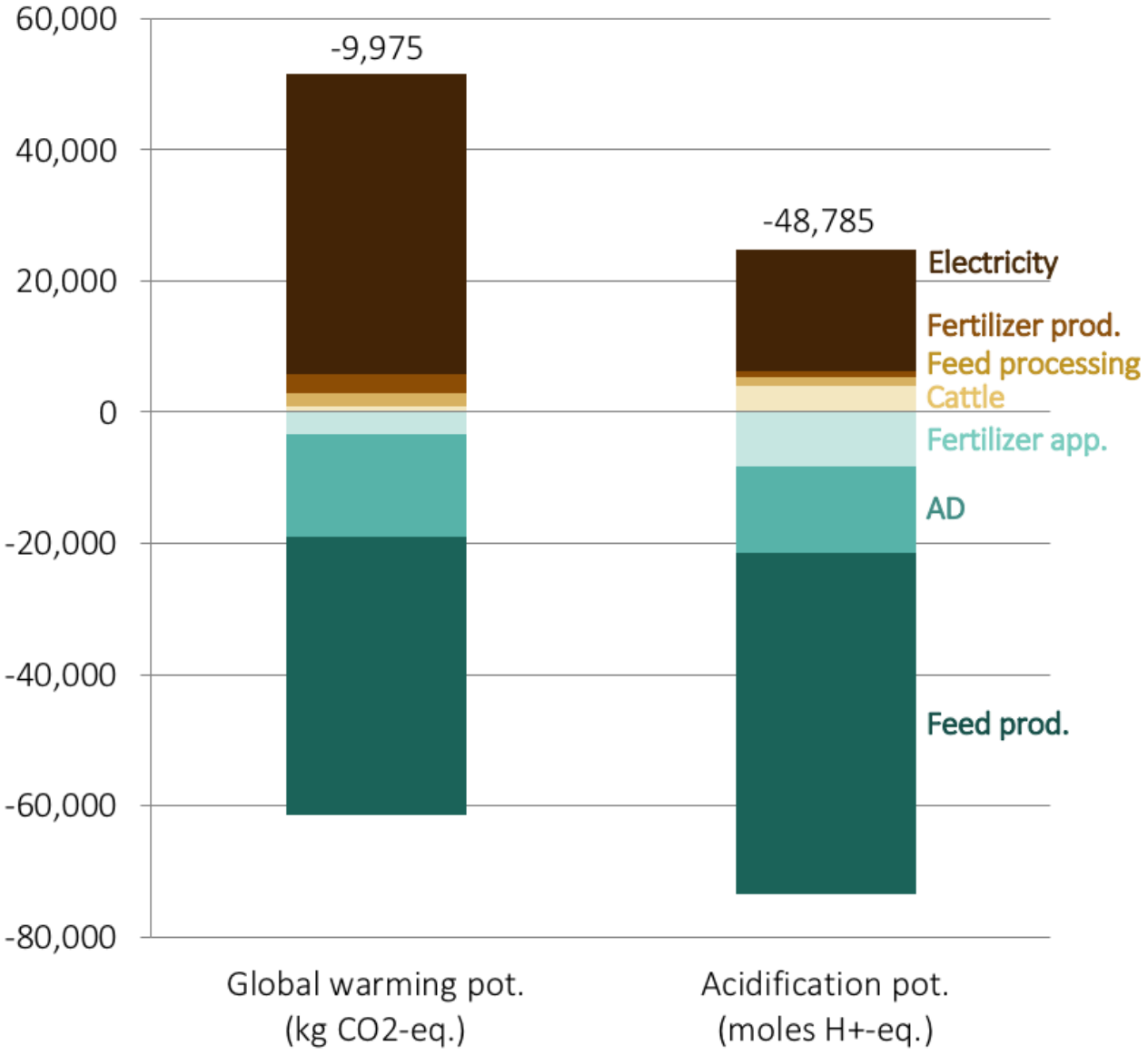
Beef in the Northeast example

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

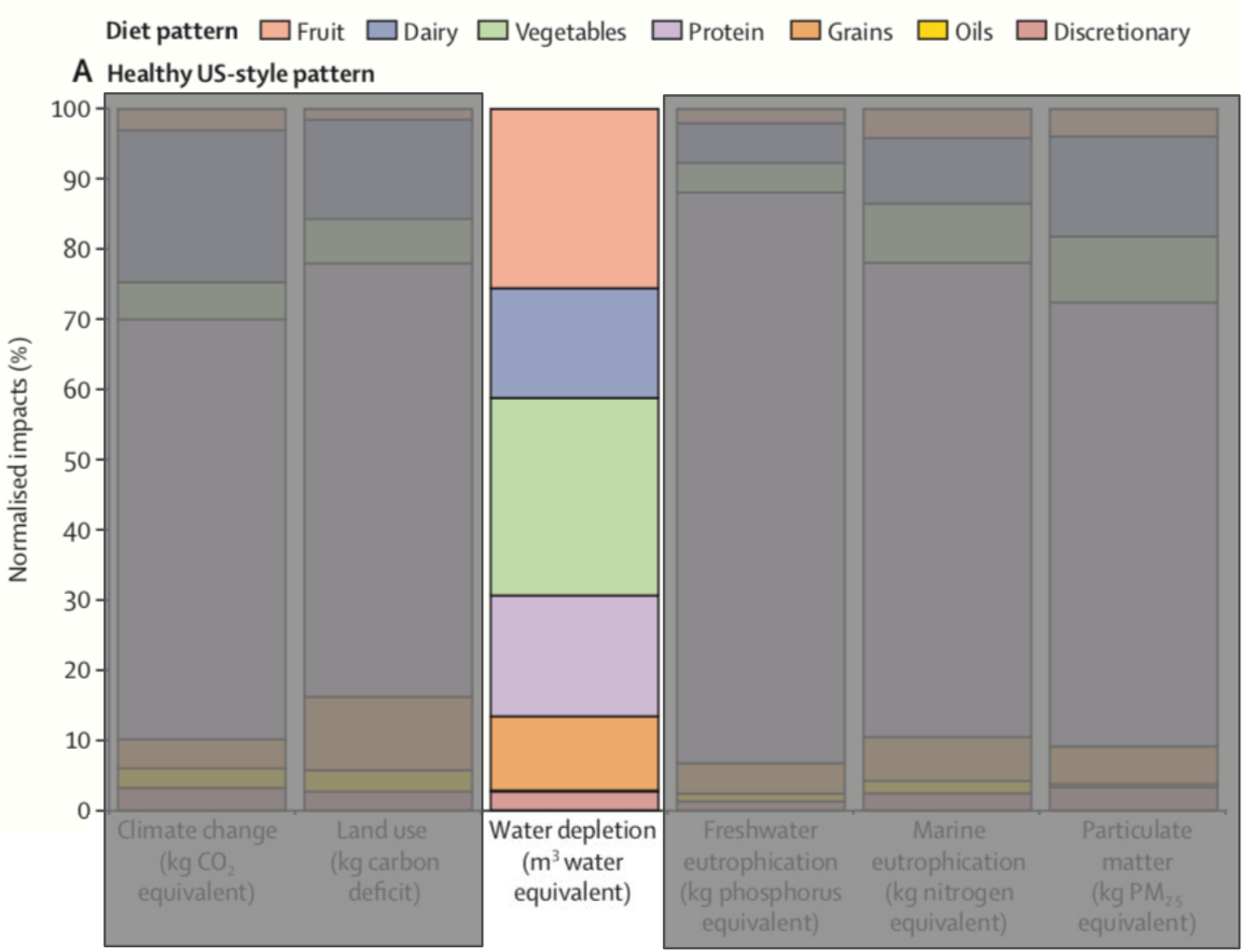
- Markets, logistics, policies, innovation (ReFED 2016)
- Additional species

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 the potential contributions of local and regional food systems into sustainable diets research in meaningful ways?

