Journal of Agriculture, Food Systems, and Community Development

Volume 9, Issue 2
Winter 2019–2020

JAFSCD
www.FoodSystemsJournal.org
ISSN 2152-0801 (online only)

Published by the Thomas A. Lyson Center for Civic Agriculture and Food Systems with the support of:

Johns Hopkins Center for a Livable Future
KPU Kwantlen Polytechnic University
The University of Vermont
CEFS
Clemson University College of Behavioral Social Health Sciences

and the members of the JAFSCD Shareholder Consortium

Journal of Agriculture, Food Systems, and Community Development

Published by the Thomas A. Lyson Center for Civic Agriculture and Food Systems, a project of the Center for Transformative Action, with the support of our institutional sponsors:

The *Journal of Agriculture, Food Systems, and Community Development,* ISSN 2152-0801 (online only), is published quarterly (Summer, Fall, Winter, Spring) with occasional supplements by the Thomas A. Lyson Center for Civic Agriculture and Food Systems, a project of the Center for Transformative Action (a nonprofit affiliate of Cornell University). Journal office: 295 Hook Place, Ithaca, NY 14850 USA.

JAFSCD is open access through the support of our annual partners, our university and college program shareholders, library shareholders, individual shareholders, and nonprofit and foundation shareholders. Our transition to open access was supported by a grant from the W.K. Kellogg Foundation. Learn more about how to support the broad distribution of research published in JAFSCD at http://www.LysonCenter.org.

Permanent link for this entire issue: https://doi.org/10.5304/jafscd.2019.092.024

JAFSCD Reviewers

Paivi Abernethy, U of Waterloo (Canada)
Shivaugn Ahern, Independent consultant (Costa Rica)
Graham Ambrose, U of Minnesota (USA)
Colin Anderson, Coventry U (UK)
Molly Anderson, Middlebury College (USA)
Anna AndersonLazo, Rural Coalition (USA)
Wandra Arrington, Alcorn State U (USA)
Sandip Banerjee, Mansarovar Global U (India)
Kelsey Barale, Midwest Organic Services Association (USA)
Ricardo Barbosa Jr, U of Calgary (Canada)
Jim Barham, USDA (USA)
Benjamin Bartley, Penn State U (USA)
Karen Bassarab, Johns Hopkins Center for a Livable Future (USA)
Mark Bauermeister, Foothill College (USA)
Allison Bauman, Colorado State U (USA)
Jody Beck, U of Colorado Denver (USA)
Florence Becot, Ohio State U (USA)
Alissa Bilfield, U of Arizona (USA)
Nicole Tichenor Blackstone, Tufts U (USA)
Rebecca Boehm, Union of Concerned Scientists (USA)
Ellie Bomstein, Independent advocate (USA)
Ramón Borges-Méndez, Clark University (USA)
Becky Bowen, North Carolina State Extension (USA)
Ariadne Brancato, U of Washington (USA)
Christy Brekken, Oregon State U (USA)
Mladen Brnčić, U of Zagreb (Croatia)
Laura Brown, U of Connecticut Extension (USA)
Lyndi Buckingham-Schutt, Drake U (USA)
Rachael Budowle, U of Wyoming (USA)
William Butler, Florida State U (USA)
Janette Byrd, Oregon State U (USA)
Larissa Calancie, U of North Carolina (USA)
Catherine Campbell, U of Florida (USA)
Christopher Cane, Green Village Initiative (USA)
Michelle Carnegie, U of New England (USA)
Megan Carney, U of Arizona (USA)
Kuo-Liang Chang, USDA (USA)
Jill Clark, The Ohio State U (USA)
Frederick Clerson, U of Arkansas (USA)
Nevin Cohen, CUNY School of Public Health (USA)
Sean Connelly, U of Otago / Te Whare Wananga o Otago (New Zealand)
David Conner, U of Vermont (USA)
Amy Coplen, Portland State U (USA)
Christine Costello, U of Missouri–Columbia (USA)
Sarah Cramer, Stetson U (USA)
Amy Crone, USDA (USA)
Miranda Dafoe, Salesforce (USA)
Tom Daniels, U of Pennsylvania (USA)
Juliana de Groot, U of North Carolina at Chapel Hill (USA)
Laura De Los Santos, St. Augustine College, Field Museum (USA)
Michelle Deckard, Fairbanks Economic Development Corporation (USA)
Alia DeLong, U of Florida (USA)
Bessie DiDomenica, Walden U (USA)
Carolyn Dimitri, New York U (USA)
Megan Donovan, U of Florida (USA)
Michael Dougherty, Illinois State U (USA)
Steven Dukeshire, Dalhousie U (Canada)
Rebecca Dunning, North Carolina State U (USA)
Shelley Dyer, Tenderloin Neighborhood Development Corp. (USA)
Jeanette Eckert, U of Toledo (USA)
Hamid El Bilali, Mediterranean Agronomic Institute of Bari (CIHEAM-MAIB) (Italy)
Regan Emmons, Utah State U (USA)
Jason Entsminger, U of Missouri (USA)
Anna Erwin, Purdue U (USA)
Mark Estep, Freedom Gardens (USA)
James Farmer, Indiana U (USA)
Cathy Farnworth, Pandia Consulting (USA)
David Fazzino, Bloomsburg U of Pennsylvania (USA)
Melissa Fernandez Arrigoitia, London School of Economics (UK)
Paula Fernández-Wulff, U of Louvain (Belgium)
John Fisk, Wallace Center at Winrock International (USA)
Jill Fitzsimmons, U of Massachusetts-Amherst (USA)
Sheila Fleischhacker, Georgetown Law (USA)
Devin Foote, W.K. Kellogg Foundation (USA)
Julia Freedgood, American Farmland Trust (USA)
Kathlee Freeman, CGIAR Research Program for Climate Change, Agriculture and Food Security (USA)
Russell Fricano, Minnesota State U Mankato (USA)
Vanessa Fry, Boise State U (USA)
Jasenka Gajdoš Kljusurić, U of Zagreb (Croatia)
Gilbert Gillespie, Harrisdale Homestead (USA)
Stephan Goetz, The Pennsylvania State U (USA)
Carol Goland, Ohio Ecological Food and Farm Association (USA)
Zachary Goldberg, Penn State U (USA)
Elisa Gonzalez, Community Science (USA)
Thomas Gray, USDA, RD, Cooperative Programs (USA) and U of Saskatchewan (Canada)
Arthur Green, Okanagan College (USA)
R. Bruce Gregory, Mitchell Bay Farm (USA)
Dominique Gumirakiza, Western Kentucky U (USA)
Clare Gupta, U of California, Davis (USA)
Eugenia Gusev, International Rescue Committee (USA)
John Guszkowski, CME Associates, Inc. (USA)
Lauren Gwin, Oregon State U (USA)
Nadra Hashim, Independent researcher (USA)
Neva Hasssanein, U of Montana (USA)
Lena Hatchett, Loyola U Chicago (USA)
Cassandra Hawkins, Mississippi Valley State U (USA)
Mary Hendrickson, U of Missouri (USA)
Johanna Herron, State of Alaska (USA)
Elizabeth Higgins, Cornell Cooperative Extension (USA)
Janie Hipp, Native American Agriculture Fund (USA)
Tia Ho, Portland State U (USA)
Lesli Hoey, U of Michigan (USA)
Brandon Hoover, Messiah College (USA)
Elizabeth Hoover, Brown U (USA)
Leslie Hossfeld, Clemson U (USA)
Sarah Huang, Purdue U (USA)
Sarah Hultine Massengale, MU Extension (USA)
Becca Jablonski, Colorado State U (USA)
Krista Jacobsen, U of Kentucky (USA)
Ann James,
Brandi Janssen, U of Iowa (USA)
Chelsea Johnson, Ohio Ecological Food and Farm Association (OEFFA) (USA)
Love Jonson, City of Portland (Oregon) Bureau of Planning and Sustainability; Persephone Farm (USA)
Anupama Joshi, Blue Sky Funders Forum (USA)
Mariam Kadzamira, International Food Policy Research Institute (USA)
Rick Kaye, Puma Springs Vineyards (USA)
Elizabeth Kendall, Manchester Community College (USA)
Geoff Kira, Massey U (New Zealand)
Uma Koirala, Tribhuvan U (Nepal)
Jane Kolodinsky, U of Vermont (USA)
Caroline Krejci, The U of Texas at Arlington (USA)
Asiyah Kurtz, Goucher College (USA)
Julia Laforge, Lakehead U (Canada)
Julia Lapp, Ithaca College (USA)
Laura Lavid, Sprout City Farms (USA)
Yi-Ming Law, The Food Trust (USA)
Megan Lehnerd, Framingham State U (USA)
Kristi Lekies, The Ohio State U (USA)
Charles Levkoe, Lakehead U (Canada)
Robin Lewis, Hobart and William Smith Colleges (USA)
Matt Lobley, U of Exeter (UK)
Bohdan Lojka, Czech U of Life Sciences Prague (Czech Republic)
Helena Lyson, U of California San Francisco (USA)
William Mala, U of Yaounde I (Cameroon)
Joseph Malual, U of Wisconsin Madison, Division of Extension (USA)
Christian Man, Penn State U (USA)
Ranjitsinh Mane, U of Arkansas at Pine Bluff (USA)
John Mann, Michigan State U (USA)
Lisa Markowitz, U of Louisville (USA)
Matthew Mars, The U of Arizona (USA)
Wende Marshall, Independent scholar (USA)
Jennifer Marshman, Wilfrid Laurier U (Canada)
Sarah Martin, Memorial U of Newfoundland (Canada)
Fally Masambuka-Kanchewa, The Ohio State U (USA)
Derek Masselink, British Columbia Public Service Agency (Canada)
Steven Masvaure, Human Sciences Research Council (South Africa)
Mahealani Matsuzaki, Kamehameha Schools (USA)
Todd Matthews, Cabrini U (USA)
Nathan McClintock, Portland State U (USA)
Scott McClure, Shenandoah U (USA)
Jared McGuirt, U of North Carolina–Greensboro (USA)
Joseph McIntyre, 10 Circles (USA)
Philip McNab, Johns Hopkins Bloomberg School of Public Health (USA)
Mahbubur Meenar, Rowan U (USA)
Bethann Merkle, Independent consultant (USA)
Steven Miller, Michigan State U (USA)
Farhad Mirzaei, Animal Sciences Research Institute of Iran (Iran)
Caitlin Misiaszek, Johns Hopkins Center for a Livable Future (USA)
Kelly Moore, U of Florida (USA)
Alfonso Morales, U of Wisconsin-Madison (USA)
Elizabeth Morgan, Macquarie U (Australia)
Caitlin Morgan, U of Vermont (USA)
Vicki Morrone, Michigan State U (USA)
Heidi Mouillesseaux-Kunzman, Cornell U (USA)
Phil Mount, Wilfrid Laurier U (Canada)
Darcy Mullen, Georgia Technical Institute (USA)
Kent Mullinix, Kwantlen Polytechnic U (Canada)
James Mwololo, International Crops Research Institute for the Semi-Arid Tropics (Malawi)
Joe Nasr, Ryerson U (Canada)
Taylor Nelsen, U of California, Davis (USA)
Lenore Newman, U of the Fraser Valley (Canada)
Eric Ngang, U of Birmingham (UK)
Jennifer Nicklay, U of Minnesota–Twin Cities (USA)
Kim Niewolny, Virginia Tech (USA)
Rebecca Nixon, Purdue U (USA)
Kimberly Norris, Encompass LLC (USA)
Josh O'Conner, Independent consultant (USA)
Lydia Oberholtzer, Penn State U (USA)
Fernando Ona, Tufts U School of Medicine (USA)
Maria Oria, National Academies of Sciences, Engineering, and Medicine (USA)
Philip Otienoburu, Self-Help Credit Union & Ventures Fund (USA)
Anne Palmer, Johns Hopkins U (USA)
Laxmi Pant, U of Guelph (Canada)
Francois Pelatan, AMAP/CIVAM Regional Network for Aquitaine (France)
Robert Perry, U of Kentucky (USA)
Ryan Pesch, U of Minnesota (USA)
John Phillips, American Indian Higher Education Consortium (AIHEC) (USA)
Greg Pillar, Queens U of Charlotte (USA)
Emily Piltch, Tufts U (USA)
Michael Pinto, NAC Architecture (USA)
Zoe Plakias, Ohio State U (USA)
Joanna Pollock, U of Arkansas (USA)
Christine Porter, U of Wyoming (USA)
Matthew Potteiger, Syracuse U (USA)
Alicia Powers, Alabama Cooperative Extension System (USA)
Madeleine Pullman, Portland State U (USA)
Mallory Rahe, Oregon State U (USA)
Md. Masud Parves Rana, Rajshahi U (Bangladesh)
Anne Randle, U of Georgia (USA)
Connie Ray, Hood College (USA)
Taylor Reid, The Culinary Institute of America (USA)
Henk Renting, International Network of Resource Centres on Urban Agriculture and Food Security (RUAF Foundation) (The Netherlands)
Kristin Reynolds, The New School (USA)
Suzana Rimac Brnčić, U of Zagreb (Croatia)

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.FoodSystemsJournal.org

Contents | Volume 9, Issue 2 / Winter 2019–2020

On our cover: Squid are loaded onto a conveyor belt by a Rhode Island fisherman. Rhode Island is fortunate to have a vibrant, year-round fishery steeped in tradition. The state's Port of Galilee is one of the largest commercial fishing ports on the East Coast of the U.S. and is home port to over 250 commercial fishing vessels, including the Eastern Seaboard's largest squid-fishing fleet. The Rhode Island Seafood Marketing Collaborative is engaged in a host of programs and activities aimed at fostering increased interest in and demand for local seafood products. See the article in this issue, Rhode Island Branding Program for Local Seafood: Consumer Perceptions, Awareness, and Willingness-to-Pay.

Photo by M. Stultz, Rhode Island Department of Environmental Management

continued

Reviews

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

The Thomas A. Lyson Center for Civic Agriculture and Food Systems, a project of the Center for Transformative Action (an affiliate of Cornell University), is grateful for the support of **JAFSCD's partners:**

JOHNS HOPKINS CENTER *for* A LIVABLE FUTURE

KPU KWANTLEN POLYTECHNIC UNIVERSITY

The University of Vermont

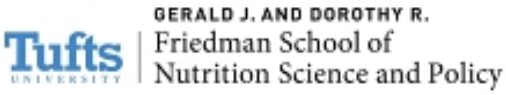
CEFS CENTER for ENVIRONMENTAL FARMING SYSTEMS NCSU | NCA&TSU | NCDA&CS

and the members of the **JAFSCD Shareholder Consortium**

Members of the JAFSCD Shareholder Consortium

Alaska Food Policy Council	**Northeast Sustainable Agriculture Research and Education (SARE)**
Alaska Pacific University	**Ohio State University** Initiative for Food and AgriCultural Transformation (InFACT) Discovery Theme
American Farmland Trust	**Oregon State University** Center for Small Farms & Community Food Systems
Arizona State University Food Systems Transformation Initiative	**Portland State University** Supply Chain Program
Center for Environmental Farming Systems	**Rural Coalition**

Chatham University Food Studies Program 	**Small Planet Fund** 
Chelsea Green Publishing 	**Soka University** Environmental Studies 
College at Brockport, State University of New York (SUNY) 	**Southern Sustainable Agriculture Working Group (SSAWG)** 
Colorado State University Agricultural and Resource Economics 	**Sustainable Agriculture Education Association (SAEA)** 
Coventry University (UK) Centre for Agroecology, Water & Resilience 	**Syracuse University** Falk College—offering a BS, MS, and Certificate of Advanced Studies in Food Studies 

Dalhousie University Rural Research Centre-Collaborative 	**Texas Center for Local Food** 
DePaul University Geography Department, Urban Development and Planning Concentration 	**Tufts University** Agriculture, Food and Environment 
Fair Food Network 	**Tuskegee University** Cooperative Extension Program 
First Nations Technical Institute 	**University at Buffalo, SUNY** Growing Food Connections, Food Systems Planning and Healthy Communities Lab 
Food Policy Council of San Antonio 	**University of Alaska Anchorage** 
Food Research, Enterprise, and Sustainability Hub (FRESH), Alaska	**University of Arizona** Center for Regional Food Studies 

Harrisdale Homestead (Atlantic, Iowa) Affiliated with the Wallace Foundation for Rural Research & Development	**University of Houston Downtown**
Indiana University Sustainable Food Systems Science	**University of Michigan** Sustainable Food Systems Initiative
INFAS—the Inter-institutional Network for Food, Agriculture, and Sustainability University of California Davis, Agricultural Sustainability Institute	**University of Southern Maine** Food Studies Program
Iowa State University Extension and Outreach Local Foods Program	**University of the District of Columbia** College of Agriculture, Urban Sustainability & Environmental Sciences
Johns Hopkins Center for a Livable Future	**University of Vermont** Food Systems

Kwantlen Polytechnic University Institute for Sustainable Food Systems	**University of Wisconsin-Madison** Center for Integrated Agricultural Systems
Lakehead University Centre for Sustainable Food Systems, Research and Engagement	**University of Wyoming** Food Dignity Project
Michigan State University Center for Regional Food Systems	**Vermont Law School** Center for Agriculture and Food Systems
Mississippi Valley State University Rural Public Policy and Planning Program	**W.K. Kellogg Foundation**
National Farm to School Network	**Wallace Center at Winrock International**

New Mexico State University Agricultural Economics and Agricultural Business	**Wayne State University** SEED Wayne
New York University Department of Nutrition and Food Studies	**WISE & Mino Bimaadiziwin partnership**

Library Shareholders

Agricultural Research Council (South Africa)
American University of Beirut (Lebanon)
Appalachian State University
Berea College°
California State Polytechnic University, Pomona°
Carleton University (Canada)
Chatham University
Chinese Academy of Agricultural Sciences (China)
Clemson University
Colorado State University
Columbia University
Cornell University
Emory University
Florida State University
Gettysburg College
Hampshire College
Harris-Stowe State University°
Harvard University & Harvard Business School
Indiana State University
Indiana University
Iowa State University
Johns Hopkins University*
Kenyon College
Kwantlen Polytechnic University*
Lakehead University (Canada)
Laval University | Université Laval (Canada)
Massachusetts Institute of Technology (MIT)
Memorial University of Newfoundland (Canada)
Michigan State University
Middlebury College
Minnesota State University, Mankato
Montana State University
New York University
Ohio State University
Ohio University
Okanagan College (Canada)
Oregon State University
Pennsylvania State University
Portland State University
Purdue University
Rhodes College
Rutgers University
Ryerson University (Canada)
San Jose State University
Simon Fraser University (Canada)
Southern Illinois University
Southern Oregon University
Sterling College
State University of New York (SUNY)-Brockport
Syracuse University
Temple University
Texas A&M University
Tufts University
University at Buffalo (SUNY)
University College Cork (Ireland)
University of Alaska–Fairbanks
University of Arizona
University of Arkansas
University of British Columbia (Canada)
University of California, Berkeley

University of California, Davis
University of California, Los Angeles (UCLA) School of Law
University of California, Santa Barbara
University of California, Santa Cruz
University of Florida
University of Idaho
University of Illinois at Chicago
University of Illinois at Urbana-Champaign
University of Kansas
University of Kentucky
University of Maine
University of Maryland
University of Massachusetts Amherst
University of Michigan
University of Minnesota–Twin Cities
University of Mississippi
University of New Hampshire
University of North Carolina-Asheville
University of North Carolina-Greensboro
University of North Carolina-Wilmington
University of Northern British Columbia
University of Oregon
University of Pennsylvania
University of Regina (Canada)
University of Rhode Island
University of South Florida
University of Tennessee–Knoxville
University of the West Indies (Trinidad and Tobago)
University of Vermont*
University of Washington
University of Western Australia (Australia)
University of Wisconsin-Stevens Point
University of Wyoming
Utah State University
Vermont Law School
Virginia Tech
Wageningen University (Netherlands)
Washington State University
West Virginia University
Wilfrid Laurier University (Canada)
Worcester Polytechnic Institute
Yale University

* JAFSCD's institutional partners, who receive complimentary shareholder status in recognition of their annual underwriting support.
° HBCUs, Hispanic-serving institutions, and Tribal colleges and universities receive complimentary shares.

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

In This Issue

Duncan Hilchey

Open call papers

Published online March 6, 2020

Citation: Hilchey, D. (2020). In this issue: Open call papers [Editorial]. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 1–3. https://doi.org/10.5304/jafscd.2019.092.023

Earlier this winter, the Alaska cod fishery—once considered robust and resilient—was closed for the entire 2020 season. It has been a blow to coastal communities' economies and ways of life, and to the food supply chain North America has depended on for much of its cod. The reality is that fisheries around the world are being dramatically affected by overconsumption, overfishing, and climate change. Consumers are flocking to nutritious sources of ocean-based proteins, from top-of-the-food-chain tuna to secondary and tertiary species and even bycatch. But what are the consequences of this trend? As with many aspects of the food system, we must find a balance between our personal health and well-being and the interests of the planet. Finding this homeostasis is the mission of a growing number of food systems researchers and practitioners, and this is a welcome addition to the good food movement. As depicted on our cover, the state of Rhode Island's Seafood Marketing Collaborative may provide an example of a practical way forward in finding this balance.

In his Economic Pamphleteer column, entitled *A Right to Harm*, **John Ikerd** takes on concentrated animal feeding operations (CAFOs) and questions the government's lack of response to the social and environmental problems they have wrought.

Next, **Chad Hellwinckel** envisions a glut of hemp production and its subsequent industrialization hurting small producers and proffers a possible solution in his commentary, *Hemp: Can Cooperative-run Quotas Prevent Overproduction?*

On our cover: Squid are loaded onto a conveyor belt by a Rhode Island fisherman. Rhode Island is fortunate to have a vibrant, year-round fishery steeped in tradition. The state's Port of Galilee is one of the largest commercial fishing ports on the East Coast of the U.S. and is home port to over 250 commercial fishing vessels, including the Eastern Seaboard's largest squid-fishing fleet. The Rhode Island Seafood Marketing Collaborative is engaged in a host of programs and activities aimed at fostering increased interest in and demand for local seafood products. See the article in this issue, Rhode Island Branding Program for Local Seafood: Consumer Perceptions, Awareness, and Willingness-to-Pay.
Photo by M. Stultz, Rhode Island Department of Environmental Management and used with permission.

In our lead-off peer-reviewed paper, *Rhode Island Branding Program for Local Seafood: Consumer Perceptions, Awareness, and Willingness-to-Pay,* **Nicole Richard** and **Lori Pivarnik** examine what Rhode Island residents consider high-quality local seafood.

This is followed by **Russell Fricano** and **Carla Davis's** seminal research in *How Well Is Urban Agriculture Growing in the Southern United States? Trends and Issues from the Perspective of Urban Planners Regulating Urban Agriculture.*

In *The Motivations and Needs of Rural, Low-Income Household Food Gardeners,* **Kate Darby, Taylor Hinton**, and **Joaquin Torre** find that rural gardeners are motivated by cost savings, pleasure, and spiritual practice.

This is followed by *Integrated Food Systems Governance: Scaling Equitable and Transformative Food Initiatives through Scholar-Activist Engagement,* by **Colleen Hammelman**, **Charles Levkoe**, **Julian Agyeman**, **Sanjay Kharod**, **Ana Moragues Faus, Elisa Munoz**, **Jose Oliva**, and **Amanda Wilson,** who explore how differing anchor institutions engage in translocal governance, coalition-building, and adaptation.

In *Counting Local Food Consumption: Longitudinal Data and Lessons from Vermont,* **David Conner**, **Florence Becot**, **Ellen Kahler**, **Jake Claro,** and **Annie Harlow** provide a rare case example of how a state's progress toward increased food localization can be calculated.

Next, **Steven Miller** and **John Mann** present a new low-cost method of calculating the scale and impact of local food production in *Measuring the Importance of Local Food in the Chicago Foodshed.*

Incentivizing the Reduction of Pollution at U.S. Dairies: Addressing Additionality When Multiple Environmental Credit Payments Are Combined, by **Tibor Vegh** and **Brian Murray,** proposes a clever approach to maximizing the adoption of aerobic digesters.

Julia Valliant, Kathryn Ruhf, Stephanie L. Dickinson, Yijia Zhang, Lilian Golzarri-Arroyo, and **James Farmer** then examine the challenge of balancing the interests of farm buyers and sellers in *Farm Seeker Needs Versus Farm Owner Offers: A Comparison and Analysis in the U.S. Midwest and Plains.*

In *The State of Sustainable Agriculture and Agroecology Research and Impacts: A Survey of U.S. Scientists,* by **Marcia DeLonge, Tali Robbins, Andrea Basche,** and **Lindsey Haynes-Maslow,** the authors report on academics' perceived critical barriers to the development and widespread adoption of agroecology practices.

Next, **Rebecca Dunning, Dara Bloom,** and **Emma Brinkmeyer** find that payments to farmers by food banks is a growing food system development strategy in *Making a Market for On-farm Food Loss: Exploring Food Banks as a Market for Southeastern Produce.*

In *Integrating Food Systems and Local Food in Family and Consumer Sciences: Perspectives from the Pilot Extension Master Food Volunteer Program,* **Dara Bloom, Joanna Lelekacs, Gretchen Hofing, Robyn Stout, Morgan Marshall,** and **Kristin Davis** identify potential tensions between the two objectives of expanding local food consumption while increasing healthy food decisions.

In *Vendor Variety and Market Sales: A Case Study of the Williamsburg Farmers Market,*
Steven Archambault, Shawn Trivette, Phillip Warsaw, and **Alfonso Morales** confirm that vendor product diversity does, in fact, increase overall market sales.

Leah Halliday and **Michèle Foster** then compare and contrast two different approaches by food cooperatives to expanding their impact in communities of color in *A Tale of Two Co-ops in Two Cities.*

The efficacy of incentive programs to increase the value of nutrition assistance at farmers markets is explored in *Implementation of a Farmers Market Incentive Program in Maryland: Perspectives from Vendors* by **Caitlin Misiaszek, Amelie Hecht, Gabby Headrick, Shelley Brosius**, **Amy Crone,** and **Pamela Surkan.**

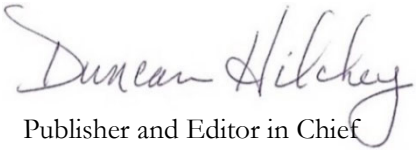
In our last peer-reviewed paper, *Comparative Analysis of Four Maple Species for Syrup Production in South-Central Appalachia,* **Jacob Peters, Ryan Huish, Dakota Taylor,** and **Benjamin Munson** explore the potential for extending maple sugar production commercially in a nontraditional syrup production area.

In this issue, we also offer five book reviews: **Aliza Tuttle** reviews *Can We Feed the World Without*

Destroying It? by Eric Holt-Giménez. **Amy Rosenthal** reviews *Feeding the Other: Whiteness, Privilege, and Neoliberal Stigma in Food Pantries*, by Rebecca de Souza. **Matthew Potteiger** reviews *The Community Food Forest Handbook: How to Plan, Organize, and Nurture Edible Gathering Places*, by Catherine Bukowski and John Munsell. Finally, **Garrett Graddy-Lovelace**, **Priscilla McCutcheon**, **Ashanté Reese, Angela Babb, Jonathan Hall, Eric Sarmiento,** and **Bradley Wilson** offer a set of reflections on Monica White's *Freedom Farmers: Agricultural Resistance and the Black Freedom Movement*.

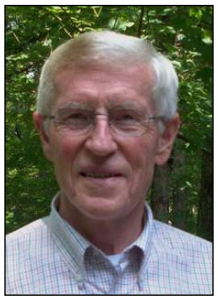
In wrapping up this editorial, I wish to express my appreciation for the nearly 50 new reviewers who joined the JAFSCD community this winter, many of whom are people of color. In addition, we are now seeking associate editors to help us manage our *Voices from the Grassroots* essays and book reviews. Since becoming the world's first open access, community-supported journal, our growth requires more and more folks to put their shoulders to the wheel. We are so grateful for those contributing their expertise and passion to JAFSCD.

With appreciation,



Publisher and Editor in Chief

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org



THE ECONOMIC PAMPHLETEER
JOHN IKERD

A right to harm

Published online January 30, 2020

Citation: Ikerd, J. (2020). The Economic Pamphleteer: A right to harm. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 5–8. http://dx.doi.org/10.5304/jafscd.2020.092.017

A recent documentary film, *Right to Harm,* documents the negative impacts large-scale concentrated animal feeding operations, or CAFOs, are having on public health and the overall quality of life of people in rural communities (Wechsler & Speicher, 2019). The film also reveals the frustration of concerned citizens who have asked their governments to address these negative impacts. When they ask for regulations to mitigate environmental impacts, they get regulations that effectively grant CAFOs a legal "license to pollute" (Gustin, 2016). When counties enact public health ordinances to protect residents from the health risks posed by CAFOs, state governments take away the right of local control (Steever, 2019). When undercover reporters reveal animal abuse in CAFOs, state governments pass "ag-gag laws" that make the covert investigation of animal abuse a crime (American Society for the Prevention of Cruelty to Animals [ASPCA], n.d.). When neighbors who have been adversely affected win nuisance lawsuits against CAFO operators, governments pass ever-stronger "right to farm" laws (Fajen, 2019),

John Ikerd is professor emeritus of agricultural economics, University of Missouri, Columbia. He was raised on a small farm and received his BS, MS, and PhD degrees from the University of Missouri. He worked in the private industry prior to his 30-year academic career at North Carolina State University, Oklahoma State University, the University of Georgia, and the University of Missouri. Since retiring in 2000, he spends most of his time writing and speaking on issues of sustainability. Ikerd is author of six books and numerous professional papers, which are available at http://johnikerd.com and http://faculty.missouri.edu/ikerdj/

*Why an **Economic Pamphleteer?** Pamphlets historically were short, thoughtfully written opinion pieces and were at the center of every revolution in western history. I spent the first half of my academic career as a free-market, bottom-line agricultural economist. During the farm financial crisis of the 1980s, I became convinced that the economics I had been taught and was teaching wasn't working and wasn't going to work in the future—not for farmers, rural communities, consumers, or society in general. Hopefully my "pamphlets" will help spark the needed revolution in economic thinking.*

essentially giving CAFO operators the "right to harm." Thus the title of the film.

Public efforts to ban the use of pesticides in crop production that threaten the health of farm-workers and the integrity of natural ecosystems have resulted in similar frustrations (Milman, 2017; Natural Food Certifiers 2019). When the federal government refused consumers' demands for labeling of genetically modified food ingredients, some states attempted to pass their own labeling laws. The federal government then responded by passing a law known as the DARK Act, which requires essentially useless labels in all states and prevents all other labeling of genetically modified foods (Detisch, 2016). When Congress responded to public pressure for a country of origin labeling law, the USDA refused to implement the law, and it was eventually repealed by Congress in response to threats from the World Trade Organization (Fink Huehnergarth, 2015). When the National Organic Program responded to public concerns by approving stronger animal welfare rules for organic animal production, the USDA delayed and eventually abandoned implementation of the rule (Associated Press, 2018). In every instance, the government has given the economic interests of industrial agriculture priority over the rights of people to protect their health and determine their own systems of food production.

In every instance, the government has given the economic interests of industrial agriculture priority over the rights of people to protect their health and determine their own systems of food production.

This certainly is not the first time in history that our governments have given presumed "economic rights" priority over fundamental "human rights." For example, the economy of this nation—most certainly its agricultural economy—was built on the institutional foundation of *slavery*. The founders of the nation knew slavery was a denial of basic human rights, which the government was obligated to protect. They wrote in the American Declaration Independence: *"We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty, and the Pursuit of Happiness.—That to secure these rights, Governments are instituted among Men"* (Declaration of Independence, 1776). However, the U.S. Constitution is silent on the issue of slavery, neither affirming nor denying it—presumably a matter of political and economic expediency. The nation is still suffering the consequences of that omission.

However, the nation eventually awakened to the hypocrisy as well as the national tragedy of slavery. Abraham Lincoln, in his historic address at Cooper Union in New York prior to the Civil War, rhetorically asked what it would take to appease the slave states. At the time, he was simply calling for a moratorium on slavery, meaning any *new* states would be free. After addressing a long list of previous efforts to pacify the slave states, he said, *"The question recurs, what will satisfy them? . . . These natural, and apparently adequate means all failing, what will convince them? This, and this only: cease to call slavery* ***wrong,*** *and join them in calling it* ***right.*** *And this must be done thoroughly—done in* ***acts*** *as well as in* ***words*** *. . . The whole atmosphere must be disinfected from all taint of opposition to slavery"* (emphasis in original; Lincoln, 1860). LET ME MAKE PERFECTLY CLEAR, I am not equating the threats posed by industrial agriculture or CAFOs to the tragedy of slavery. The delayed and protracted end to slavery is perhaps the greatest failure of the U.S. government. Instead, I simply argue that, like slavery, the advent and growth of CAFOs are failures of our government to fulfill its fundamental purpose of securing and protecting basic human rights.

The industrial agricultural establishment wields economic and political power today, not unlike the power of the economic and political power of ante-bellum slave owners and plantation agriculture. Whenever people try to find ways to protect the environment, public health, and quality of life, the response is much the same as when Lincoln attempted to negotiate and legislate an end to

slavery. Paraphrasing Lincoln, it seems that nothing will appease them short of *ceasing to call industrial agriculture* ***wrong*** *and joining them in calling it* ***right***—*in* ***acts*** *as well as* ***words****. The whole atmosphere must be disinfected from all taint of opposition to so-called modern industrial agricultural practices.*

This, we simply cannot do. If we Americans have the right to *life,* as affirmed in the Declaration of Independence, we have a right to clean air and water and wholesome food—the essentials of life and the liberty to pursue happiness. After stating that governments are instituted to secure these rights, the Declaration of Independence continues, *"That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness."*

How can advocates of a socially responsible agri-food system reclaim their rights? They can keep on doing what they have been doing. They certainly are not winning every battle, but they are slowly winning the war. They are making more people aware of the realities of industrial agriculture. They are changing public opinion, which ultimately will lead to either changes in laws or a change in government. Those who feel frustrated can find hope in the words with which Lincoln closed his speech at Cooper Union: *"Neither let us be slandered from our duty by false accusations against us, nor frightened from it by menaces of destruction to the Government nor of dungeons to ourselves. LET US HAVE FAITH THAT RIGHT MAKES MIGHT, AND IN THAT FAITH, LET US, TO THE END, DARE TO DO OUR DUTY AS WE UNDERSTAND IT"* (emphasis in original; Lincoln, 1860).

We each have a duty to defend and protect the basic human rights with which we are all equally endowed. *There is no right to harm.*

References

American Society for the Prevention of Cruelty to Animals (ASPCA). (n.d.). *What is ag-gag legislation?* Retrieved January 22, 2020, from https://www.aspca.org/animal-protection/public-policy/what-ag-gag-legislation

Associated Press. (2018, March 12). USDA kills animal welfare rule for organic meat. *Des Moines Register.* Retrieved from https://www.desmoinesregister.com/story/money/agriculture/2018/03/12/usda-kills-animal-welfare-rule-organic-meat/419106002/

Declaration of Independence. (1776, July 4). America's Founding Documents: Declaration of Independence: A Transcription. National Archives. Retrieved from https://www.archives.gov/founding-docs/declaration-transcript

Detisch, C. (2016, August 1). President Obama signs DARK Act into law. *Food and Water Watch.* Retrieved from https://www.foodandwaterwatch.org/news/president-obama-signs-dark-act-law

Fajen, O. F. (2019, March 1). North Carolina expands protections for its farmers under the Right to Farm Act. Retrieved from the Fox Rothschild LLP website: https://animallaw.foxrothschild.com/2019/03/01/north-carolina-expands-protections-for-its-farmers-under-the-right-to-farm-act/

Fink Huehnergarth, N. (2015, December 21). Quashing consumers' right-to-know, Congress repeals country-of-origin-labeling for beef and pork. *Forbes.* Retrieved from https://www.forbes.com/sites/nancyhuehnergarth/2015/12/21/quashing-consumers-right-to-know-congress-repeals-country-of-origin-labeling-for-beef-and-pork/#ca1fe7436e54

Gustin, G. (2016, October 21). Factory farms get bigger, pollution grows, but regulators don't even know where they are. *Inside Climate News.* Retrieved from https://insideclimatenews.org/news/19102016/cafo-epa-regulations-factory-farms-get-bigger-pollution-grows-environmental-impact-methane

Lincoln, A. (1860, February 20). *Cooper Union Address.* Retrieved from Abraham Lincoln Online, http://www.abrahamlincolnonline.org/lincoln/speeches/cooper.htm

Milman, O. (2017, May 17). Pesticide that Trump's EPA refused to ban blamed for sickening farm workers. *The Guardian.* Retrieved from https://www.theguardian.com/environment/2017/may/17/pesticide-trump-ban-california-farm-workers-sick

Natural Food Certifiers. (2019, June 1). *US recently banned 12 dangerous pesticides for bees. Environmentalists are pleased but concerned!* Retrieved from https://nfccertification.com/the-us-just-banned-12-pesticides-that-are-like-nicotine-for-bees-heres-how-dangerous-they-are/

Steever, T. (2019, June 9). Nearly 700 witness Missouri SB 391 ceremonial signing in Sedalia. *Brownfield Ag News.* Retrieved from https://brownfieldagnews.com/news/nearly-700-witness-missouri-sb-391-ceremonial-signing-in-sedalia/

Wechsler, M. (Director), & Speicher, A. (Director & Producer). (2019). *Right to harm* [Motion picture]. USA: Hourglass Films. https://righttoharm.film/

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

COMMENTARY

Hemp: Can cooperative-run quotas prevent overproduction?

Chad Hellwinckel *
University of Tennessee

Submitted August 12, 2019 / Accepted August 12, 2019 / Published online January 22, 2020

Citation: Hellwinckel, C. (2020). Hemp: Can cooperative-run quotas prevent overproduction?. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 9–11. https://doi.org/10.5304/jafscd.2020.092.016

The legalization of hemp provides a new opportunity for small farmers in the U.S., and coming on the heels of trade wars and depressed crop returns, the timing couldn't be better. However, while hemp production could support a decent living for these small farmers, production opportunities such as this will draw interest from producers of all sizes, which may determine its profitability. Hemp, just like any other crop, can be produced on a massive scale. The industrial system stands at the ready with machines, inputs, land-grant agricultural research universities, transportation systems, markets, and capital to plant hemp on large acreages and then process, market, and deliver it to consumers. Once unleashed, the vast majority of the crop could be grown on large acreages under industrial management, mechanized, and with few people on the land. Organic hemp could be another option offered by the industrial model, but could be equally mechanized. Within five to 10 years, any current profit advantage of hemp to farmers could diminish to the low level of market returns offered by other industrial crops like corn or beans.

Today, new hemp farmers are able to do what they love and make a living doing it. These farmers are truly building an ideal agrarian life, often producing organically on small acreages while integrating other crops on the farm, raising families on the land, improving the local ecology, and being good neighbors. Many of these farmers see their work as an art form—caring for the earth, the soil, and all the inhabitants of their unique corner of the universe. Profitable, small ecological farms are a welcomed emergence in rural areas where good news has been scarce for decades. Hopefully, they persist and more farmers are able to tend to small acreages. Yet the history and nature of agriculture teach that this bright future will only be attainable if we insist upon prices that cover the costs of production and a cooperative system that assures that small hemp farmers will always receive a fair price for their crop.

* Chad Hellwinckel, Research Associate Professor, University of Tennessee; 2621 Morgan Circle Drive; Knoxville, TN 37996 USA; chellwin@utk.edu

The tobacco quota system that supported small-scale rural farmers from the 1930s until about 2000 provides a good model for hemp growers. The tobacco system functioned by the federal government granting the sole right to sell tobacco to farmer cooperatives. Cooperative members voted every three years to determine if they wanted price support. If so (and they always voted yes), they were subject to a quota system limiting their level of production to that which would return a living wage to all members of the tobacco cooperative. Members of the cooperatives received "quotas" or rights to bring a certain amount of crop to market. The program worked by limiting supply and thereby raising the market price above what it would be under all-out free-market production. The program was mostly self-funded, with minimal cost to taxpayers (Womach, 2005). Consumers of tobacco paid a slightly higher price, and this higher price allowed farmers to make a living on small plots of land. For example, in Kentucky, tobacco made up only 1% of cropland but accounted for about 50% of total crop income (Snell & Goetz, 1997). It kept small farmers in business and, in turn, kept small-town economies healthy.

In 2004, the program ended through a buyout by the tobacco industry due to the decrease in domestic tobacco demand and tobacco companies importing greater amounts from other countries. Since the buyout, farmers are free to produce as much as they want. Not surprisingly, tobacco farmers in the hilly, forested, rural areas of Appalachia—where the geography is not conducive to massive machinery—could not compete. The vast majority of tobacco in the U.S. is now grown in the flat country on the Atlantic coastal plains. Instead of 1 to 5 acres (0.4 to 2 hectares) of production supporting a farm family, you now see thousand-acre (405 ha) fields under mechanization. Small Appalachian rural economies have collapsed. It may be no coincidence that the opioid epidemic has exploded in old tobacco country since the quota system buyout in 2004.