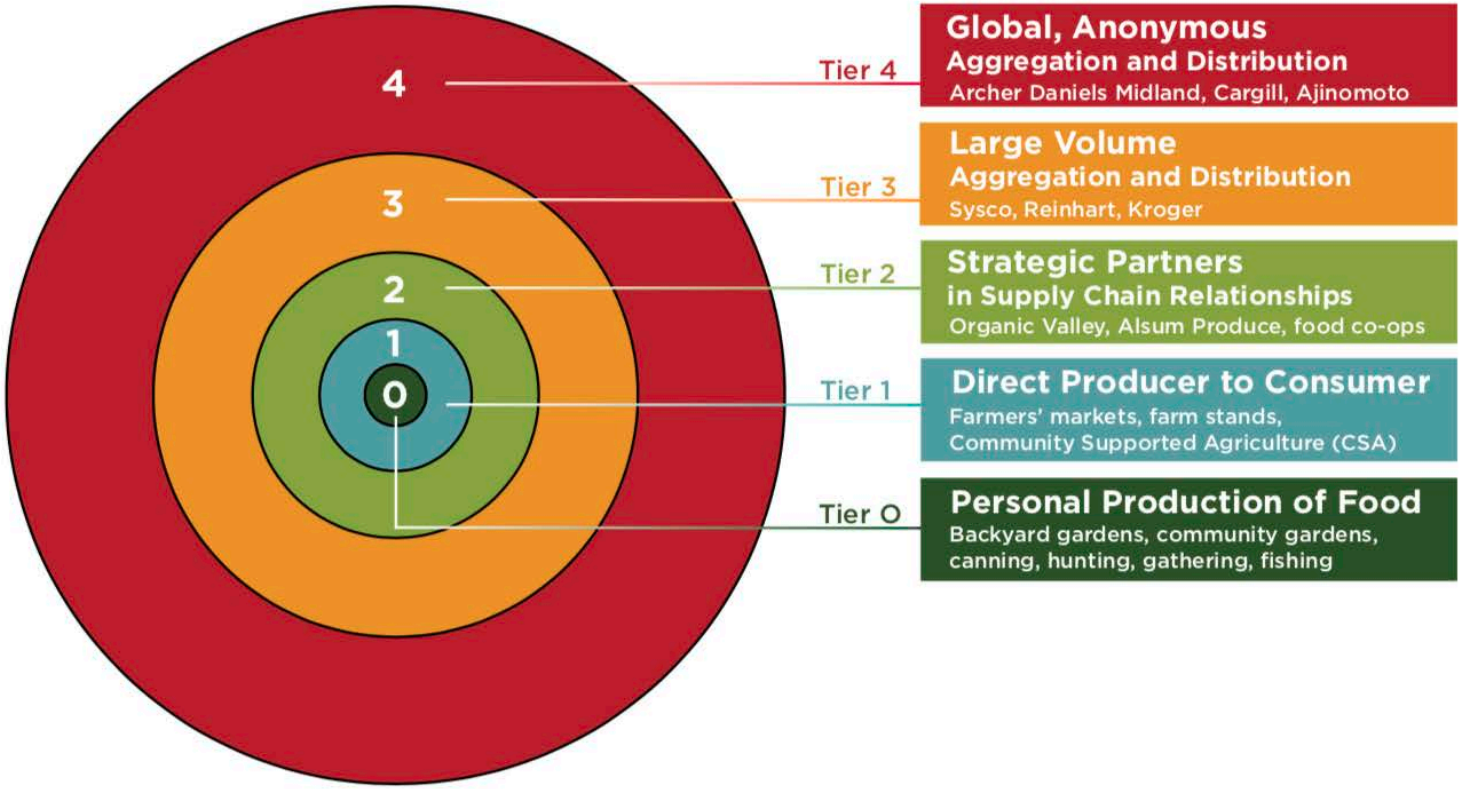
Role in circular economies?

Social and cultural potential?

Resilience?

Other structural issues?