Today, some hemp farmers believe that the expanding market can support unlimited numbers of growers, and they do not want any constraints on the growing or selling of hemp. I think we need to pause and take a circumspect look at the problem of overproduction in agriculture that has been in the nature of agriculture for the past century, rather than letting these boom times cloud our view of reality. Technology, mechanization, and the inability of any one farmer to control market supply has consistently driven the market price of crops below the cost of production, leading to cycles of farmer bankruptcies and consolidations. Overproduction is in the nature of modern technological agriculture, and it cannot be solved without an agreed-upon system of production controls (Ray, De La Torre Ugarte, & Tiller, 2003).

Hemp is a new crop not yet in the hands of industrial growers. New farmers and conscientious consumers should take steps now to devise a cooperative-run quota system that would assure fair prices for small hemp farmers now and into the future. Because the federal law that re-established hemp requires individual states to regulate hemp, ideally states could establish supply control quota systems within their borders to ensure the benefits of the new crop are directed toward small farms. If state or national governments cannot act, then private cooperatives can also be fairly effective. For example, in the dairy industry, Organic Valley, a farmer-owned cooperative, has been successful at providing higher prices to members. Organic Valley does this by sometimes limiting the quantity that each farmer can provide to assure that overproduction does not occur. However, private cooperatives only work if there is a loyal consumer base willing to pay more for the differentiated product. If full legalization continues without quota systems, prices will likely fall within a decade, the vast majority of production will be in the hands of very large corporate farms, and the potential of the crop to support agrarian life and rural prosperity will have been missed (Berry, 2016, minute 41:00).

References

Berry, W. (2016, December 13). *The land, the people, and a proper economy*. Lecture at the 2016 Prairie Festival, The Land Institute, Salina, Kansas. Retrieved from https://landinstitute.org/video-audio/land-people-proper-economy/

Ray, D. E., De La Torre Ugarte, D. G., & Tiller, K. H. (2003). *Rethinking U.S. agricultural policy: Changing course to secure farmer livelihoods worldwide.* Knoxville: Agricultural Policy Analysis Center, The University of Tennessee. Retrieved from https://www.agpolicy.org/publication.htm

Snell, W., & Goetz, S. (1997). *Overview of Kentucky's tobacco economy* (Report No. AEC-83). Lexington: University of Kentucky Cooperative Extension Service. Retrieved from http://www.ca.uky.edu/agc/pubs/aec/aec83/aec83.pdf

Womach, J. (1995/2005). *Tobacco price support: An overview of the program* (CRS Report for Congress, 95-129). Washington, D.C.: Congressional Research Service. Retrieved from https://nationalaglawcenter.org/wp-content/uploads/assets/crs/95-129.pdf

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Rhode Island branding program for local seafood: Consumer perceptions, awareness, and willingness-to-pay

Nicole L. Richard [a] * and Lori F. Pivarnik [b]
University of Rhode Island

Submitted March 14, 2019 / Revised June 7 and August 28, 2019 / Accepted August 28, 2019 / Published online January 30, 2020

Citation: Richard, N. L., & Pivarnik, L. F. (2020). Rhode Island branding program for local seafood: Consumer perceptions, awareness, and willingness-to-pay. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 13–29. https://doi.org/10.5304/jafscd.2020.092.011

Abstract

A state brand was created for Rhode Island (RI) seafood in an effort to encourage the development of the fishing and aquaculture industries. Little was done to assess RI consumers, however, regarding their perceptions and understanding of local seafood. Therefore, a survey (*N*=968) of RI consumers at least 18 years old was implemented to assess consumer perceptions, purchasing choices, and understanding of local seafood. The majority of RI consumers, regardless of income, education, and locality, would prefer local seafood if they could easily find it in the market and if they could trust the brand to identify product choices. The top three places to purchase seafood were supermarkets, seafood specialty stores, and restaurants. Seafood quality, taste preference, safety at purchase, and absence of contaminants were considered important or very important factors influencing purchasing decisions; however, respondents felt only somewhat knowledgeable about key seafood attributes. More than half of survey consumers (66%) felt that the branding logo, created by the RI Department of Environmental Management, would encourage them to select a local seafood product, and 53% indicated they would be more willing to try a seafood product if it were labeled local. However, only 12% of respondents recognized the brand for local RI seafood. This information will be used by state partners to help develop an outreach strategy to promote the RI seafood brand and local seafood and will be used to inform current policy regarding branding.

Keywords

Seafood, Local Seafood, Local Food, Consumer Behavior, Consumer Preferences, Willingness-to-Pay, Local Branding Program, State Branding Program

[a] * *Corresponding author:* Nicole L. Richard, Food Safety Outreach/Research Program, Department of Fisheries, Animal and Veterinary Science, University of Rhode Island; 530 Liberty Lane; West Kingston, RI 02892 USA; +1-401-874-2977; nicolerichard@uri.edu

[b] Lori F. Pivarnik, Food Safety Outreach/Research Program, Department of Fisheries, Animal and Veterinary Science, University of Rhode Island; 530 Liberty Lane; West Kingston, RI 02892 USA.

Funding Disclosure

This study was funded by a grant from National Oceanic and Atmospheric Administration (NOAA)/Rhode Island Sea Grant under agency award no. NA140AR4170082.

Introduction

Seafood is a primary source of high-quality protein and contains a variety of nutrients needed for overall health and disease prevention; thus, increased consumption has been recommended (U.S. Department of Health and Human Services [USDHHS] & U.S. Department of Agriculture [USDA], 2015). The extensive health and nutritional benefits of seafood have been widely reported. Numerous studies have confirmed the positive impact of regular seafood consumption on the reduction of coronary heart disease and for cognitive and vision development (Hicks, Pivarnik, Richard, Gable, & Morrissey, 2013; McManus, Hunt, Storey, McManus, & Hilhorst, 2014). While there are some inherent dietary risks associated with the consumption of certain species, particularly for high-risk populations (children, pregnant and nursing mothers, the elderly), the majority of research has shown that seafood consumption benefits greatly outweigh the risks (Hellberg, Dewitt, & Morrissey, 2012). However, U.S. annual per capita consumption of seafood has been declining or remaining stagnant (National Marine Fisheries Service [NMFS], 2017a), and consumers are not meeting the recommended intake of seafood, particularly seafood containing the omega-3 fatty acids EPA and DHA (Hellberg et al., 2012). Nationwide messaging, while important, may not be as influential as specific programming that targets state-specific consumers, especially in an ocean state such as Rhode Island (RI), which has a significant seafood industry.

In 2015, the RI seafood industry directly supported over 4,800 jobs, landing revenue close to US$82 million, sales over US$347 million, and income of US$116 million (NMFS, 2017b). Remarkably, from 85 to 95% of seafood consumed in the U.S. is imported, and a significant portion caught by U.S. fishers is exported (NMFS, 2017a). The robust RI industry, like the rest of U.S. fisheries, exports the majority of what it catches (K. Ayars, Division of Agriculture, RI Dept. of Environmental Management, personal communication, 2015), and Rhode Islanders, along with the rest of U.S. consumers, mainly eat imported fish.

In the U.S., interest in and consumption of local food is growing exponentially (USDA Economic Research Service [USDA ERS], 2016) propelled by a growing consumer awareness of the benefits of a strong community food system (Dillemuth, 2017; Freedgood & Fydenkevez, 2017; Johnston, Jai, Phelan, & Velikova, 2018). The desire for local food—in part due to the perceptions of improved nutrition and food safety, as well as to support local economies, have fresh and more flavorful food, and produce less environmental impact—has fueled the growing interest in local food (Giovannuci, Barham, & Pirog, 2010). Local governments play an important role in supporting the local food economy. Through the development of targeted strategies and policies, government can support and promote the local food system and impact the economy (Dillemuth, 2017; Freedgood & Fydenkevez, 2017). In efforts to expand marketing opportunities for local food and support a state's food industry, state branding and marketing campaigns have emerged as a strategy to help food producers differentiate their products by using an official state label (Benson, 2018; French, Cullen, Manalo, & Jones, 2014; Hullinger & Tanaka, 2015).

In order to expand local seafood marketing efforts, provide educational opportunities regarding local issues, and increase consumer demand for local seafood, the Rhode Island Seafood Marketing Collaborative (RISMC) was established by the RI state legislature (RI General Laws 20-38, 2011). As an advocacy coalition of academia, industry, and government members, RISMC overall goals were to develop policy initiatives aimed at (1) sustaining and growing the RI seafood industry by increasing the value of RI seafood and of its associated economic benefits, and (2) improving the health and welfare of RI citizens. In support of those goals, key RISMC strategies include increasing consumer awareness of and access to RI seafood, and in turn increasing consumer demand. In an effort to distinguish RI seafood products in the marketplace and seize on the growing movement to "buy local," the collaborative created a RI seafood brand (logo) and codified its use via regulations enacted in 2013 entitled "Rules and Regulations Governing the RI Seafood Brand and Mislabeling of Marine Species" (RIDEM, 2013). The RI Department of Environmental Management (RIDEM) was charged with the legal authority to establish and administer the

programs to promote seafood products grown and produced in RI. Developing regulations and policy for the term "local" is difficult, since it can be used to describe a variety of marketing or geographical characteristics (Fonner & Sylvia, 2015; Wilde, 2013); the concept of local seafood is even less well defined (Fonner & Sylvia, 2015). Local food can have multiple definitions with multiple measures, and it is challenging to find agreement on all the attributes or issues that should be considered (e.g., environmental, geographic, social) (Wilde, 2013). As a policy and regulatory decision, RI or local marine seafood products were considered local if they were grown in RI waters or landed in RI ports by commercial fishers licensed in RI. The brand is authorized for use by licensed RI seafood dealers, but the "chain of custody" can continue through to retail (K. Ayars, personal communication, 2015).

The development of a state brand as a crucial policy centerpiece could benefit the local industry, from harvest to retail (Hullinger & Tanaka, 2015). Mechanisms must be in place to both protect and foster the integrity of local programs (Giovannucci, Barham, & Pirog, 2010). However, once the RI seafood brand had been developed and implemented, little was done to assess RI consumers regarding their perceptions and understanding of local seafood. Gauging the attitudes and beliefs of RI consumers concerning seafood, and local seafood specifically, was needed to inform the development and successful implementation of the RI seafood marketing initiative and overall outreach strategy. A 2010 study was conducted at RI farmers markets about consumer preferences for local RI seafood (Grimley & Roheim, 2010) with results that could have helped direct the brand approach. However, the results of this study, while providing some insight into perceptions regarding seafood, cannot be extrapolated to the larger RI general public that purchases the majority of seafood (and all food) in seafood markets, grocery stores, and restaurants. While the study seemed to indicate a willingness to pay more for fish that was "certified" as being caught by a RI fisherman, customers at farmers markets often pay more for most commodities, so that pricing is not necessarily a motivation for purchasing at this venue. In 2017, the first RI State Food Strategy was released, intended to provide a potential pathway to enhance the climate for food and beverage businesses and to help direct food policy in the state (RI Food Strategy, 2017). The Food Strategy identified the preservation and growth of agriculture and commercial fishery industries as one of five policy focus areas. One specific recommendation was to support the RISMC's efforts to market and grow the RI Seafood brand, recognizing that while RI consumers report that they would prefer seafood landed in RI, they claimed they had a difficult time locating RI caught seafood, even with the logo (RI Food Strategy, 2017). Before an outreach strategy can be developed, it is important to carry out research in order to understand what RI consumers are thinking—their attitudes, concerns, and understanding of local food—and to assess their current purchasing choices and willingness-to-pay (WTP). The research results could be utilized to help encourage industry to promote the brand and, more importantly, could also inform current policy or impact the direction of policy regarding branding.

Methods

Sampling and Data Collection

A survey was designed and implemented to measure RI consumer preferences for local seafood following the protocol utilized by Pivarnik and her research colleagues (Hicks, Pivarnik, & McDermott, 2008; Hicks et al., 2009; 2013; Pivarnik, Richard, Gable, & Worobo, 2016; Pivarnik, Richard, Patnoad, & Gable, 2012; Pivarnik et al., 2018). The protocol and questionnaire were approved by the University of Rhode Island Institutional Subjects Review Board. An advisory team helped URI project directors to develop the survey questions. The advisory team consisted of four members, representing the RIDEM, RI Agriculture Partnership, the RI Coastal Resources Management Council, and the University of Rhode Island. All members of the advisory team are also members of the RISMC or the RI Food Policy Council. Prior to implementation, the survey items were reviewed for content validity and clarity. Fourteen experts, solicited from land-grant cooperative extension programs, academic institutions, and the project advisory panel, reviewed the survey. The question-

naire was revised prior to distribution based on their recommendations. A paper survey was mailed to 5,000 randomly selected households in Rhode Island. The sample of households and their mailing labels were purchased from DirectMail.com (Prince Frederick, MD, USA) and reflected homeowners and renters who were at least 18 years old. The project coordinators considered both paper (mailed) and online survey formats for this project. Online methodologies that were considered included the use of a consumer panel that was available from the online survey clearinghouse; however, it was determined that the RI-specific panel was too small and that therefore this option was not practical. A second option considered was to use email addresses from the direct labeling companies, but consumers often discard random e-mails without reading them. Therefore, the project directors believed that consumers would be more likely to answer a paper survey with clearly identified university credentials and the possibility of an incentive for their time and effort. The survey was launched in November 2016 and data were collected through the end of December 2016. The mailed survey was administered based on a strategy outlined by Dillman Total Design Method (Salant & Dillman, 1994). This protocol involved mailing a survey announcement postcard about two weeks prior to the paper survey administration. The survey, along with a self-addressed stamped envelope, was mailed about a week later. The questionnaire contained a letter explaining the project and survey. A second survey reminder postcard was mailed about two weeks later. In an effort to maximize response, a monetary incentive of a US$100 gift card was offered to 20 randomly selected respondents who chose to enter a lottery-type drawing for surveys returned by the December 20, 2016, deadline (Pivarnik et al., 2018). Of the 5,000 surveys administered, 304 were returned by the postal service due to inadequate addresses. Of the 974 surveys received, six were excluded from analysis (blank, incomplete, or received after the due date). A total of 968 completed surveys were included in the data analysis, with a return rate of 21%.

Questionnaire

The survey included four sections: background information, behavior and purchasing habits, interpretation of local seafood, and attitudes and sources of information regarding local seafood. The background and demographic section contained questions regarding age, gender, education, race, ethnicity, income, and living situation. Respondents who indicated that they eat seafood (n=952) answered questions about their seafood consumption and seafood purchasing habits: frequency of consumption, types of seafood eaten, and preferences in purchasing seafood. The interpretation of local seafood section contained questions that elicited respondents' interpretations of local seafood: which seafood species they considered to be local, their interpretation of defining local seafood, their recognition of the "Rhode Island Seafood" logo and its impact on their seafood purchasing and consumption habits. This section also assessed other factors that may influence respondent purchasing decisions to determine how their self-rated knowledge on key seafood topics compared to the issues they considered important to their purchase decisions. Using a 4-point Likert scale (not knowledgeable, somewhat knowledgeable, knowledgeable, very knowledgeable), respondents self-rated their level of knowledge about seafood topics regarding environmental concerns and seafood quality and safe handling practices. They also rated the level of importance that these topics had on their seafood purchasing choices, using a 5-point Likert scale (1=not important to 5=very important). The attitudes and sources of information regarding local seafood section asked respondents to indicate what they believe is the best place to get information about seafood, using a "check all" format. Respondents also rated nine attitude statements related to seafood purchasing and consumption, using a 5-point Likert scale (1=strongly disagree to 5=strongly agree). Except where noted, survey response formats also included multiple choice, check all choices that apply, and yes/no response options.

Data Analysis

Data analysis was carried out using the SPSS statistical program. Descriptive analysis (e.g., frequencies, percentages, means, and standard deviations), one-way ANOVA followed by the Scheffe post-

hoc test, and *t*-tests were run. Chi-square statistics were run where the relationships between variables were examined for observed versus expected frequencies. Reliability was tested with Cronbach's alpha measure of internal consistency. For all analysis, the *p*-value for significance was set at $p<.05$; $p<.1$ (but greater than 0.05) was considered to indicate a trend toward significance (Paulin, Lofgren, & Pivarnik, 2017). The specific number of respondents is shown in the tables, indicating where some respondents did not answer the relevant questions.

Table 1. Demographics of Survey Respondents (*N*=968)

	Frequency	%
Age		
18-24 years	11	1
25-39 years	79	9
40-59 years	377	39
60-69 years	283	29
70+ years	210	22
Gender		
Male	550	58
Female	404	42
Highest Level of Education Completed		
Less than high school/high school or GED	15	2
High school or GED	144	15
Associate/technical degree/some college	266	28
College degree	293	31
Post-graduate degree	241	25
Estimated Annual Income (before taxes) for Respondents Who Purchase Food for THEMSELVES only (US$)		
Less than $49,999	126	49
Between $50,000-$79,999	76	29
Between $80,000-$99,999	22	9
$100,000 or more	35	14
Estimated Annual Income (before taxes) for Respondents Who Purchase Food for Their HOUSEHOLD (US$)		
Less than $49,999	66	12
Between $50,000-$79,999	106	20
Between $80,000-$99,999	101	19
$100,000 or more	267	49
Rhode Island County of PRIMARY Residence		
Bristol	66	7
Kent	204	21
Newport	88	9
Providence	394	41
Washington	209	22

Results and Discussion

Demographic Characteristics

The survey targeted RI residents who were at least 18 years old. Significant demographics of respondents (Table 1) had some discrepancies when compared to U.S. Census data (U.S. Census Bureau, 2016). The distribution of respondents (*N*=968) by primary county of residence mirrored U.S. Census data for residential distribution in three of the five counties that Rhode Island consists of; respondents from Providence and Washington Counties were under- and over-represented, respectively. Respondents were disproportionately older than the population data reported by the U.S. Census (2016), with a higher representation of 60+-year-olds (51% vs. 28%) and a lower representation in the 18-24-year age range (1% versus 7% for 20-24-year-olds). The time of survey implementation (November–December) could have affected the number of respondents in the latter group, since this household population would most likely reflect many short-term renters and college students, i.e., temporary populations that would not participate or were not in residence at the time of survey distribution. The 25–59–year age range for this survey compared favorably to Census data: 48% versus 58.5%, respectively. Ninety-nine percent of respondents attained a high school degree or higher, surpassing the 2016 Census estimate of 87% (U.S. Census Bureau, 2016). However, educational level was higher than the typical RI population, with 56% having attained a bachelor's degree or higher versus 33% identi-

fied by the Census. Concomitant with higher education is the higher than expected income reported by survey respondents (49%≥US$100,000 vs. 27% Census; 12%<US$49,000 vs. 44% Census). While there were a few significant differences that could be attributed to income and/or education demographics, they were not universal. However, the demographics of these groups could have influenced survey results such as the frequency of seafood consumption and WTP. Although RI has a high Caucasian population (U.S. Census Bureau, 2016), there was still lower diversity in the population surveyed than expected, with the respondent pool predominantly Caucasian (93%) and the African American and Hispanic populations (≤2%) underrepresented (data not shown).

Seafood Consumption

Of the 98% of the respondents who ate seafood, 63% ate seafood one or more times per week and thus could be considered to be regular or frequent seafood eaters, as defined by Hicks et al. (2008). However, only 36% ate seafood two or more times per week, as recommended (USDHHS & USDA, 2015). Table 2 shows the seafood consumption frequency of survey participants. With the exception of the location of primary residence, there were few statistical differences between seafood consumption behavior and the respondent demographic profile. Of the respondents who indicated that they lived on or near the coast, significantly (p<.05) more people ate seafood twice per week or more. As might be expected, trends toward significance were noted for the counties nearer to the water (i.e., Bristol, Newport, and Washington), where a higher frequency of respondents indicated that they ate seafood twice or more per week. In addition, the median incomes of these counties are higher than those of Kent and Providence counties (U.S. Census Bureau, 2016), which could also account for higher consumption due to affordability. Age affected the frequency of seafood consumption, with higher consumption (p<.05) among respondents at least 60 years old. Other researchers have also reported a positive correlation between age and seafood consumption: older consumers are more likely to be regular or frequent seafood eaters (Birch & Lawley, 2012; Carlucci et al., 2015; Olsen 2003, 2004; Richter & Klöckner, 2017).

While other studies also have shown that a high percentage of consumers eat seafood, less than a third typically eat the recommended amount. A 2005 national survey found that 89% of adult Americans reported eating seafood, but only 35% ate the recommended amount of seafood (Storey, Forshee, Anderson, & Miller, 2006). In addition, a 2006 national study found that 88% ate

Table 2. Frequency of Seafood Consumption among Survey Respondents, Separated by the County of Primary Residence and Self-selection if Residence is on or near the Rhode Island Coast

		Frequency of seafood consumption (% of respondents)			
Demographic		Twice per week or more [a]	Once per week	Few times per month	Once per month or less
RI State (*N*=936)	*(p<.1)* [b]	36	27	27	10
Bristol county (*n*=66)		**49**	29	17	6
Kent county (*n*=194)		34	22	33	11
Newport county (*n*=87)		**40**	22	26	12
Providence county (*n*=384)		32	28	30	10
Washington county (*n*=205)		**37**	31	21	11
Live on or near the coast (*N*=931)	*(p<.05)* [c]				
Yes (*n*=559)		**40**	28	23	9
No (*n*=372)		29	26	33	12

[a] The 2015-2020 Dietary Guidelines for Americans, issued by the U.S. Department of Health and Human Services (HHS) and the USDA, recommend that Americans eat seafood twice a week.
[b] Chi-square analysis indicated data trends toward significance at p<.1.
[c] Chi-square analysis indicated a significant relationship at p<.05.

seafood, with 46% considered frequent seafood eaters (one or more times per week), but that only 22% ate the recommended amount (Hicks et al., 2008). A 2017 survey conducted in Connecticut showed that 91% indicated they ate seafood, and 35% were considered to be regular or frequent seafood eaters, but only 15% ate the recommended amount (Benson, 2018). The higher percentage of seafood consumption among RI consumers could be due to the fact that Rhode Island, nicknamed the "Ocean State," has the second-highest ratio of shoreline (feet) to land area (square miles) among U.S. states (1,312 ft./mi^2), while Connecticut ranked eighth (589 ft./mi^2) (U.S. Census Bureau, 2011, Table 360).

Places to Purchase Seafood

The top three places to purchase seafood, of the eight options listed in the survey, are shown in Table 3. The top three, as first or second choices, were supermarkets, seafood specialty stores, and restaurants. The top choice, supermarkets, was driven by the choices of the more inland and/or urban Kent and Providence Counties ($p<.05$), which accounted for over 60% of the respondent pool. As expected, RI counties nearer to the sea (i.e., Bristol and Newport) had a higher frequency of people who indicated that their first choice was a seafood specialty store. However, respondents who self-identified that they felt they lived on or near the coast (n=554) indicated that the supermarket (36%) was also their first choice to purchase seafood. This was due to Washington County residents composing a higher respondent pool and to the county, including about a third of its area away from the coastline. Also, a 2017 survey of seafood consumers in Connecticut identified the same top three places to purchase seafood: local seafood market (29%), grocery store (28%), and restaurant (23%) (Benson, 2018). Similarly, a survey conducted by the Atlantic Corporation (2019) found that supermarkets accounted for the most popular place (51%) to purchase seafood to eat at home. Purchase-site preferences would be critical to targeting RI consumers regarding local seafood and seafood consumption, as shoppers tend to be loyal to their supermarket (Skallerud, Korneliussen, & Olsen, 2009).

Places to Get Information About Seafood

Improving marketing campaigns for seafood involves a multifaceted approach that includes the development of trust in sources of information, confidence in the evaluation of the quality and preparation of fish, along with the importance of fish and the perceived potential risk of consuming it (Carlucci et al., 2015). Table 4 shows the top choices, of the 12 items listed in the survey, for places to get information about seafood: point-of-purchase at a seafood specialty store (56%), family or friends (40%), cookbooks (38%), and point-of-purchase at a supermarket (31%). Although seafood specialty store was among the top three places to purchase seafood, it was not the overall first or second choice averaged for all respondents and urban areas. However, this may reflect the fact that while consumers may purchase their seafood at a grocery store for convenience, they might think that information may be better at a seafood specialty store. Food choice and purchase decisions have been linked to habitual behavior (Carlucci et al., 2015; Christenson, O'Kane, Farmery, & McManus, 2017; McManus et al., 2014) and are

Table 3. Top Three Places to Purchase Seafood, Ranked First and Second Choice

	Percent (%) of Respondents							
	All Respondents		First Choice by County of Primary Residence					First Choice by Live on/near the Coast (n=554)
Places to Purchase Seafood	First Choice (n=934)	Second Choice (n=845)	Bristol County (n=63)	Kent County (n=192)	Newport County (n=85)	Providence County (n=381)	Washington County (n=206)	
Restaurant	13	**39**	-	**-**	**-**	**-**	**-**	**-**
Seafood Specialty Store	28	16	33	-	32	-	33	-
Supermarket	**41**	32	**-**	47	-	46	33	36

Table 4. Top Choices for Places to Get Information about Seafood, for the State of Rhode Island and by the Respondents' County of Primary Residence

	Percent (%) of Respondents			
Demographic	Point of Purchase: Seafood Store	Family and Friends	Cookbook	Point of Purchase: Supermarket
Rhode Island State (*N*=652[a])	**56**	**40**	**38**	**31**
Bristol County (*n*=41)	59	42	49	34
Kent County (*n*=139)	50	36	40	32
Newport County (*n*=64)	59	50	41	25
Providence County (*n*=265)	57	36	37	34
Washington County (*n*=139)	57	47	34	43

[a] Respondents who indicated exactly three top choices, as asked in the survey, were included in the data. Those who indicated fewer or more than three choices were excluded.

influenced by trustworthy sources (Birch & Lawley, 2012; Giampietri, Verneau, Del Giudice, Carfora, & Finco, 2018). Thus, it is not surprising that stores that specialize in seafood, and family and friends, ranked high among preferred sources of information about seafood. However, the survey choices did not include healthcare providers, such as dieticians, as a group that has been considered a reliable information source, as indicated by other research (Hicks et al., 2013; International Food Information Council [IFIC] Foundation, 2018).

Factors Influencing Seafood Purchasing

Issues relating to seafood quality (97%), taste preference (93%), seafood safety at purchase (92%), and contaminants in seafood (91%) were important or very important factors for seafood purchasing choices (Table 5). However, respondents felt only somewhat knowledgeable about seafood quality and contaminants in seafood. In addition, respondents had lower knowledge confidence concerning seafood selection, preparation, and handling. Issues relating to seafood origin, seafood sustainability, and consumption advisories were considered important by over 70% of respondents, while self-rated knowledge was low. These are reasons often cited as barriers to seafood consumption. However, the barriers tend to have a stronger impact on those who consume less seafood (Birch & Lawley, 2012). Hicks et al. (2008) showed that consumers considered to be frequent eaters more often ate seafood at home, reflecting more knowledge regarding handling and preparation. Therefore, with 63% of respondents considered regular or frequent eaters in this study, higher confidence regarding handling would be expected. Of the 81% of respondents who felt knowledgeable about the health benefits of seafood, statistical analysis showed that 53% were considered regular or frequent seafood eaters (data not shown), with only 31% eating the recommended amount of seafood (two or more servings per week) (USDHHS & USDA, 2015) and 22% eating one serving per week.

The nutritional value of seafood alone does not appear to be the only driver to increase consumer seafood consumption. A positive attitude toward the health benefits of seafood has not been found to be a sufficient indicator of intention to eat seafood (Carlucci et al., 2015; Christenson et al., 2017; Thong & Solgaard, 2017). Overall, respondents did not feel very knowledgeable about key seafood attributes. While taste, nutritional value, and quality are considered important factors influencing seafood purchase and consumption (Birch & Lawley, 2012; Hicks et al., 2008; Olsen, 2003, 2004), low knowledge has been associated with a lack of confidence in making seafood purchasing decisions (Hicks et al., 2008; Olsen, 2003, 2004; Sterling et al., 2015; Verbeke, Vermeir, & Brunso, 2017). Product familiarity and knowledge have been shown to have a positive correlation with consumer confidence in evaluating seafood and making informed purchasing decisions (Birch &

Table 5. Self-rated Knowledge with Level of Importance on Purchasing Habits of Seafood Topics among Rhode Island Consumer Respondents

	Self-Rated Knowledge [a] 4-point Scale (*N*=905–929)		Level of Importance [b] 5-point Scale (*N*=919–930)	
Seafood Topics	Average Score ± Standard Deviation	Knowledgeable + Very Knowledgeable (% respondents)	Average Score ± Standard Deviation	Important + Very Important (% respondents)
Seafood quality	2.7 ± 0.8	62	4.7 ± 0.6	97
Contaminants in seafood	2.2 ± 0.8	30	4.5 ± 0.8	91
Seafood safety at purchase	-	-	4.5 ± 0.7	92
Taste preference	-	-	4.5 ± 0.7	93
Safe seafood handling practices	2.9 ± 0.8	73	4.3 ± 0.9	84
Health benefits from eating seafood	3.1 ± 0.7	81	4.3 ± 0.8	87
Selecting seafood at a market	2.8 ± 0.8	63	4.1 ± 0.8	83
Environmental concerns	-	-	4.0 ± 1.0	76
Preparing seafood	3.0 ± 0.8	74	4.0 ± 0.9	77
Where the seafood comes from (origin)	2.3 ± 0.9	38	4.0 ± 0.9	76
Sustainable seafood	2.1 ± 0.9	32	4.0 ± 0.9	73
Purchasing convenience	-	-	3.9 ± 1.5	75
Fish consumption advisories	2.1 ± 0.9	35	3.9 ± 1.0	70
Access and availability	-	-	3.9 ± 1.0	77
Household member preference	-	-	3.9 ± 1.0	75
Price	-	-	3.9 ± 0.9	71
Food Allergies	-	-	3.5 ± 1.5	59
Eco-labeled seafood products	1.7 ± 0.8	15	3.4 ± 1.0	46

[a] Average score calculated from a 4-point Likert scale: 1=Not Knowledgeable, 2=Somewhat Knowledgeable, 3=Knowledgeable, 4=Very Knowledgeable.
[b] Average score calculated from a 5-point Likert scale: 1=Not Important, 2=Somewhat Important, 3=Neutral, 4=Important, 5=Very Important.

Lawley, 2012; Hicks et al., 2008). A review by Richter and Klöckner (2017) showed that consumers' familiarity with sustainable seafood labels increased their willingness to purchase compared to consumers not familiar with the labels. Therefore, any brand or logo indicating local RI seafood would require strategies to educate the consumer about its meaning.

Studies have shown that consumers may consider brand name and price as extrinsic indicators of product quality (Boulding & Kirmani, 1993; Dodds, Monroe, & Grewal, 1991; Verbeke et al., 2017), especially when they lack the knowledge and confidence on their own to evaluate seafood quality and other characteristics. The role of trust in influencing consumer food purchasing decisions may offset negative perceptions (Giampietri et al., 2018) and low knowledge (Giampietri et al., 2018; Grebitus, Steiner, & Veeman, 2015). Enhanced trust could be facilitated by the development of a familiar, trusted brand (Birch & Lawley, 2012; Campbell & Goldstein, 2001; Lobb, Mazzocchi, & Traill, 2007).

Purchasing Local Seafood

Tables 6 to 9 and Figure 1 show RI consumer perceptions regarding purchasing local RI seafood, and the RI brand logo and WTP for local seafood. Personal factors shape food choices. Understanding these traits can help to improve promotion, communication, product perception, and distribution (Thong & Solgaard, 2017). Therefore, investigating RI consumer perceptions will enhance outreach and marketing strategies regarding local seafood and branding. Initially, respondents were queried concerning the fresh seafood species most

commonly eaten and which species they considered local (data not shown). The top 10 species (of 31 listed in the survey) most commonly eaten by respondents were shrimp (74%), canned tuna (66%), cod (66%), clams (59%), scallops (58%), lobster (54%), haddock (52%), salmon, wild and aquacultured (47% and 40%), flounder (35%), and swordfish (34%). Shrimp, salmon, canned tuna, cod, and clams are seafood products that are favored by consumers nationally and compose the top 10 frequently consumed species, ranging in 2016 from 4.10 lbs. (1.86 kg.) per person (shrimp) to 0.34 lbs. (0.15 kg) per person (clams) (National Fisheries Institute [NFI], 2017). Scallops, while not on the national top ten list, were close behind the most frequently consumed kinds of seafood at 0.214 lbs. (0.10 kg) per capita, as calculated from national fisheries statistics (NMFS, 2017a).

While RI consumers indicated that they would prefer to purchase local seafood products (4.2 ± 0.8) and order at local restaurants (4.1 ± 0.9) (Table 6), their purchasing habits do not strongly align with these preferences. Shrimp and salmon ranked as the most consumed species, but they are never local options although 20% considered shrimp to be a locally caught product. Clams and lobsters are local products, however, and the other commonly eaten seafood is seasonal. Although sea scallops are seasonally local, bay scallops are never local to RI; nevertheless, 56% considered bay scallops local. RI is the second-largest U.S. harvester of squid and accounts for the highest percentage of landings along the East Coast (NMFS, 2017a, 2017b). In fact, squid (calamari) is the RI official state appetizer (RI Secretary of State, 2014). However, squid is consumed by only 33% of respondents and was considered local by only 32%. Scup, which is always local, was hardly eaten and only 18% considered it local. In part, this could be attributed to difficulty in finding local seafood in the market (3.2 ± 1.0) and that sales personnel and wait staff are not highly knowledgeable, since the respondents appeared to think that local seafood was only slightly safer or of higher quality (3.4 ± 0.9 and 3.6 ± 0.9, respectively). The desire for local seafood could provide opportunities to develop consumer knowledge and retail marketing strategies for local seafood products. The RI branding program was designed to increase consumer awareness regarding the identification of local seafood and seasonal availability; however, consumers have different perceptions of local, and without an outreach strategy, local brands would be of little use.

Defining "Local Seafood"

When respondents were queried about their interpretation of the term "local seafood," the majority defined it as having been caught within RI state waters (3-mile or 4.8-km limit; 68%) and aquacultured or farm-raised in RI waters (55%) (Table 7). While the latter comports with the definition of local as codified in RI state statutes and pertains to

Table 6. Rhode Island Consumer Attitudes Related to Seafood Purchasing and Consumption (*N*=920–927)

Items	Average Score[a] ± Standard Deviation
I prefer to buy local seafood	4.2 ± 0.8
I prefer to order seafood at local restaurants rather than larger chain or franchise restaurants	4.1 ± 0.9
Local seafood is higher quality than other seafood at the market	3.6 ± 0.9
Buying local seafood is more important than price	3.5 ± 1.0
Local seafood is safer than other seafood at the market	3.4 ± 0.9
It is easy to find local seafood in the market	3.2 ± 1.0
Sales personnel at the retail counters are knowledgeable about seafood	3.2 ± 0.9
Waitresses/waiters at restaurants are knowledgeable about seafood	2.8 ± 0.9
As long as seafood is sold in RI, I consider it local	2.2 ± 1.1
Total Score	**3.4 ± 0.9**

[a] Average score was calculated from a 5-point Likert scale: 1=Strongly Disagree, 2=Disagree, 3=Neither Disagree nor Agree, 4=Agree, 5=Strongly Agree.

Table 7. Rank Order of Rhode Island Consumer Interpretation of "Local Seafood" (*N*=941[a])

Fish or Shellfish Species	Frequency	%
Caught within Rhode Island (RI) state waters (the 3-mile limit)	644	68
Aquacultured or farm-raised in RI waters	517	55
Landed in a New England port	317	34
Caught anywhere and by any fisher as long as it is landed in a RI port	267	28
Caught anywhere as long as it is caught by a RI licensed fisher	195	21
Landed in RI ports only	178	19
Caught by RI licensed fishers but landed in another state port and trucked to RI	102	11
Landed in a Northeast (Virginia to Maine) port	73	8
Sold in Rhode Island, regardless of where or by whom the fish was caught	39	4
Other	19	2

Respondents checked all that applied.

[a] Of the respondents who indicated that they eat seafood (N=952), 11 respondents did not answer this question.

the RI branding logo (RI General Laws, Section 20-38-1), the former does not. A Rhode Island seafood product means "any marine species that have been grown in RI waters by commercial aquaculturists and any marine species that have been landed in RI by commercial fishers, pursuant to all applicable state and federal regulations" (RIDEM, 2013, Rule 5.00 Definitions). When queried if they understood the definition, 90% agreed; however, only 60% agreed that the definition reflected their concept of "local seafood" and only 61% felt that this definition was a good reflection of what local means (Table 8). This could be a barrier to increasing the consumption of local RI seafood products. Understanding how RI consumers interpret "local" seafood is important to building trust through branding and helping to develop a policy direction through which to promote RI seafood.

Branding "Local Seafood"

The RI Seafood brand is overseen and guided by the RISMC and administered by RIDEM (2013). However, only 23% of respondents indicated that they trusted the state government to administer the brand (data not shown). RI consumers did not appear to have much trust in any one organization or group to accurately administer the RI local seafood brand: consumer group (29%), independent third party (27%), or industry (18%). Trust in the certifying body is critical to consumer acceptance of labelled products (Richter & Klöckner, 2017). While lack of trust could be a potential barrier to increasing consumption of local RI seafood products through a branding program, lack of consumer recognition of the RI Seafood branding logo was a bigger factor: only 12% of respondents recognized the logo and 27% were unsure if they recognized the logo (Table 9). Familiarity with the RI local

Table 8. Consumer Interpretation of the "Rhode Island Seafood Products" Branding Definition[a] per Legislation (*N*=943–946[b])

		Percent (%) of Respondents		
Definition of "Rhode Island Seafood Products"		Yes	No	Unsure
Understand the definition of "local RI seafood products"	(*N*=946)	90	2	8
Definition reflects consumer concept of "local seafood"	(*N*=943)	60	27	13
Definition is a good reflection of meaning of "local seafood"	(*N*=943)	61	23	16

[a] "Rhode Island Seafood Products" means any marine species that have been grown in RI waters by commercial aquaculturists and any marine species that have been landed in RI by commercial fishers, pursuant to all applicable state and federal regulations (RIDEM, 2013, Rule 5.00 Definitions).

[b] Of the respondents who indicated that they eat seafood (*N*=952), four to nine respondents did not answer these questions.

seafood label is important to building consumer trust and acceptance of the products. Two-thirds of respondents (66%) felt that the logo would encourage them to select a local seafood product and 53% indicated that they would be more willing to try a seafood product if it were labeled local. There was clearly an increased trend in all communities to be willing to try a new seafood product if it were labeled local, and respondents living on or near the coast in regions having significantly (p<.05) more people (57%) would be more willing to try a new seafood species if it were labeled local. A consumer study in Connecticut showed that 24% preferred seafood from Connecticut, whereas almost half of respondents (45%) did not have a preference (Benson, 2018). Other studies have shown that Australian consumers strongly preferred "local" fish to imported products and one of the top reasons for consuming less seafood was the lack of local seafood varieties (Christenson et al., 2017; Daneberg & Mueller, 2011).