Conclusion



UW-Madison Center for Integrated Agricultural Systems, 2010

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*

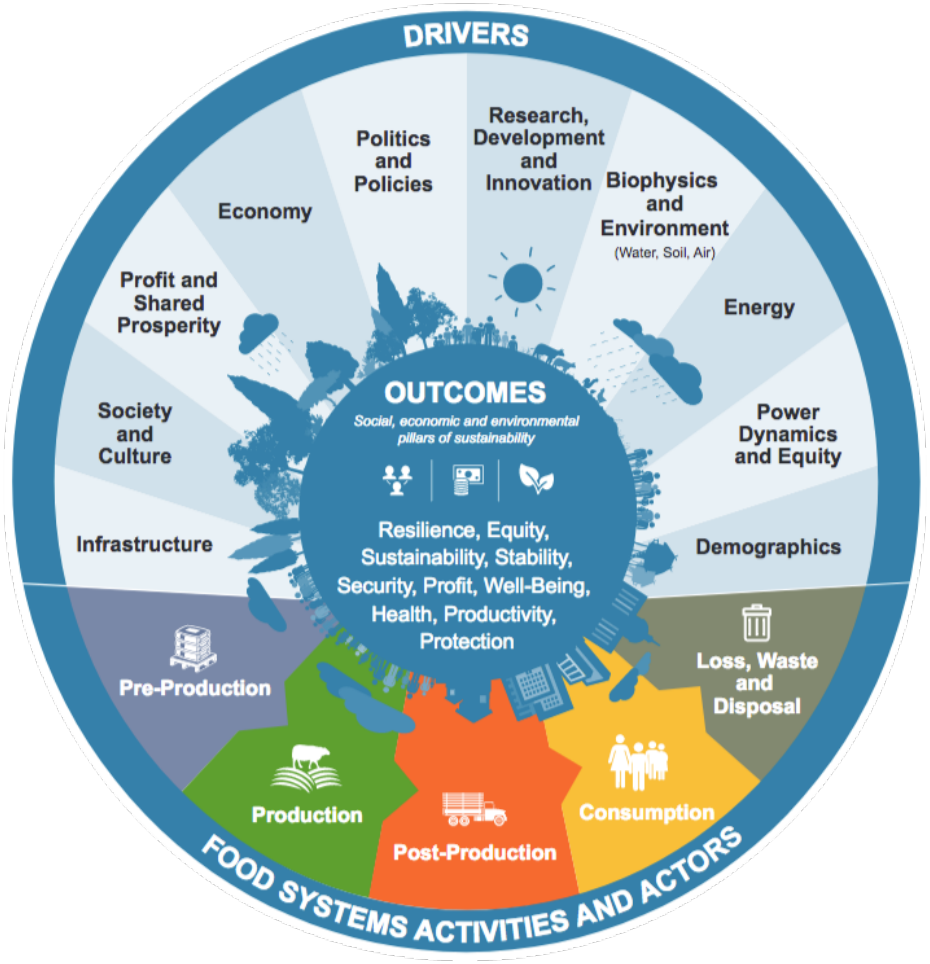


Image: Niles et al. 2017

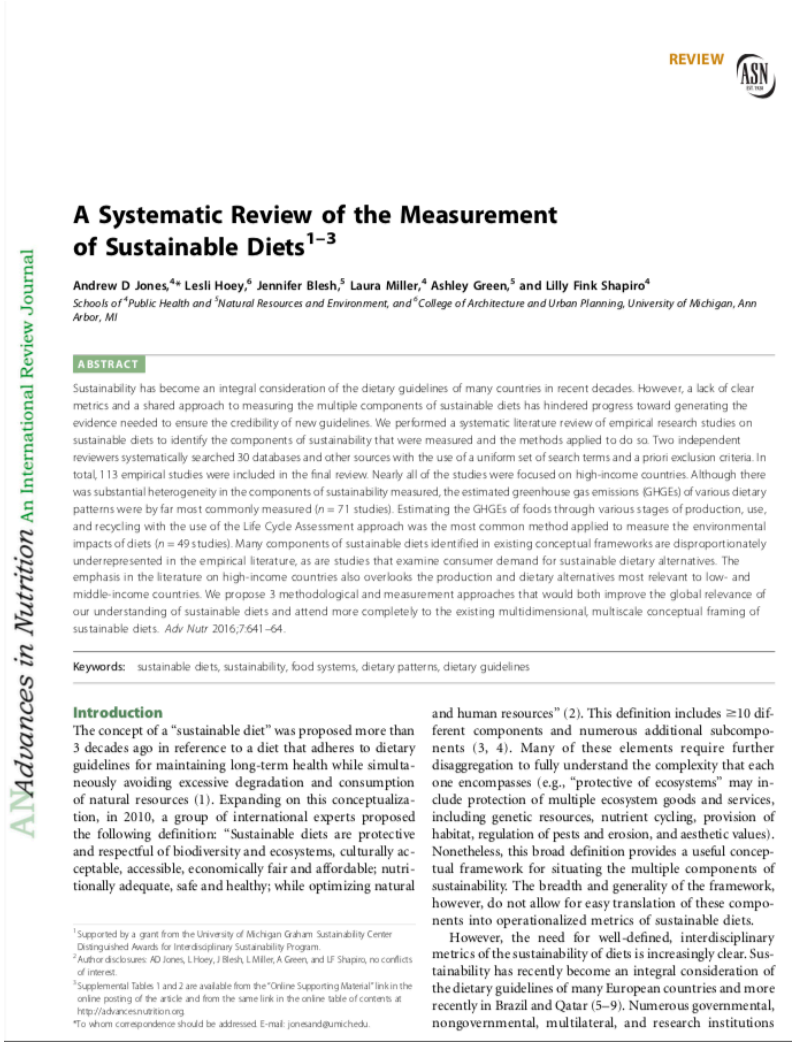
Food systems perspective

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*

Jones et al. 2016 *Adv Nutr*



REVIEW

AN Advances in Nutrition An International Review Journal

A Systematic Review of the Measurement of Sustainable Diets[1–3]

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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 measuring 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 30 databases and other sources with the use of a uniform set of search terms and a priori exclusion criteria. 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 heterogeneity 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 ($n = 49$ 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. We propose 3 methodological and measurement