Overall, 72% of RI consumers were WTP more money to purchase a "local" white fish over a similar, less expensive "non-local" seafood product (Table 9), with females significantly more likely (p<.05) than expected to pay more (data not shown). This agrees with other published information, reported by Richter & Klöckner (2017), that indicated females purchase more organic and seafood products. For respondents who indicated that they live on or near the coast, significantly (p<.05) more than expected (75%) indicated they would be WTP more money to purchase a "local" white fish. While Providence County, an urban community with lower median income was significantly lower, two-thirds (68%) still indicated willingness to consider paying more for local. Forty-two percent of respondents were willing to spend US$1.00 more per pound for a local fish of similar quality if the

Table 9. "Rhode Island Seafood" Branding Logo: Consumer Recognition of the Logo and its Influence on their Seafood Consumption and Purchasing Choices

	Percent (%) of Respondents						
			Rhode Island County				
"Rhode Island Seafood" Branding Logo	Rhode Island State (*N*=948–947)	Live on/near Coast (*N*=557–564)	Bristol (*N*=64–66)	Kent (*N*=196–197)	Newport (*N*=85–87)	Providence (*N*=379–384)	Washington (*N*=204–207)
Recognition of the logo							
Yes	12	12	14	12	9	13	11
No	61	59	58	65	53	64	58
Unsure	27	29	28	23	38	23	31
Logo encouragement on selection of seafood for purchase and/or consumption							
Encourages	66	68	66	72	70	62	67
No Effect	21	18	15	18	13	25	20
Unsure	13	13	19	10	17	13	13
Willingness to try a new seafood species if labeled local							
Only willing to try if labeled local	14	13	11	16	9	14	12
More willing to try if labeled local	53	**57**[a]	52	51	67	49	58
Does not matter, would try new seafood species, labeled local or not	22	**19**[a]	25	21	14	26	20
Not willing to try any new seafood, labeled local or not	11	11	12	12	9	11	10
Willingness to pay more money for a local "white" fish that is the same quality as a similar, non-local "white" fish							
Willing to pay	72	**75**[a]	73	70	76	**68**[a]	**79**[a]

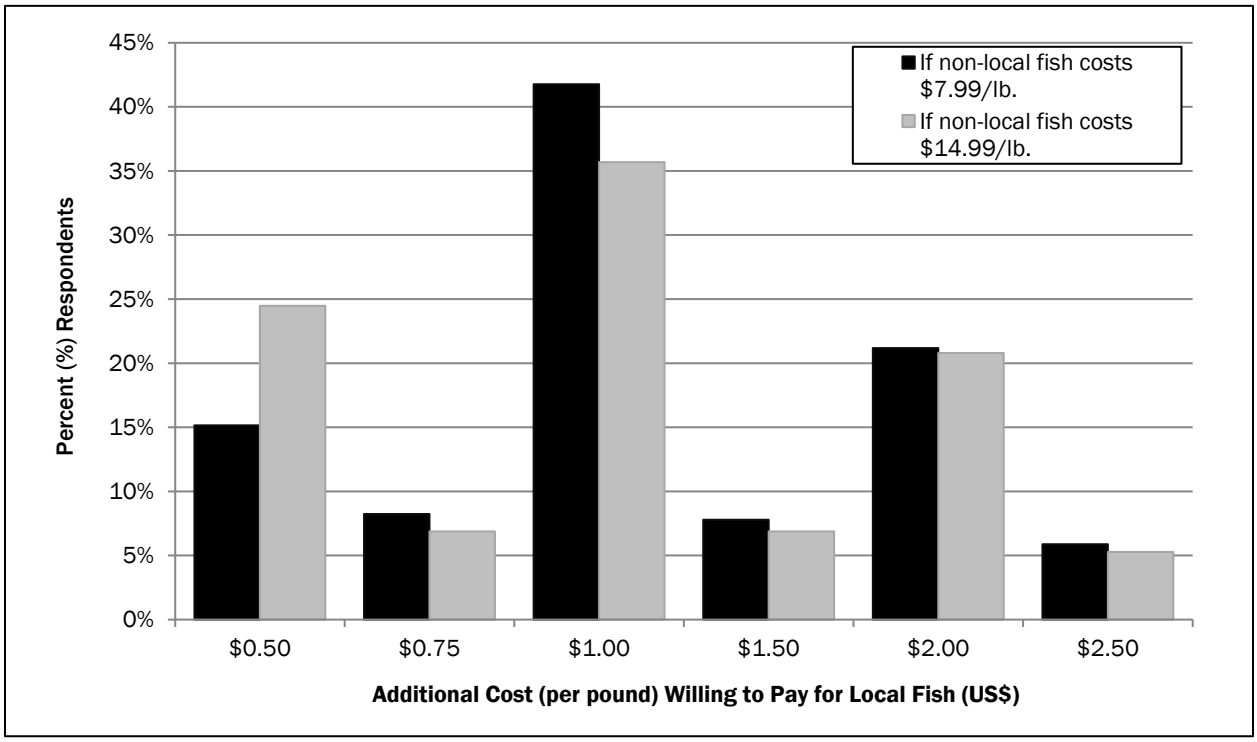
[a] Chi-square analysis indicated a significant relationship at p<.05 within the branding logo subheadings and among demographic categories.

non-local fish costs US$7.99/lb., and 36% were willing to spend US$1.00 more per pound if the non-local fish costs US$14.99/lb. (Figure 1). As indicated previously, the respondent pool consisted of educated participants with higher than expected income, and the data should be considered in that context. Specifically, education had an impact on WTP, with respondents with at least a bachelor's degree significantly more likely than expected ($p<.05$) to pay more money for local products. However, there did appear to be an overall WTP if RI consumers knew that the fish was local, although cost is often considered a barrier to seafood consumption (Hicks et al., 2008). Willingness-to-pay information helps assess demand for local seafood. However, there are limitations for extrapolation from this study. Directly asking participants their WTP under various hypothetical scenarios could reflect possible purchase intentions, but may not reflect actual purchase behavior. What people say they are WTP and what they actually pay may differ by as much as 50% (French et al., 2014). This study provides clear evidence of WTP for local RI seafood by RI consumers throughout the state, but behavior assessment, not in the scope of this project, could be a next step.

Promoting RI Local Seafood

The results of this survey were presented to the RISMC. The presentation reinforced the emerging perception that the RI Seafood brand was not fully achieving its intended purpose. While it constituted a potentially useful way to distinguish RI seafood products in the marketplace, insufficient consumer outreach and education limited its effectiveness. At the most recent meeting of the collaborative, in 2019, there was a general consensus that the logo, while perhaps appropriate as an official seal, was not working well as a brand, since it was not conveying the Rhode Island local seafood message in a way that readily resonates with consumers (R. Ballou, RI Dept. of Environmental Management, personal communication, 2019). The collaborative has therefore agreed to pursue the development of a new brand, consider loosening the regulatory restrictions on its use so that it can better serve as an all-encompassing ambassador for RI seafood, and enhance efforts to develop and implement an

Figure 1. Respondent Willingness to Pay Additional Money for Local Fish of Similar Quality Over Non-local Fish



effective outreach strategy. These key policy objectives are a direct consequence of the survey results (R. Ballou, personal communication, 2019).

Conclusion

This study assessed consumer perceptions of local seafood, as well as purchasing choices and willingness-to-pay. The majority of RI consumers, regardless of income, education, and locality, would prefer local seafood if they could easily find it in the market and if they could trust the brand (i.e., logo) to identify product choice. A trusted local brand that consumers could recognize could positively influence consumer seafood purchasing decisions and thus aid in sustaining the local seafood industry.

The results of this study, which have been presented to and well received by stakeholders, have helped to establish a critical baseline for consumer perceptions and awareness of local seafood, and WTP. Thus, these results have influenced the policy direction of the local brand. However, the local RI seafood brand has not lived up to its potential in that it has not had a major influence on seafood consumers, as the study results indicate. There is an emerging consensus on the part of the RISMC that the brand should be redesigned and repurposed to render it more effective. At the same time, there is increasing recognition that a more robust public information and outreach program needs to be developed and implemented in RI to better address the strong consumer preferences for local seafood affirmed by this study. RI is well-positioned to act on the results of this study by stepping up efforts, via the RISMC, to better link the supplies of local seafood products with the documented consumer interest in such products. Such efforts could, and should, lead to the sustained economic growth of the RI seafood industry as well as the improved health of RI citizens. The results of this work will be integral in informing new directions for a more successful program. It will impact future discussions by informing the process and help influence policy efforts.

Consumer interest in and WTP for local seafood coupled with a known branding program could support a stronger local seafood industry. Working through the RISMC and in accordance with the RI Food Strategy, the results of the study will be used to help develop and implement a more effective outreach strategy to achieve the above-noted policy objectives pertaining to RI seafood. Based on this research, the easiest communities to target initially would be the coastal communities at both supermarkets and specialty seafood stores. Consumers must be educated as to what the brand means and how it is defined in an effort to build trust; there must be both consumer awareness to help facilitate the purchase of local seafood and regulatory modifications to encourage processors, retailers, and restaurateurs to use it. This may not alter the high desirability of shrimp and salmon, but it could encourage consumers to purchase more local seafood, given their willingness to try local species and pay a little more money for it.

Acknowledgments

The project coordinators would like to thank the project advisory board for their expertise and significant contributions to the development of the survey: Ken Ayers, Chief, Division of Agriculture, RI Dept. of Environmental Management; David Butel, Aquaculture Coordinator, RI Coastal Resources Management Council; and Dr. Hiro Uchida, Environmental and Natural Resource Economics, University of Rhode Island. The authors would also like to thank Dr. Robert Gable for providing his expertise in evaluation and statistical assessment.

References

Atlantic Corporation. (2019). *Measuring consumer attitudes and preferences about farm-raised shellfish, finfish, and sea vegetables in the Atlantic coast states.* Waterville, Maine: Author. Retrieved from https://www.atlanticcorp.us/

Benson, J. (2018). Too few residents taking advantage of local seafood bounty: Survey is start of efforts to encourage more consumption. *Sea Grant Connecticut Wracklines, 18*(1), 11–12. Retrieved from https://seagrant.uconn.edu/wp-content/uploads/sites/1985/2018/05/Seafood.survey.pdf

Birch, D., & Lawley, M. (2012). Buying seafood: Understanding barriers to purchase across consumption segments. *Food Quality and Preference, 26*(1), 12–21. https://doi.org/10.1016/j.foodqual.2012.03.004

Boulding, W., & Kirmani, A. (1993). A consumer-side experimental examination of signaling theory: Do consumers perceive warranties as signals of quality? *Journal of Consumer Research, 20*(1), 111–123. https://doi.org/10.1086/209337

Campbell, M. C., & Goldstein, R. C. (2001). The moderating effect of perceived risk on consumers' evaluations of product incongruity: Preference for the norm. *Journal of Consumer Research, 28*(3), 439–449. http://dx.doi.org/10.1086/323731

Carlucci, D., Nocella, G., Devitiis, B., Viscecchia, R., Bimbo, F., & Nardone, G. (2015). Consumer purchasing behavior towards fish and seafood products: Patterns and insights from a sample of international studies. *Appetite, 84,* 212–227. https://doi.org/10.1016/j.appet.2014.10.008

Christenson, J. K., O'Kane, G. M., Farmery, A. K., & McManus, A. (2017). The barriers and drivers of seafood consumption in Australia: A narrative literature review. *International Journal of Consumer Studies, 41*(3), 299–311. https://doi.org/10.1111/ijcs.12342

Daneberg, N., & Mueller, S. (2011). *Omnibus consumer research findings – Wave 2*. Deakin, ACT: Australian Seafood Cooperative Research Center, UniSA Ehrenberg-Bass Institute for Marketing Science. Retrieved from https://www.seafoodcrc.com/southern-bluefin-tuna/consumer-research/2008-779-omnibus-consumer-research-findings-wave-2.html

Dillemuth, A. (2017). *Community food production: The role of governments in increasing community food production for local markets* (Planning & Policy Brief). Washington, D.C.: U.S. Department of Agriculture, National Institute of Food and Agriculture & Growing Food Connections. Retrieved from http://growingfoodconnections.org/wp-content/uploads/sites/3/2015/11/GFCFoodProductionPlanningPolicyBrief_2017August29.pdf

Dodds, W. B., Monroe, K. B., & Grewal, D. (1991). Effects of price, brand and store information on buyers' products evaluations. *Journal of Marketing, 28*(3), 307–319. https://doi.org/10.2307/3172866

Fonner, R., & Sylvia, G. (2015). Willingness to pay for multiple seafood labels in a niche market. *Marine Resource Economics, 30*(1), 51–70. https://doi.org/10.1086/679466

Freedgood, J., & Fydenkevez, J. (2017). *Growing local: A community guide to planning for agriculture and food systems.* Northampton, MA: American Farmland Trust. Retrieved from http://www.farmlandinfo.org/growing-local-community-guide-planning-agriculture-and-food-systems

French, C., Cullen, K., Manalo, A. & Jones, E. (2014). *Consumer and retailer demand for local seafood: Opportunities in the N.H. marketplace* (Pub. No. UNHMP-IS-SG-14-010). Durham: University of New Hampshire Cooperative Extension, New Hampshire Sea Grant College Program. Retrieved from https://seagrant.unh.edu/sites/seagrant.unh.edu/files/media/pdfs/extension/alternative_seafood_marketing.pdf

Giampietri, E., Verneau, F., Del Giudice, T., Carfora, V., & Finco, A. (2018). A theory of planned behavior perspective for investigating the role of trust in consumer purchasing decision related to short food supply chains. *Food Quality and Preference, 64,* 160–166. https://doi.org/10.1016/j.foodqual.2017.09.012

Giovannucci, D., Barham, E., & Pirog, R. (2010). Defining and marketing "local" foods: Geographical indications for US products. *Journal of World Intellectual Property, 13*(2), 94–120. https://doi.org/10.1111/j.1747-1796.2009.00370.x

Grebitus, C., Steiner, B., & Veeman, M. (2015). The roles of human values and generalized trust on stated preferences when food is labeled with environmental footprints: Insights from Germany. *Food Policy, 52,* 84–91. https://doi.org/10.1016/j.foodpol.2014.06.011

Grimley, S., & Roheim, C. (2010). *Assessing the market potential for "local" seafood in Rhode Island: Qualitative results of a survey of consumers' preferences and perceptions* (RI Sea Grant report). Narragansett: University of Rhode Island, RI Sea Grant.

Hellberg, R. S., Dewitt, C. A., & Morrissey, M. T. (2012). Risk-benefit analysis of seafood consumption: A review. *Comprehensive Reviews in Food Science and Food Safety, 11*(5), 490–517. https://doi.org/10.1111/j.1541-4337.2012.00200.x

Hicks, D., Pivarnik, L. F., & McDermott, R. (2008). Consumer perceptions about seafood—An internet survey. *Journal of Foodservice, 19*(4), 213–226. https://doi.org/10.1111/j.1748-0159.2008.00107.x

Hicks, D., Pivarnik, L. F., McDermott, R., Richard, N. L., Hoover, D. G., & Kniel, K. E. (2009). Consumer awareness and willingness to pay for high-pressure processing of ready-to-eat food. *Journal of Food Science Education, 8*(2), 32–38. https://doi.org/10.1111/j.1541-4329.2009.00069.x

Hicks, D., Pivarnik, L. F., Richard, N. L., Gable, R., & Morrissey, M. (2013). Assessing knowledge and attitudes of US healthcare providers about benefits and risks of consuming seafood. *Journal of Food Science Education, 12*(4), 75–80. https://doi.org/10.1111/1541-4329.12014

Hullinger, A. M., & Tanaka, K. (2017). Agriculture of the middle participation in state branding campaigns: The case of Kentucky. *Journal of Agriculture, Food Systems, and Community Development, 6*(1), 107–120. https://doi.org/10.5304/jafscd.2015.061.008

International Food Information Council (IFIC) Foundation. (2018). *2018 Food and health survey*. Washington, D.C.: Author. Retrieved from https://www.foodinsight.org/2018-food-and-health-survey

Johnston, N. E., Jai, T. M., Phelan, K. V., & Velikova, N. (2018). Branding state-level pride: Exploring values and attitudes of local food product consumption. *Journal of Foodservice Business Research, 21*(6), 659–681. https://doi.org/10.1080/15378020.2018.1531740

Lobb, A. E., Mazzocchi, M., & Traill, W. B. (2007). Modelling risk perception and trust in food safety information within the theory of planned behavior. *Food Quality and Preference, 18*(2), 384–395. https://doi.org/10.1016/j.foodqual.2006.04.004

McManus, D., Hunt, W., Storey, J., McManus, J., & Hilhorst, S. (2014). Perceptions and preference for fresh seafood in an Australian context. *International Journal of Consumer Studies, 38*(2), 146–152. https://doi.org/10.1111/ijcs.12076

National Fisheries Institute (NFI). (2017, November 2). *Top 10 list highlights seafood consumption progress*. McLean, Virginia: Author. Retrieved from https://www.aboutseafood.com/press_release/top-10-list-highlights-seafood-consumption-progress

National Marine Fisheries Service (NMFS). (2017a). *Fisheries of the United States, 2016 Report*. Washington, D.C.: U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Retrieved from https://www.fisheries.noaa.gov/resource/document/fisheries-united-states-2016-report

National Marine Fisheries Service (NMFS). (2017b). *Fisheries economics of the United States, 2015* (NOAA Tech. Memo. NMFS-F/SPO-170). Silver Spring, MD: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, NMFS. Retrieved from https://www.st.nmfs.noaa.gov/economics/publications/feus/fisheries_economics_2015/index

Olsen, S. O. (2003). Understanding the relationship between age and seafood consumption: The mediating role of attitude, health involvement, and convenience. *Food Quality and Preference, 14*(3), 199–209. https://doi.org/10.1016/S0950-3293(02)00055-1

Olsen, S. O. (2004). Antecedents of seafood consumption behavior. An overview. *Journal of Aquatic Food Product Technology, 13*(3), 79–91. https://doi.org/10.1300/J030v13n03_08

Paulin, C., Lofgren, I. E., & Pivarnik, L. F. (2017). An assessment of consumer food safety handling practices of produce at grocery stores in Rhode Island. *Food Protection Trends, 37*(2), 99–106. Retrieved from https://pdfs.semanticscholar.org/8656/847cf1651501c62b78da8ef92ab0b19694ed.pdf

Pivarnik, L. F., Richard, N. L., Gable, R. K., & Worobo, R. (2016). Knowledge and attitudes of produce and seafood processors and food safety educators regarding nonthermal processes. *Journal of Food Science Education, 15*(4), 120–128. https://doi.org/10.1111/1541-4329.12093

Pivarnik, L. F., Richard, N. L., Hirsch, D., Becot, F., Conner, D., & Parker, J. (2018). Small- and medium-scale New England produce growers' knowledge, attitudes and implementation of on-farm food safety practices. *Food Protection Trends, 38*(3), 156–170. Retrieved from https://pdfs.semanticscholar.org/8915/cece567651053cc6ed7bae77be3c6638030e.pdf

Pivarnik, L. F., Richard, N. L., Patnoad, M. S., & Gable, R. K. (2012). Assessment of food safety knowledge for managers of residential childcare institutions (RCCI) in the Northeast. Food *Protection Trends, 32*(6), 296–308. Retrieved from http://www.foodprotection.org/files/food-protection-trends/Jun-12-Gable.pdf

Rhode Island Food Strategy. (2017). *Rhode Island Food Strategy: An actionable vision for food in Rhode Island*. Providence: RI Commerce Corporation. Retrieved from http://dem.ri.gov/relishrhody/pdf/rifood17.pdf

Rhode Island General Laws, 20-38. (2011). *The Rhode Island Seafood Marketing Collaborative of 2011*. Providence: Rhode Island General Assembly. Retrieved from http://webserver.rilin.state.ri.us/Statutes/title20/20-38/INDEX.HTM

Rhode Island Department of Environmental Management (RIDEM). (2013). *Rules and regulations governing the Rhode Island seafood brand and the mislabeling of marine species*. Providence: RIDEM, Division of Agriculture. Retrieved from https://risos-apa-production-public.s3.amazonaws.com/DEM/7861.pdf

Rhode Island Secretary of State. (2014). *Rhode Island state symbols*. Providence: RISOS. Retrieved from http://sos.ri.gov/divisions/civics-and-education/reference-desk/ri-state-symbols

Richter, I. G. M., & Klöckner, C. A. (2017). The psychology of sustainable seafood consumption: A comprehensive approach. *Foods, 6*(10), 86–100. https://doi.org/10.3390/foods6100086

Salant P., & Dillman, D. A. (1994). *How to conduct your own survey*. New York: John Wiley.

Skallerud K., Korneliussen, T., & Olsen, S. O. (2009). An examination of consumers' cross-shopping behavior. *Journal of Retailing and Consumer Studies, 16*(3), 181–189. https://doi.org/10.1080/08961530.2014.848081

Sterling B., Gooch, M., Dent, B., Marenick, N., Miller, A., & Sylvia, G. (2015). Assessing the value and role of seafood traceability from an entire value-chain perspective. *Comprehensive Reviews in Food Science and Food Safety, 14*(3), 205–268. https://doi.org/10.1111/1541-4337.12130

Storey M., Forshee, R. A., Anderson, P. A., & Miller, S. A. (2006). *Communicating risk-risk to the public: The case of the health benefits and risks from eating seafood* (Ceres White Paper). College Park: University of Maryland, Center for Food, Nutrition, and Agricultural Policy. Retrieved from http://wealthandhealth.ltd.uk/articles/Seafood_Risks__Benefits.pdf

Thong, N. T., & Solgaard, H. S. (2017). Consumer's food motives and seafood consumption. *Food Quality and Preference, 56,* 181–188. https://doi.org/10.1016/j.foodqual.2016.10.008

U.S. Census Bureau. (2011). *Statistical abstract of the United States 2011. Section 6: Geography and environment*. Retrieved from https://www2.census.gov/library/publications/2010/compendia/statab/130ed/tables/geo.pdf

U.S. Census Bureau. (2016). *2012-2016 American Community Survey 5-year estimates*. Retrieved from https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/2016/

U.S. Department of Agriculture, Economic Research Service (USDA ERS). (2016). *Local foods. overview*. Washington, D.C.: Author. Retrieved from https://www.ers.usda.gov/topics/food-markets-prices/local-foods.aspx

U.S. Department of Health and Human Services & U.S. Department of Agriculture. (2015). *2015–2020 dietary guidelines for Americans* (8th ed). Washington, D.C.: Authors. Retrieved from http://health.gov/dietaryguidelines/2015/guidelines/

Verbeke W., Vermeir, I., & Brunso, K. (2017). Consumer evaluation of fish quality as basis for fish market segmentation. *Food Quality and Preference, 18*(4), 651–661. https://doi.org/10.1016/j.foodqual.2006.09.005

Wilde, P. (2013). *Food policy in the United States: An introduction*. New York: Routledge.

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

How well is urban agriculture growing in the Southern United States? Trends and issues from the perspective of urban planners regulating urban agriculture

Russell Fricano [a] *
Minnesota State University Mankato

Carla Davis [b]
Alabama A&M University

Submitted January 28, 2019 / Revised April 26 and May 19, 2019 / Accepted May 20, 2019 / Published online January 7, 2020

Citation: Fricano, R., & Davis, C. (2020). How well is urban agriculture growing in the Southern United States? Trends and issues from the perspective of urban planners regulating urban agriculture. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 31–53. https://doi.org/10.5304/jafscd.2020.092.001

Abstract

In this study, we evaluate urban agriculture trends in 55 cities in the Southern United States. Our research is important for three reasons. First, as the geographic scope of urban agriculture research is limited mostly to Northeast and West Coast cities, we focus on the South, the fastest-growing U.S. Census region. Second, despite rapid growth, this region has also experienced the highest rate of poverty and food insecurity. Third, we surveyed urban planners who regulate and monitor urban agriculture sites, develop urban agriculture policies and programs, and advise local decision-makers. The study documents Southern urban agriculture changes between 2000 and 2010. It also considers types of projects, implementation barriers, and strategies used to promote urban agriculture. A survey questionnaire was mailed to planning officials in 153 Southern cities; 55 cities responded. Among respondents, 87% reported the existence of urban agriculture in their jurisdiction. Most Southern cities reporting urban agriculture experienced urban agriculture growth (69%), 21% reported decline, and 10% did not report a change. The most common projects included neighborhood gardens, school gardens, and community supported and entrepreneurial agriculture. Irrespective of urban agriculture growth or decline, the responding cities relied on the same types of regulatory and policy approaches. Only cities reporting

[a] * *Corresponding author:* Russell Fricano, Associate Professor, Minnesota State University Mankato, Urban & Regional Studies Institute; 106 Morris Hall; Mankato, MN 56001 USA; +1-506-389-1540; russell.fricano@mnsu.edu

Some of the research for this paper was conducted while Fricano was Assistant Professor, Alabama A&M University, Normal, Alabama.

[b] Carla Davis, Department of Community & Regional Planning, Alabama A&M University, Normal, Alabama.

Davis is now a planner with the City of Fairhope (Alabama) Department of Planning and Zoning.

Funding Disclosure

The authors are indebted to Alabama A&M University Department of Community and Regional Planning for providing a portion of the funding for this project.

growth in urban agriculture implemented programs to promote urban agriculture, including land acquisition, trusts, and interjurisdictional coordination. Land conversion and lack of economic sustainability were cited as main barriers to urban agriculture. The findings suggest the need to further explore the impact of external factors on the effectiveness of urban agriculture regulations, policies and programs, and solutions to urban agriculture barriers.

Keywords
Urban Agriculture, Urban Planners, Land Use, Southern United States

Introduction

Urban agriculture is an important component of a larger community food system, providing nutrition, green development, economic opportunities, and resilience to the urban environment. Most of our knowledge of urban agriculture comes from case studies of successful urban agriculture programs and surveys primarily focusing on community garden stakeholders at a site-specific level. In the process, research has identified what has made urban agriculture successful as well as what impedes its progress. Successful urban agriculture strategies consist of favorable site conditions, entrepreneurship, agricultural cultivation techniques, land, labor, capital, consumer demand, and distribution channels (Hodgson, Campbell, & Bailkey, 2011; Tixier & Bonn, 2006; Veenhuizen, 2006). In addition, Hodgson et al. (2011), Sharp, Jackson-Smith, and Smith (2011), and Raja, Born and Kozlowski-Russell (2008) also emphasize the importance of the regional component of food systems and community food councils, comprehensive urban agriculture and land resource studies, and the incorporation of urban agriculture in local comprehensive and regional plans. Conversely, research has also revealed various barriers to urban agriculture, including site-related (physical and biological characteristics) issues, restrictive or poorly defined regulations and policies, lack of agricultural training and experience, land tenure issues, organizational and institutional obstacles, and negative public perceptions (American Community Garden Association [ACGA], 1998; Hodgson et al., 2011; Kaufman & Bailkey, 2000; Mukherji & Morales, 2010).

While these studies provide important information, certain issues that affect urban agriculture growth and decline remain unexplored: First, Guitart, Pickering and Byrne (2012) noted that the geographic scope of community garden research was predominantly limited to Northeast and West Coast cities. The question, then, is how well urban agriculture has grown in the South?[1] This is especially important as the South experienced the highest rate of growth in population (14%) compared to other U.S. regions from 2000 to 2010 (U.S. Census Bureau, 2011b).

Second, the Southern region consistently experienced the highest rate of poverty among U.S. regions from 1959 to 2017 (U.S. Census Bureau, 2018). As noted by Coleman-Jensen, Rabbitt, Gregory, and Singh (2018), households with income near or below the poverty level also reported higher rates of food insecurity. Further, according to the U.S. Department of Agriculture Economic Research Service (USDA ERS), eight states, or 80% of states in this region, reported food insecurity above the national average (USDA, 2017a; 2017b); 8.3% of Southern households reported "low food security," and 5.1% reported "very low food security." Compared with other U.S. Census regions, these are the highest incidences of food insecurity in the U.S. (Coleman-Jenson et al., 2018).

Third, this study addresses perceived urban agriculture trends over a set time frame *within* cities. Most studies are conducted either at one point in time or in inconsistent time frames. Equally important are trends at the perspective of the city level. City jurisdiction perspectives are crucial, as that is where land use policy and regulation take place. These functions are under the purview of local government planning, which can permit, restrict, or

[1] We refer to the Southern region as delineated by the U.S. Census Bureau American Community Survey Office (2018) – *Census Regions and Divisions in the United State*. This includes Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

replace urban agriculture projects. It follows that perspectives are needed from planners who work closely with the city council and planning commission to regulate urban agriculture and develop policies that promote it.

This leads to our fourth issue: The extent cities implement regulations, policies, and programs that preserve and promote urban agriculture is not adequately covered in research. The American Planning Association report by Hodgson et al. (2011) and related research by Campbell (2004) and Kaufman and Bailkey (2000) provide a detailed list of planning strategies that maintain and promote urban agriculture. We examine the extent to which these approaches are followed from the perspective of urban planners.

Fifth, we examine how well research identifies barriers to urban agriculture. For urban agriculture to be successful, barriers must be more thoroughly identified and anticipated. There is some discussion of barriers in the literature, but these works primarily focus on site characteristics, restrictive regulations, or land tenure issues.

Finally, we also consider the extent of interjurisdictional coordination. Cities that are highly urbanized look to peri-urban areas outside the local jurisdiction for potential urban agriculture sites. To accomplish this requires interjurisdictional coordination, which planners initiate.

This research addresses these issues by surveying local government planners. Planners can provide important insight into urban agriculture in several ways. They view urban agriculture from a comprehensive perspective at the city and regional levels, thereby placing them in a position to view urban agriculture and other food system issues in the context of other local considerations (Pothukuchi & Kaufman, 1999).

Planners administer a permitting system for the development of land that includes urban agriculture projects. The outcomes of these decisions are part of their day-to-day work, and they are also legally required to maintain records of these decisions. Planners also periodically update existing land use maps utilizing field investigation, aerial photos, and geographic information systems (GIS). They also monitor and rectify zoning violations.

Further, planners work closely with planning commissions and city councils, which have authority in land use decisions. In the process, they advise decision-makers on ways of promoting urban agriculture in local comprehensive planning policies. Planners also implement policies through zoning and other forms of land use regulation and coordinate land development with adjacent jurisdictions. Further, Campbell (2004) emphasized a role for planners as a food system partner that includes revising local land use plans and regulations to promote local food systems. Thibert (2012), Hodgson et al. (2011), and Kaufman and Bailkey (2000) share these suggestions.

Utilizing a planner's perspective with a Southern geographic scope, this study adds to the existing literature by examining perceived urban agriculture growth and decline over a 10-year period. Based on a citywide level in the Southern U.S. region, the study also explores types of projects, approaches used to regulate and promote urban agriculture, the extent of interjurisdictional coordination, and barriers to urban agriculture faced by the survey respondents. Further, we detail changes in urban agriculture through planners' observations based on their knowledge of local land development trends, changes in cultivated acres, and the number of agricultural projects.

The definition of urban agriculture used in the survey is "a formal or organized agricultural activity within a city-sponsored by government, nonprofit, or private organizations." "Organized" cultivation of land places urban agriculture within the scope of land use regulation and policy.

This research also views urban agriculture in three capacities: (a) community-oriented crops grown for neighborhood consumption and community supported agriculture; (b) entrepreneurial farming: cultivating crops or raising livestock for small business development and job training; and (c) institutional farming taking place in public parks, municipally owned land, public housing locations, and educational institutions. We based our taxonomy on projects classified by the American Planning Association (Hodgson, Campbell, & Bailkey, 2011) and the American Community Gardening Association National Survey (ACGA, 1998). We do not include one-shot projects in our definition, as they are difficult to track, have a

comparatively shorter life, and do not provide an understanding of the long-term allocation of vacant urban space.

While literature also places farmers markets and peri-urban agriculture within the definition of urban agriculture, we do not include these practices. Regarding distribution, farmers markets do not always sell local food products. In contrast, on-site sales at urban farm sites better fit this definition.

Peri-urban agriculture is practiced on the edge of urban areas and therefore would be outside the authority of our surveyed cities. However, we do recognize the value of peri-urban agriculture, especially when land for growing crops in cities becomes developed or redeveloped, making farmland scarce; proximity to the urban area provides replacement sites. Peri-urban agriculture also facilitates the rural-urban interface, offering farming opportunities for high-value, perishable products near cities and reducing transport costs and energy usage (Heimlich, 2001; Oberholtzer, Clancy, & Esseks, 2010). For these reasons, peri-urban agriculture is examined by exploring whether the surveyed cities coordinate with adjacent jurisdictions.

Studies of community gardens often focus on specific sites. However, the focus on community gardens prevents the documentation of other types of urban agriculture, including specialized agricultural, ranching, dairy, livestock, or permaculture projects—collectively defined as entrepreneurial agriculture. They also disregard private/public research or university-sponsored projects. Further, site-specific studies are not comprehensive.; they ignore overall trends in urban agriculture in a specific jurisdiction.

Literature Review

Our survey of the literature on urban agriculture revealed three categories: first, programs and practices that lead to successful urban agriculture; second, research detailing barriers to implementing urban agriculture; and last, case studies and surveys of community garden organizations and stakeholders documenting gardening initiatives.

Successful urban agriculture consists of interdependent components that include site conditions, entrepreneurship, agricultural cultivation techniques, land, labor, capital, consumer demand, and distribution channels (Hodgson et al., 2011; Tixier & Bonn, 2006; Veenhuizen, 2006). Other works have shown the importance of the regional component and community food councils, community food assessments, comprehensive urban agriculture and land resource studies, and the incorporation of urban agriculture in local comprehensive and regional plans (Hodgson et al., 2011; Raja, Born, & Kozlowski-Russell, 2008; Raja & Campbell, 2014; Sharp, Jackson-Smith, & Smith, 2011).

School gardens also play a special role in improving nutritional education and behavior. Ratcliffe, Merrigan, Rogers, and Goldberg (2011) found that school gardening improved students' willingness to taste and consume vegetables. According to research by Parmer, Salisbury-Glennon, Shannon, and Struempler (2009), school gardens were associated with knowledge of fruit and vegetables and nutritious consumption behavior. Graham, Beall, Lussier, McLaughlin and Zidenberg-Cherr (2005) also found that as a form of academic instruction, schools used gardens primarily for teaching science, environmental concepts, and nutrition.

Major collaborative programs formed by urban agriculture stakeholders coordinate efforts over a regional area with a variety of non-agricultural stakeholders, including environmental protection and greening groups, schools, city agencies, charitable foundations, and volunteer organizations (Krones & Edelson, 2011). Community participation also provides an opportunity for public education, shaping perceptions of urban agriculture, and provides training to prospective urban farmers (Bleasedale, Crouch, & Harlan, 2011; Covert & Morales, 2014; Feenstra, McGrew & Campbell, 1999; Kaufman & Bailkey, 2000).

Other studies discuss planning methods that facilitate urban agriculture. Cities can promote urban agriculture through comprehensive planning policies to fulfill broader goals such as open space preservation and food access (Hodgson et al., 2011). Modifying standalone agriculture ordinances and zoning districts can make vacant parcels conducive to multifunctional agricultural use (Lovell,

2010). Mukherji and Morales (2010) also suggested that planners may want to promote agriculture that is more intensive as permitted uses but limit the extent of such uses through a conditional use permit process to avoid nuisances.

The practice of urban agriculture has encountered various barriers throughout its history. These barriers fall into six main categories: site-related (physical and biological characteristics), restrictive or poorly defined regulations and policies, lack of agricultural training and experience, land tenure issues, organizational/institutional obstacles, and negative public perceptions (ACGA, 1998; Hodgson et al., 2011; Kaufman & Bailkey, 2000; Mukherji & Morales, 2010).

Regulatory and policy barriers include restrictions imposed on urban agriculture by zoning and comprehensive planning (Castillo, Winkle, Krauss, Turkewitz, Silva, & Heinemann, 2013; Lovell, 2010; Masson-Minock & Stockman, 2010; Mukherji, 2009; Mukherji & Morales, 2010). Comprehensive planning policies can promote sustainable development, including redevelopment, urban forestry, and other forms of land use that compete with urban agriculture practices (Lovell, 2010).

Agricultural and entrepreneurial skills are essential for a successful business. Urban farming operations have the added burdens of the seasonal nature of food production, shortages of qualified, experienced staff, and missing educational programs and training for both the farmer and staff (ACGA, 1998; Bleasedale, Crouch, & Harlan, 2011; Kaufman & Bailkey, 2000).

Land tenure is widely discussed in the literature. Agricultural enterprises are fixed to the land. If land is sold or converted to another use, relocating an urban farming project to another location is difficult, if not impossible. Landowners commonly lease vacant lots to urban agricultural interests for the short term, but convert to other, more profitable uses as opportunities arise. The urban farmer has no assurance of the continued use of the site for cultivation from year to year (Castillo et al., 2013; Hodgson et al., 2011; Kaufman & Bailkey, 2000; Schmelzkopf, 1995; Schukoske, 2000). In cases where replacement sites are available, the cost of moving from one site to another can be prohibitive (Castillo et al., 2013).

Organizational and institutional obstacles also complicate or prevent the establishment of urban agriculture projects. These obstacles can include competing priorities with other projects (Lovell, 2010; Schmelzkopf, 1995), jurisdictional issues over which governmental organization regulates community gardens (e.g., parks or planning), and independent urban agriculture programs that conduct operations without strong institutional support and coordination (Feenstra et al., 1999; Linn, 1999; Mukherji, 2009; Smith & Kurtz, 2003).

Perceptions of negative agricultural impacts and questions over the legitimacy of agricultural use within city boundaries as a nonformalized process can sometimes cause resistance. Following World War II, cities relegated food processing and related uses to industrial zones, with food markets shifting to retail supermarket outlets (Donofrio, 2014). These perceptions have persisted into contemporary times over potential nuisances and lawless activities. When urban agriculture advocates propose or implement projects, residents often develop a "not in my backyard" (NIMBY) attitude toward urban agriculture, which can obstruct project approval or the adoption of urban agriculture ordinances (Covert & Morales, 2014).

Studies of urban agriculture practices and programs consist mainly of surveys and case studies focusing on successful programs. We note two surveys conducted by the American Community Garden Association (ACGA, 1998; Lawson & Drake, 2012) and another by the National Center for Appropriate Technology (NCAT) (Oberholtzer, Dimitri & Pressman, 2016). Three prominent case studies include those conducted by the Lincoln Institute (Kaufman & Bailkey, 2000), the American Planning Association Report (Hodgson, Campbell & Bailkey, 2011) and Thibert (2012).

Perhaps the most comprehensive work on current urban agriculture practices from a planning perspective is the American Planning Association's Planning Advisory Service Report, *Urban Agriculture: Growing Healthy, Sustainable Cities* (Hodgson et al., 2011). The study closely analyzed urban agriculture policies and programs in 11 North American cities. Based on interviews with local government officials, planners, and urban agriculture practi-

tioners, the study compared differences in urban agriculture approaches between jurisdictions and provided guidelines to urban planners interested in promoting agriculture. The authors concluded that engaged political leadership and support of urban agriculture stakeholders provided a foundation for successful urban agriculture policy development and implementation. They also stressed that planners could utilize traditional planning tools and approaches to facilitate the process.

Thibert (2012) also followed a case study approach, interviewing 14 urban agriculture stakeholders in Detroit, Toronto, and Montreal. He emphasized that the slow acceptance of urban agriculture was a perception of agricultural use traditionally segregated from urban land uses, as it was considered incompatible. The concept of "highest and best use" of land remains fundamental. Further, planners do not normally consider food systems as part of their professional domain, and its transdisciplinary nature can cause it to be disregarded. Residents in disadvantaged communities have difficulty accepting urban agriculture as a form of food security or economic opportunity. Thibert further highlights that given differences in urban agriculture practices as well as cultural, legal, and technical challenges, municipalities should utilize their traditional role in land use planning to enable urban agriculture.

Three surveys conducted by the American Community Gardening Association (ACGA) in 1992, 1998, and 2012 illustrate long-term trends in urban agriculture. The ACGA initially compiled information on community garden organizations in 1992. The subsequent survey of 1998 gave the ACGA the opportunity to compare trends over the past five years among those that originally took the 1992 survey. In addition, the 1998 survey compiled the responses of organizations conducting urban agriculture practices in 38 U.S. cities. This survey is of great value in recognizing contemporary American urban agriculture and classifying its various practices.

In most cases, respondents cited the land tenure as an issue. The survey also provided the status of community garden loss and gain. Gains exceeded losses: The survey reported the loss of community gardens at 9%, with the creation of new gardens at 38% (ACGA, 1998). Major reasons cited for garden loss included lack of interest by gardeners and the loss of public and private owners (land tenure). Only a relative minority of respondents (39%) reported open space initiatives to preserve urban farmland (ACGA, 1998).

The 2012 ACGA study, conducted in conjunction with Rutgers University, surveyed 420 representatives of community garden associations. The survey examined diversity in gardening and changes in garden types. While some of the same types of issues were explored in the 1998 and 2012 surveys, the 2012 survey departed from the previous measurement of number of sites and disaggregated community garden sites and examined those established by small, medium, large, and very large organizations. The report noted increases in the number of gardens in each category as well as in the size of the sites.

The 2012 study documented garden growth or loss over a four-year period from 2007 to 2011. Measurement relied on waiting lists and respondents' knowledge of other gardens in the area. Most respondents (89%) reported an increase, followed by no change (10%) and decline (1%) (Lawson & Drake, 2012). Respondents attributed the garden loss to lack of gardener interest, loss of land to private organizations, loss of funding, and loss of land to public agencies. Respondents also reported that the main challenges for community gardens were funding, recruitment of community members, access, and gardening materials. The survey also detailed information on collaboration and partnerships at various levels and through land trusts (Lawson & Drake, 2012).

While we recognize the value of community garden studies, we extend the scope to include other forms of urban agriculture that include entrepreneurial and public or private research projects. This can be done through the perspective of planners who monitor and regulate land use. We also view urban agriculture over a more consistent time frame.