approaches that would both improve the global relevance of our understanding of sustainable diets and attend more completely to the existing multidimensional, multiscale conceptual framing of sustainable diets. *Adv Nutr* 2016;7:641–64.

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 one 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 erosion, 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

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[3] Supplemental Tables 1 and 2 are available from the "Online Supporting Material" link in the online posting of the article and from the same link in the online table of contents at http://advances.nutrition.org.
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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*)

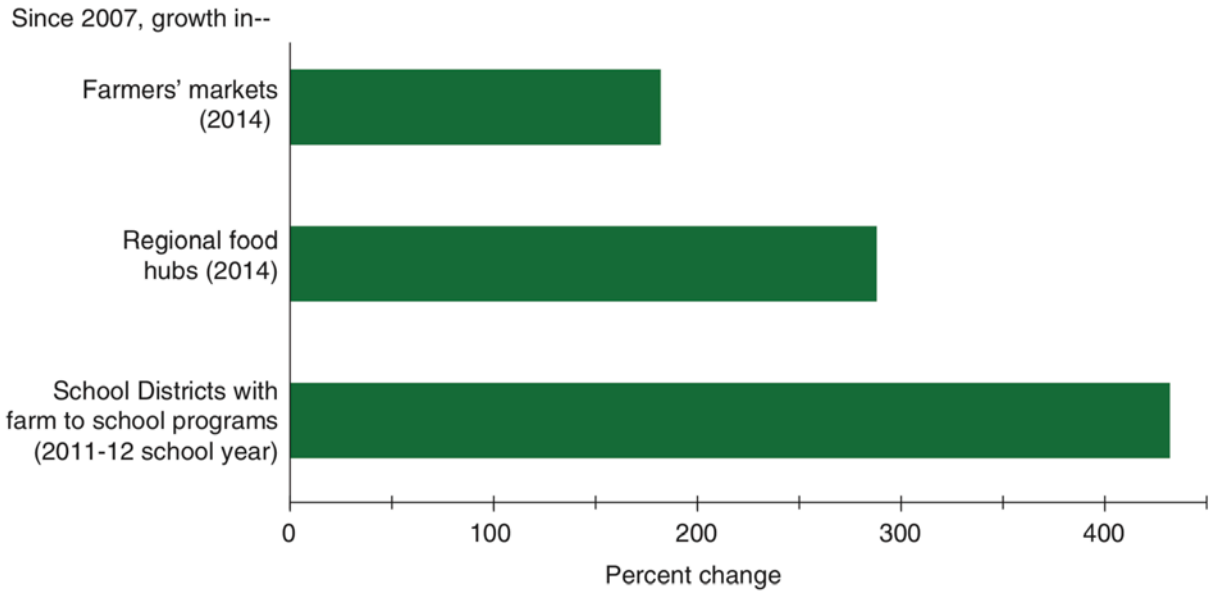
Reflections on local and regional food systems

"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



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)