NCAT published another survey on urban farming practices in 2016 that focused on the risks and economics of urban agriculture (Oberholtzer, Dimitri & Pressman, 2016). While this study did not measure growth or decline in urban farming, it

provided useful statistics on urban farming operations. The survey interviewed 315 urban farmers across the U.S. and examined basic statistics of urban farming, which include number of acres, years in production, number of primary farmers and managers, number of farmworkers, and type of operation (nonprofit, sole proprietorship, etc.). The study also considered ownership statistics and lease terms, production practices in terms of crops and livestock, sales, and marketing practices. The survey interviewed urban agriculture stakeholders in 15 cities where urban agriculture was considered to be increasing (Oberholtzer et al., 2016).

Land tenure emerged as a significant factor, as most responding farmers either leased their land or borrowed their land in an informal arrangement. The study further shed light on entrepreneurial agriculture. Most of the sites were operated under a form of business entity and sold some of their products. Most farmers owned and operated more than one site.

Along with entrepreneurial activity, economic viability (the ability of urban farmers to live off the revenue of their operation) was another major concern: 60% of the farms were sustained with off-farm income, and approximately 33% of the primary farmers derived their income from the farm; most urban farmers reported revenue of less than US$10,000; the small size of sites precluded large-volume operations. Further areas of concern reported by stakeholders included policy differences, profitability, financing, and farm labor. Respondents also expressed needs for business education and technical assistance (Oberholtzer et al., 2016).

In summary, the existing urban agricultural literature primarily explores trends and other issues through case studies and survey instruments. Neighborhood gardens are the predominant form of urban agriculture, followed by entrepreneurial farming, school gardens, and other forms of farming accessory to an institutional use. Most urban agriculture research focuses on community gardeners at site-specific levels. In this manner, the literature takes a grassroots emphasis aligned with community garden stakeholders. From these studies we receive a general impression that urban agriculture is growing in terms of number of sites devoted to neighborhood gardens; the reasons for growth include organized initiatives to preserve urban farmland. Decline or loss of agricultural land was attributed to lack of gardener interest, loss of land, funding issues, and economic sustainability.

Despite these findings, various issues remain. The narrow focus on community gardens prevents documenting larger economic and land use issues associated with urban agriculture. Apart from the survey by Oberholtzer et al. (2016), these studies did not document larger specialized agricultural, ranching, dairy, livestock or permaculture projects, collectively defined as entrepreneurial agriculture, nor private or public research or university-sponsored projects. Regional differences in the U.S. should also be considered. The geographic scope of most community garden research was limited mostly to Northeast and West Coast cities. Further, these studies lack consistent long-term documentation of urban agriculture. Case studies are normally conducted at one point in time, and the ACGA surveys did not consider consistent time spans or precise ways of measuring trends.

The site-specific emphasis by previously mentioned community gardens studies complicates assessing urban agriculture trends at the citywide level. As indicated in Oberholtzer et al. (2016), urban farmers can own more than one site, which can straddle jurisdictions. This issue also emerges with peri-urban farming.

The literature also provides working examples of prescriptive approaches intended to facilitate urban agriculture. These include land resource studies, land acquisition, open space initiatives, and policies that promote urban agriculture in local comprehensive and regional plans (AGCA, 1998; Kaufman & Bailkey, 2000; Lawson & Drake, 2012). While prescriptive approaches serve as useful models, the extent to which these approaches are used and are effective warrants further consideration.

Finally, previous surveys did not utilize the observations of planners intimately involved in the local land development process. Information provided by local government planners can build on these studies. This is crucial given that urban agriculture projects are subject to review and approval by the local planning department, planning com-

mission, and city council.

Planners implement land use regulations and policies that affect urban agriculture. Community gardens and other forms of urban agriculture are subject to zoning and supporting policies in the comprehensive plan. Further, the planning department and tax assessor are required to keep records of land-use decisions, and planners must update existing land-use maps based on field checks. In their enforcement capacity, they also monitor local development for zoning violations. These responsibilities put planners in a favorable position to identify various obstacles. This method of analysis provides an opportunity to compare differences in policies and regulation of urban agriculture between jurisdictions.

Research Design

Research Questions

This research explores answers to the following questions:

- According to city planners, how well has urban agriculture grown in Southern U.S. cities? Has it grown, declined, or remained the same?
- What do trends in urban agriculture reflect over a 10-year period?
- To what extent do cities implement prescriptive approaches intended to preserve and enhance urban agriculture?
- What are the perceived barriers to urban agriculture?
- How extensive is interjurisdictional coordination?

The survey questionnaire has some similarities to and differences from the 1998 and 2012 ACGA surveys. Similarities include types of projects featured on a checklist: neighborhood gardens, public housing gardens, job training, and economic development, community supported agriculture (CSA), senior center housing gardens, and mental health center gardening projects. We also included questions about land ownership status, barriers to urban agriculture, and the presence of land preservation and acquisition strategies. The barriers we surveyed followed those of the 1998 ACGA survey, with the addition of gentrification.

We designed the survey to provide a checklist of popular types of urban agriculture projects and regulatory and policy tools, but we also provided spaces for open-ended responses beyond the checklist. This included other forms of urban agriculture policies and programs, additional reasons why urban agriculture has declined, and other strategies for extending local government policy in promoting urban agriculture. Checklist responses were tallied by the number of responses. Open-ended questions were compiled and summarized.

Conversely, our survey differed from the ACGA studies in several ways. We investigated the presence of urban agriculture approaches beyond the community garden level and extended the study to include entrepreneurial agriculture and university and research projects.

As the survey was directed at directors of planning or community development directors, it was customized so that respondents could report about urban agriculture trends as well as policies, regulations, and programs from a comprehensive perspective in their jurisdiction. We, therefore, asked planners to report on urban agriculture growth and decline in their jurisdictional boundaries. Implementation of land-use policy and regulation occurs at the citywide jurisdictional level. Using this method of documenting local changes in urban agriculture provides a more precise way to report the status of urban agriculture in a jurisdiction. Considering farming plots irrespective of local jurisdiction location can confuse local regulatory and policy issues.

Responses for growth and decline were reported in a general manner and (if known) more precisely by total acreage and number of projects. This accurately documents growth, decline, or no change in a consistent manner.

The researchers also examined the net change in urban agriculture acreage and projects over a 10-year period, observing the magnitude of change over a longer time interval compared with other works. Change is much easier to detect over a longer time frame.

Further, by focusing on the city jurisdiction level, we sought evidence of interjurisdictional

coordination. Coordination with adjacent jurisdictions is especially critical in cities facing severe land constraints for additional or replacement sites through peri-urban agriculture. We, therefore, provided respondents the opportunity to indicate whether their city had expanded opportunities for its urban agriculture stakeholders by coordinating with adjacent jurisdictions.

Surveying planners also provided insight into the regulatory and policy tools used in land use and their subsequent impact on urban agriculture. The survey was designed to provide a checklist of regulatory and policy tools planning officials use in their day-to-day work.

Survey Sampling Methodology

Survey data were gathered through a questionnaire mailed to planning or community development directors, based on the official's title and responsibilities. These planning officials were purposely selected due to their familiarity with land development trends and land use policy and regulation. Officials' contact information was obtained online through the cities' website and telephone inquiries.

We delineated the Southern region study area using the map of census regions published by the U.S. Census Bureau American Community Survey Office (2018). This region includes the 16 states of Alabama (AL), Arkansas (AR), Delaware (DE), Florida (FL), Georgia (GA), Kentucky (KY), Louisiana (LA), Maryland (MD), Mississippi (MS), North Carolina (NC), Oklahoma (OK), South Carolina (SC), Tennessee (TN), Texas (TX), Virginia (VA), and West Virginia (WV). Cities located in the top 300 Metropolitan Statistical Areas (MSAs) of the Southern region formed the sample group, based on the most recent U.S. Census Bureau data at the time of the survey (U.S. Census Bureau, 2011a). The sample furnished 153 subject cities in this region. Based on online research of planning departments in all Southern metropolitan and micropolitan areas, there are currently 451 planning departments in the Southern U.S.

The survey design consisted of open-ended questions, checklists, dichotomous questions requiring a "yes" or "no" response, and questions featuring Likert-scale rating. The survey instrument is provided in Appendix 1.

Respondents were asked to report trends in two ways: generically (whether urban agriculture had grown or declined), and quantified estimates of net growth or decline of urban agricultural land in acres and number of projects over the past 10 years. We also included a checklist for the types of urban agriculture projects.

Additionally, we provided a checklist of policy tools commonly noted in previous case studies. These included comprehensive plans, neighborhood plans, land use policy maps, and open space plans (Hodgson et al., 2011). Open-ended questions documented items of importance outside the checklist. In this manner, the survey gave respondents the opportunity to provide a complete listing of urban agriculture policies and programs, additional barriers to urban agriculture, and strategies for overcoming obstacles.

Our questionnaire further included a checklist of three major methods of land regulation reported in the literature: zoning, parks and recreation ordinances, and standalone urban agricultural ordinances. As in the case of policy tools, the checklist accommodated an open-ended response for other forms of regulation. Using a similar type of checklist, we further inquired about the existence of any city programs that promote urban agriculture. These include preservation of urban agriculture sites, acquisition of land for urban farming sites, and interjurisdictional coordination.

We also asked planners to document the obstacles affecting the establishment of urban agriculture using a checklist of the most commonly reported barriers in research (ACGA, 1998; Castillo et al., 2013; Kaufman & Bailkey, 2000; Lawson & Drake, 2012; Schmelzkopf, 1995; Schukoske, 2000); it also provided for an open-ended "Other" response.

Surveys were mailed out during the 2011/2012 academic year. The primary method of survey distribution was by mail. In certain cases, local planners provided responses by e-mail, facsimile, or a direct telephone conversation. Mailing included a reminder postcard sent to subject cities a week prior to the deadline to ensure greater response. The survey set a completion deadline within 10 days of its receipt. We granted extensions to respondents who needed additional time. The

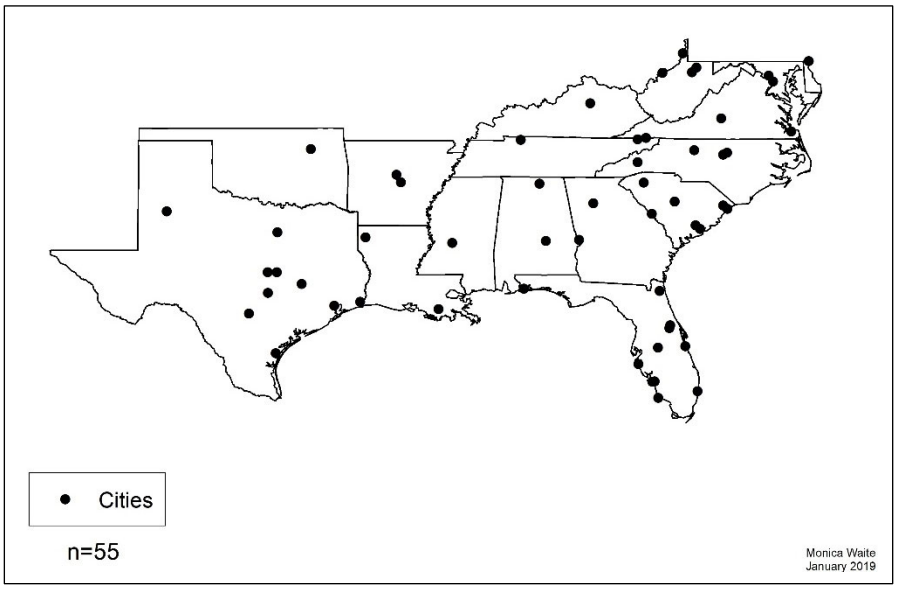
direct phone conversation paralleled the survey questions.

A final attempt at data collection for cities that did not respond to the first method consisted of a second mailing, three months after the first survey distribution. In certain cases, local planners provided responses by e-mail, fax, or, in one case, a telephone interview that paralleled the survey questions.

Survey Analysis

Survey responses provided the types of policy and regulatory tools and programs implemented by cities experiencing urban agriculture growth or decline. We entered responses in spreadsheet format and analyzed the data using response frequencies, measures of central tendency, proportions, rank ordering, and percentiles. The analysis documented how urban agriculture changed between 2000 and 2010 in terms of site acreage and projects, based on the perspective of planning officials.

Figure 1. Southern Cities Responding to the Urban Agriculture Survey, Mapped by States in the 16-State Southern Region

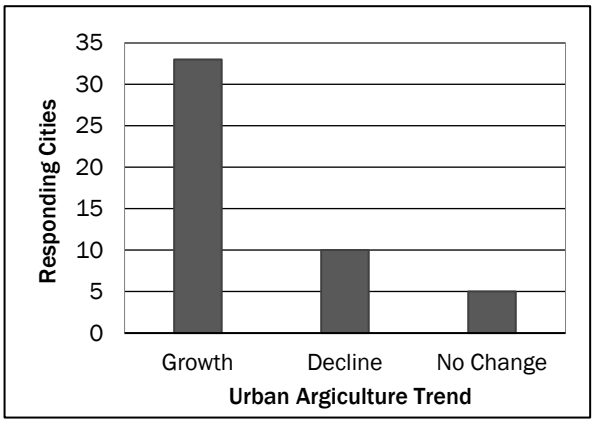


Findings

The survey response rate was 36%, with 55 out of 153 city planning officials participating in the survey; 54 cities returned the questionnaire, and one respondent answered questions in a telephone interview. Every state in the Southern region was represented. Cities and states that responded are mapped in Figure 1.

Population estimates of the responding cities were based on 2010 U.S. Census data, the most current estimates at the time of the survey. Population sizes of responding cities ranged from 1,327,407 (San Antonio, TX) to 16,413 (Marco Island, FL). The mean population size was 176,789, with a median of 76,068. Responding cities are listed in Appendix 2.

Figure 2. Reported Urban Agriculture Growth and Decline



Is Southern Urban Agriculture Growing?

Figure 2 summarizes the survey responses in terms of urban agriculture growth, decline, and stability in the Southern region.

Among the 55 respondents, 48 (87%) reported the presence of urban agriculture, and seven cities (13%) reported no urban agriculture. Of the 48 cities reporting urban agriculture in their jurisdiction, 33 cities (69%) noted that urban agriculture had grown (expressed generically) in their jurisdiction over the past 10 years; 10 cities with urban agriculture (21%) indicated it had declined; five

Table 1. Median Change in Southern Urban Agriculture over 10 Years: Acreage and Projects

Cities Reporting Growth Estimates (*n*=10)		Cities Reporting Decline Estimates (*n*=1)	
Median Increase in Acres	7	Median Acreage Loss	n/a
Range in Acreage Gain	1 to 71[a]	Range in Acreage Loss	n/a
Total Increase in Acres	203	Total Acreage Loss	–100
Median No. of Projects	3	Median No. of lost Projects	n/a
Range in Projects	1 to 43	Range in Projects	n/a
Total No. of Projects	163	Total No. of Projects	n/a

[a] Estimate reflects the removal of outlier.

cities (10%) reported no change. The AGCA surveys also noted growth in community gardens, although the methodology differed in focusing exclusively on community gardens as opposed to other forms of urban agriculture, such as entrepreneurial and community supported agriculture (ACGA, 1998; Lawson & Drake, 2012).

Change in Urban Agriculture

The following tables provide summaries of quantified urban agriculture growth and decline by acreage and projects, type of projects, urban agriculture policy and regulatory mechanisms, program approaches, and reasons for urban agriculture decline. It is important to note that the number of responses differs in each table, reflecting no response to certain questions in the survey.

Changes in urban agriculture acreage and number of projects over a 10-year period served as a measure of the extent to which urban agriculture had grown or declined. Table 1 provides estimates in both acreage and number of projects. We relied on the median as a measure of central tendency to avoid skewing. The increase in acreage ranged from one to 71 acres,[2] with a median of seven acres; one-acre plots were the most common.

In examining changes, 11 out of 55 respondents (20%) reported quantified change. Responses measuring change led to two interesting observations: In cities reporting growth, the total increase in acreage across all the cities was 203, with a median number of acres at seven; the number of projects was 163, with a median of three. According to the median, this reflects a modest growth of seven acres and three projects. In contrast, total acreage loss reported by a city experiencing decline was a loss of 100 acres. However, only one respondent in this category provided an estimate of decline, and this is not sufficient to infer a trend (see Table 1).

Project Type

Respondents estimated the number of urban agriculture projects in their city by 'project type' (see Table 2). Some cities reported more than one type

Table 2. Urban Agriculture Project Types

Project Type (n=128)	Number of Responses	Percent
Community (Neighborhood) Garden	34	27%
School Gardens	18	14%
Community Supported Agriculture	13	10%
Commercial Farming Sites	11	9%
Senior Center/Senior Citizen Housing Gardens	10	8%
Public Housing Gardens	9	7%
University Projects	9	7%
Research Projects	8	6%
Job Training	5	4%
Youth Enterprises	4	3%
Church Gardens	2	2%
Mental Health Centers (Shelters, Group Homes)	1	0.1%
Industrial Green Belt	1	0.1%
Airport Protection Zones	1	0.1%
Land Zoned for Agricultural Forest	1	0.1%
Cattle Ranches	1	0.1%

[2] 1 acre=0.4 hectare

of urban agriculture project, which resulted in a larger sample size of 128. As shown in Table 3, the responding cities reported community (neighborhood) gardens as the most numerous type of urban agriculture project, followed by school gardens and community supported agriculture projects. Commercial farming sites and senior center or senior citizen housing gardens followed these categories. These findings are similar to the ACGA surveys, with neighborhood gardens as the most commonly reported form, while the NCAT survey indicated a prominence of commercially operated sites (ACGA, 1998; Lawson & Drake, 2012; Oberholtzer et al., 2016). The remaining distribution suggests several categories of project types, though it should be noted that job training, which is a crucial part of urban agriculture success, accounted for only 4% of responses.

Urban Agriculture Policy

The next part of the analysis examined whether urban agriculture appears in local plan policies or is formally designated as a land use in a local plan or on a land use map. If local government clearly defines policies for urban agriculture and delineates urban farming on a land-use policy map and other documents, these offer a form of protection. This also provides more legitimacy and prominence to urban agriculture practices beyond an accessory use. We found these policy approaches in cities experiencing urban agriculture growth and decline. Tables 3 and 4 display the responses of most commonly used policy methods and break them down by cities reporting growth or decline in urban agriculture.

Not all of the 34 cities that reported urban agriculture growth responded to this question. Only 11 complete responses were received; the remaining left the questions blank. In general, communities reporting growth designated urban agriculture mostly in land-use policy maps and comprehensive and open-space plans. Cities reporting decline relied mostly on land-use policy mapping and comprehensive plans. In comparison, the American Planning Association survey found that its surveyed cities (21) relied on comprehensive plans, followed by sustainability plans (14). Among the cities responding to the APA survey, two Southern cities reported comprehensive planning, and one city included urban agriculture in a sustainability plan (Hodgson et al., 2011).

Regulating Urban Agriculture

Tables 5 and 6 depict regulatory mechanisms that responding cities employed to regulate urban agriculture. At this point, we note that not all cities responded to this question; these findings reflect those that reported these mechanisms. Most cities, regardless of growth or decline, primarily used their zoning and animal control ordinances; those reporting growth also relied more on the Parks and Recreation ordinance. Most respondents included urban agriculture in existing ordinances rather than developing a specific "standalone" form of regulation; only one city reported an ordinance specifically devoted to urban agriculture. Zoning and animal Control Regulations were also more prevalent in cities surveyed by the American Planning

Table 3. Urban Agriculture Policy: Cities Reporting Growth (*n*=11) [a]

Policy Approach	Cities Reporting Growth	Percent
Land Use Policy Map	6	30%
Comprehensive Plan	5	25%
Open Space Plan	5	25%
Neighborhood Plan	4	20%
Total	20	

[a] *n* reflects those cities that responded to this question and does not consist of all the cities reporting growth. Some cities reported more than one policy approach.

Table 4. Urban Agriculture Policy: Cities Reporting Decline (*n*=4)[a] *

Policy Approach	Cities Reporting Decline	Percent
Land Use Policy Map	4	57%
Comprehensive Plan	3	43%
Neighborhood Plan	0	0%
Open Space Plan	0	0%
Total	7	

[a] *n* reflects those cities that responded to this question and does not consist of all the cities reporting a decline. Some cities reported more than one policy approach.

Association; 46 cities reported zoning ordinances and 13 used animal control ordinances. Of these responding cities, four cities were located in the southern U.S.

Urban Agriculture Program Approaches

Table 7 lists urban agriculture program approaches by three main types: land acquisition, preservation, and interjurisdictional coordination. Only cities reporting growth implemented these programs. Looking at the findings in the aggregate, only 9% of cities reported land preservation programs; 15% acquired land for additional sites, and 12% coordinated with adjacent jurisdictions.

Major Reasons for Urban Agriculture Decline

Figure 3 depicts the responses of cities that experienced a decline in urban agriculture programs. Respondents were given the opportunity to check all those reasons that applied, with some cities reporting more than one. Respondents indicated that the conversion of private land to residential and nonresidential use was the most prevalent reason. This was followed by the failure of the site to maintain itself economically and conversion of land for community development projects. These responses were similar to the ACGA and NCAT studies.

Table 5. Regulation of Urban Agriculture: Cities Reporting Growth (*n*=20)[a]

Regulatory Approach	Cities Reporting Growth	Percent
Zoning Ordinance	18	75%
Parks & Recreation Ordinance	3	13%
Urban Agriculture Ordinance	1	4%
Animal Control Ordinance	1	4%
Community Garden		
Agreement Form	1	4%
Total	24	

[a] *n* reflects those cities that responded to this question and does not consist of all the cities reporting growth. Some cities reported more than one regulatory approach.

Table 6. Regulation of Urban Agriculture: Cities Reporting Decline (*n*=9)[a]

Regulatory Approach	Cities Reporting Decline	Percent
Zoning Ordinance	9	90%
Animal Control		
Ordinance	1	10%
Total	10	

[a] *n* reflects those cities that responded to this question and does not consist of all the cities reporting decline. Some cities reported more than one regulatory approach.

Discussion

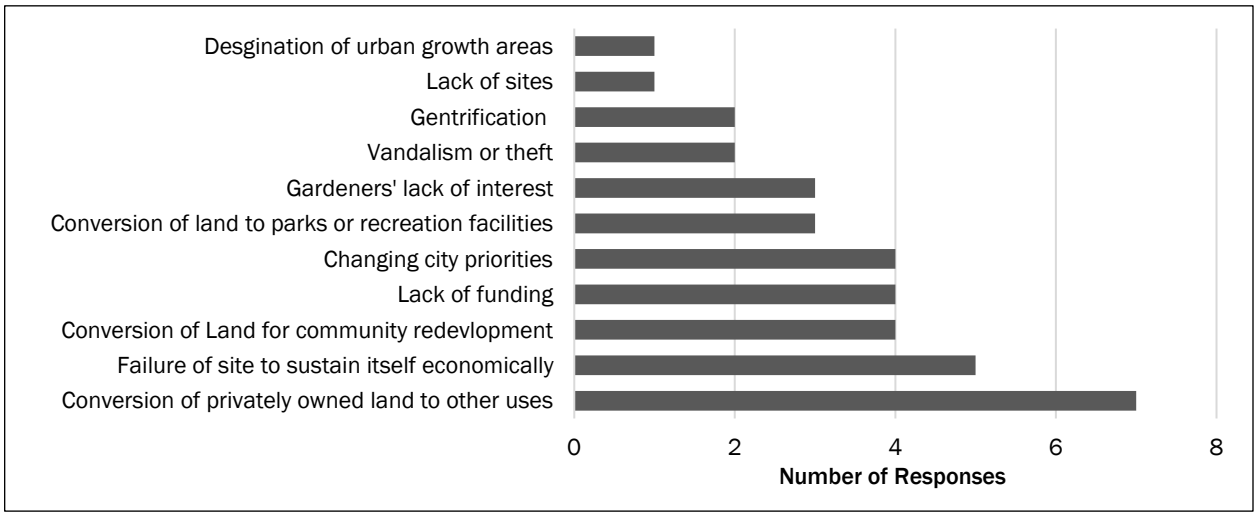
This analysis examined trends in urban agriculture in the Southern U.S. over a 10-year period as reported by planning officials. We first looked at trends in terms of urban agriculture growth and decline and then explored the reasons behind the changes. In the process, we compared our findings with other studies.

First, is urban agriculture growing? Among municipalities reporting urban agriculture, 69% noted that urban agriculture had grown over the 10 years specified in the survey, 21% of respondents indicated it had declined, and 10% reported no change. Expressed generically, this finding also corresponds to ACGA surveys, although these surveys

Table 7. Programs for Preservation and Enhancement of Urban Agriculture

Program Approach	Cities Reporting Growth	Percent
Land Preservation (*n*=33)		
Yes	3	9%
No	30	91%
Total	33	100%
Land Acquisition (*n*=33)		
Yes	5	15%
No	28	85%
Total	33	100%
Interjurisdictional Coordination (*n*=33)		
Yes	4	12%
No	29	88%
Total	33	100%

Figure 3. Reported Reasons for Urban Agriculture Decline (*n*=10)



used some different approaches by surveying community garden stakeholders (ACGA, 1998; Lawson & Drake, 2012).

While the Southern U.S. may not be characteristic of regions that normally receive the most attention in the literature, the South is the fastest-growing region in the nation, and it is important to explore urban agriculture trends in this dynamic environment. Expanding the geographic scope to include previously understudied regions and cities provides an opportunity to review trends where urban agriculture has since developed.

This study also found that while a majority of our sample cities reported growth in urban agriculture, the median rate of growth in acreage and number of projects is modest in comparison to the loss of agricultural land and projects in cities that reported a decline. We add a caveat that this sample size is not sufficient to draw an inference. Regardless, the findings that growth was more modest and decline more pronounced call for further analysis of those cities reporting decline.

While most literature focuses on the growth or decline of urban agriculture, it is also important to devote attention to communities that report no change, maintaining the status quo. This implies preservation of agricultural land use in the face of likely loss of land and/or pressure to reduce activities. The "no change" data represent an important point of analysis for determining the success or failure of an urban agriculture policy. We suggest that future research combine the no change data and growth data calculations.

Looking more closely at types of projects, these findings related to both the ACGA and NCAT surveys. The ACGA surveys focused on community gardens, with neighborhood gardens as the most prominent type. Our study also found this was the most common practice among Southern cities. In contrast, we also surveyed cities for commercial agriculture and found it represented 9% of responses, ranked within the top three. The NCAT study noted that over 50% of respondents practiced urban agriculture under some form of commercial operation. We feel that subsequent studies should go beyond community gardens to consider all forms of local urban agriculture.

So why do some cities experience growth and others decline? We examined policy and regulatory methods to see if this could provide a clue; however, it did not. Regarding policies and regulations, the literature presented prescriptive approaches for facilitating urban agriculture growth. These included comprehensive planning policies to fulfill broader goals, such as open space preservation and food access (Hodgson et al., 2011). However, we found that both those cities reporting urban agriculture growth and those reporting decline used policy approaches similar to those noted in the literature. These included neighborhood, comprehensive, and open space plans. For the surveyed cities, the implementation of policy does not

necessarily guarantee growth in urban agriculture.

The same holds true for land-use regulation. Lovell (2010) suggested the use of standalone agriculture ordinances and zoning districts to promote multifunctional agricultural use. However, only 3% of Southern cities reporting urban agriculture growth used this approach. Traditional forms of regulation, including zoning, animal control, and Parks and Recreation ordinances were used instead.

Open space initiatives have been noted as a means to preserve urban farmland, yet less than half the respondents (39%) to the 1998 ACGA survey reported such initiatives. The 2012 ACGA survey noted that access to material and land were essential for the ongoing success of community gardening(Lawson & Drake, 2012).

Only cities that experienced urban agriculture growth implemented programs to preserve and enhance agriculture. Looking at our survey findings in the aggregate, a small proportion of cities used land preservation and acquisition programs; only 9% of surveyed cities reported land preservation programs and 15% acquired land for additional sites. The reason a smaller proportion of responding cities reported these programs could relate to another obstacle reported by the ACGA surveys: funding. According to Lawson and Drake (2012), 15% of respondents reported loss of funding; further, 61% identified it as the most challenging issue. Additionally, only 12% of the responding Southern cities coordinated with adjacent jurisdictions. Most urban agriculture is conducted on temporary leaseholdings of land. Under conditions of land conversion to other uses within cities (i.e., redevelopment), urban famers seek other sites for relocation that can include peri-urban land. This is crucial in maintaining a viable program in exurban areas.

The primary barriers to urban agriculture identified in this study include conversion of land out of production and failure to maintain the site economically. Land conversion is widely discussed in the literature. The ACGA study of 1998 noted that site permanency was an issue with nearly every respondent. At that time, only 5% of the survey respondents reported that their land was farmer-owned. Land conversion also relates to urban expansion, which includes housing projects and nonresidentail development.

Inability to maintain the site economically (inability to live off the proceeds of the site) was the second-highest reported obstacle in our findings. This is consistent with the NCAT findings: Approximately one-third of the primary farmers derived their income from the farm; most farmers reported income of less than US$10,000. The small size of sites precluded large-volume operations.

Further areas of concern reported by stakeholders included policy differences, profitability, financing, and farm labor. Respondents also expressed needs for business education and technical assistance (Oberholtzer et al., 2016).

These findings generate unanswered questions concerning declines in urban agriculture. First, irrespective of urban agriculture growth or decline, planning officials reported that their cities implemented the same policy and regulatory approaches. These findings imply that it is not so much the presence of a policy or regulatory mechanism that affects the outcome, but how these approaches are implemented. Further exploration of the effectiveness of these approaches is needed, not only focusing on successful programs but also on those that experience decline and face obstacles.

Second, more needs to be done to identify and add land to the urban farming inventory. Only a small proportion of respondents to our survey have programs to preserve or acquire land or coordinate with adjacent jurisdictions. The 2012 ACGA and 2016 NCAT studies underscore the demand for more land. The former study indicated a waiting list of urban farmers; the latter study found that urban farmers cultivate more than one site.

However, Bonham, Spilka, & Rastorfer (2002) observed that the land acquisition process is lengthy; likewise, the real estate market can compel the conversion of urban agricultural sites into residential or nonresidential development. For example, one respondent to our survey noted that the designation of rural land outside of a city as growth areas targeted for residential development precludes that land being available for agriculture. An exploration of external factors such as political support, citizen collaboration, and the state of the local economy and real estate market could shed

further light on the changes in urban agriculture. A final question relates to the distribution of survey respondents at state and urban levels. Could regional and local demographic factors explain urban agriculture trends? As we observe in each decennial census, various urban regions gain population, while others decline or remain stable. The demographic link to urban agriculture trends is apparent. Population growth generates demand for land for new housing, resulting in the loss of land available for urban agriculture. This raises a question over whether population growth can significantly affect areas to the extent that less land is available for urban agriculture. We feel this warrants further study.

Limitations of the Study

This study only includes projects that the responding city planners were aware of. It is difficult to keep track of every incidence of urban agriculture in a local area, as it can be done on an ad hoc basis and is not always conspicuous. Our study only considered those projects that were subject to approval by administrative zoning permit or public hearing approval, part of the city's existing land use inventory. Planners may also not be aware of projects approved by other entities in the local jurisdictions, such as school districts. However, some planners were able to note school district and other types of projects as well. The responsibility of planners to periodically monitor land development in updating plans and zoning enforcement should also provide a reasonable assessment.

The survey identified the presence of certain policies and regulations, but it did not measure the quality or content of these programs. We focused mainly on urban agriculture growth and decline and the type of policy, regulatory, and program approaches in use. However, we were able to quantify changes in urban farming acreage and number of projects, though to a limited extent.

In analyzing trends, this study assesses reported change in urban agriculture between two points in time: 2000 and 2010. We thought it would be more feasible and less time-consuming for a respondent to provide a summary of net growth or decline during this period. The sample size of cities reporting a decline in urban agriculture is too low for rigorous regression analysis.

Another limitation may include selection bias. The focus on cities in the South signifies a regional bias. However, the findings shed light on the development of urban agriculture practices in this region and address the limited geographic focus in community garden research noted by Guitart et al. (2012). Further, four of the cities that responded to the ACGA survey in 1998 responded to our survey.

Many external factors beyond local government programs affect urban agriculture. These factors include local and regional food insecurity, the work of nonprofit and private urban agriculture advocates, external funding, economic conditions, local real estate markets, and community resistance. These could serve as topics for further study.

Conclusions

We gained some important insight by examining similarities and differences in urban agriculture trends and practices in the South compared with those reported in national surveys. As in the case of the cited national surveys, we were encouraged to find urban agriculture growing in terms of acreage and projects in our sample of cities. However, when we examined the median number of projects and project acreage, this growth was modest.

Reports of obstacles from our sample of Southern U.S. cities were also similar to those reported in national surveys. These barriers included land conversion, economic sustainability of the site, and lack of funding. Economic sustainability implies a need for training to support business and agricultural expertise. Our findings also point to lack of funding. Most cities surveyed in the ACGA (2012) and NCAT (2016) studies noted a demand for urban agricultural land *vis-à-vis* inadequate funding. Further studies should also consider complexities in land acquisition, including Bonham's observation that the land acquisition process is lengthy (Bonham et al., 2002).

This study also charted new directions in research. First, in comparison to national surveys, we viewed urban agriculture as a comprehensive whole to include community supported and entrepreneurial agriculture. Indeed, our findings show that these forms of urban agriculture play an

important role in local food production; together, they made up 19% of urban agriculture practices reported by our survey cities. Rather than survey community gardens, CSAs, and entrepreneurial agriculture in isolation, we encourage subsequent studies to take a broader perspective.

Second, both the cities reporting growth in urban agriculture and those experiencing decline used the same regulatory and policy tools. This calls for a further study regarding the quality and effectiveness of these tools to determine if they inadvertently create barriers.

Third, in comparison to other research, we surveyed Southern cities for interjurisdictional coordination. Among cities reporting urban agriculture growth, only 12% coordinated with adjacent jurisdictions. Given the precarious nature of farming on leaseholds, interjurisdictional coordination is important in extending the land inventory and providing further options on the urban fringe. In addition, most urban agriculture produce is perishable, so locations in peri-urban areas adjacent to the city are critical. It also reduces the length of vehicular trips to urban markets.

There is still a long way to go. What we learned also raised some issues for further exploration. What are the impacts of land use policies, regulations, and programs on securing reliable and diverse local food production? To what extent can local food organizations better educate and train urban farmers to be successful? What external factors are in direct conflict with planning for urban agricultural success, including population growth and the local real estate market? Finally, and most importantly, in holding barriers to urban agriculture in perspective and gaining a more detailed understanding of the problem, are decision-makers also solution-oriented? Advocates who face and overcome these obstacles provide us with a road map to our own success and understanding. As Robert Collier (1947/2009) noted, "In every adversity, there lies the seed of an equivalent advantage" (p. xv). We leave it to subsequent research to examine these issues.

References

American Community Garden Association. (1998). *National Community Gardening Survey: 1996*. College Park, Georgia: American Community Garden Association.

Bleasedale, T., Crouch, C., & Harlan S. (2011). Community gardening in disadvantaged neighborhoods in Phoenix, Arizona: Aligning programs and perceptions. *Journal of Agriculture, Food Systems, and Community Development, 1*(3), 99–113. https://doi.org/10.5304/jafscd.2011.013.007

Bonham, B., Spilka, G., & Rastorfer, D. (2002). *Old cities, green cities. Communities transform unmanaged land* (PAS Report 506/507). Chicago: American Planning Association.Campbell, M. (2014). Building a common table: The role of planning in community food systems. *Journal of Planning Education and Research, 23*(4), 341–355. https://doi.org/10.1177/0739456X04264916

Castillo, S., Winkle, C., Krauss, S., Turkewitz, A., Silva, C., & Heinemann, E. (2013). Regulatory and other barriers to urban and peri-urban agriculture: A case study of urban planners and urban farmers from the greater Chicago metropolitan area. *Journal of Agriculture, Food System and Community Development, 3*(3), 155–166. https://doi.org/10.5304/jafscd.2013.033.001

Coleman-Jenson, A., Rabbitt, M., Gregory, C., & Singh, A. (2018). Household food security in the United States in 2017 (Economic Research Report No. 256). Retrieved from https://www.ers.usda.gov/webdocs/publications/90023/err-256.pdf?v=0

Collier, R. (2009). *Riches within your reach*. New York: Jeremy P. Tarcher/Penguin. (Original work published in 1947.)

Covert, M., & Morales, A. (2014). Formalizing city farms: Conflict and conciliation. In V. Mukherji & A. Loukaitou-Sideris (Eds.), *The informal American city. Beyond taco trucks and day labor* (pp. 193–208). Cambridge, MA: MIT Press.

Donofrio, G. (2014). Attacking distribution: Obsolescence and efficiency of food markets in the age of urban renewal. *Journal of Planning History, 13*(2), 136–159. https://doi.org/10.1177/1538513213507540

Feenstra, G., McGrew, S., & Campbell, D. (1999). *Entrepreneurial community gardens: Growing food, skills, jobs and communities* (Report No. 21587). Berkeley: University of California, Division of Agriculture and Natural Resources. https://anrcatalog.ucanr.edu/pdf/21587e.pdf

Graham, H., Beall, D. L., Lussier, M., McLaughlin, P., & Zidenberg-Cherr, S. (2005). Use of school gardens in academic instruction. *Journal of Nutrition Education and Behavior, 17*(3), 147–151. https://doi.org/10.1016/S1499-4046(06)60269-8

Guitart, D., Pickering, C., & Byrne, J. (2012). Past results and future directions in urban community gardens research. *Urban Forestry & Urban Greening, 11*(4), 364–373. https://doi.org/10.1016/j.ufug.2012.06.007

Heimlich, R.(2001). Metropolitan agriculture. Farming in the city's shadow. *Journal of the American Planning Association, 55*(4), 457–466. https://doi.org/10.1080/01944368908975434

Hodgson, K., Campbell, M., & Bailkey, M. (2011). *Urban agriculture: Growing healthy, sustainable communities* (Planning Advisory Service Report No. 563). Chicago: American Planning Association. Retrieved from https://www.planning.org/research/urbanagriculture/

Kaufman, J., & Bailkey, B. (2000). *Farming inside cities: Entrepreneurial urban agriculture in the United States* (Working Paper WP00JK1). Cambridge, Massachusetts: Lincoln Institute of Land Policy.

Krones, S., & Edelson, S. (2011). Building gardens, rebuilding a city: Baltimore's community greening resource network. *Journal of Agriculture, Food Systems and Community Development, 1*(3), 133–149. https://doi.org/10.5304/jafcsd.2011.013.005

Lawson, L., & Drake, L. (2012). *Community garden organization survey: 2011-2012.* American Community Garden Association & Rutgers School of Environmental and Biological Sciences. Retrieved from http://agriurban.rutgers.edu/Documents/Lawson%20and%20Drake%20community%20garden%20survey%20report.pdf

Linn, K. (1999). Reclaiming the sacred commons. *New Village Journal, 1,* 1–8. Retrieved from https://www.newvillage.net/

Lovell, S. (2010). Multifunctional urban agriculture for sustainable land use planning in the United States. *Sustainability, 2*(8), 2499–2522. https://doi.org/10.3390/su2082499

Masson-Minock, M., & Stockman, D. (2010). Creating a legal framework for urban agriculture: Lessons learned from Flint, Michigan. *Journal of Agriculture, Food Systems, and Community Development, 1*(2), 91–104. https://doi.org/10.5304/jafscd.2010.012.007

Mukherji, N. (2009). *The promise and the pitfalls of municipal policy for urban agriculture* (Unpublished master's thesis). University of Wisconsin-Madison, Wisconsin.

Mukherji, N., & Morales, A. (2010). Zoning for urban agriculture. *Zoning Practice, 3*(March), 2–7. https://www.planning.org/zoningpractice/

Oberholtzer, L., Clancy, K., & Esseks, J. (2010). The future of farming on the urban edge: Insights from fifteen U.S. counties about farmland protection and farm viability. *Journal of Agriculture, Food Systems, and Community Development, 1*(2), 59–76. https://doi.org/10.5304/jafscd.2010.012.003

Oberholtzer, L., Dimitri, C., & Pressman, A. (2016). *Urban agriculture in the United States: Baseline findings of a nationwide survey.* National Center for Appropriate Technology. Retrieved from https://attra.ncat.org/attra-pub/summaries/summary.php?pub=558

Parmer, S., Salisbury-Glennon, J., Shannon, D., & Struempler, B. (2009). School gardens: An experiential approach for a nutrition education program to increase fruit and vegetable knowledge, preference and consumption among second-grade students. *Journal of Nutrition Education and Behavior, 41*(3), 212–217. https://doi.org/10.1016/j.jneb.2008.06.002

Pothukuchi, K., & Kaufman, J. (1999). Placing the food system on the urban agenda: The role of municipal institutions in food systems planning. *Agriculture and Human Values, 16*(2), 213–224. https://doi.org/10.1023/A:1007558805953

Raja, S., Born, B., & Kozlowski-Russell, J. (2008). *A planner's guide to community and regional food planning* (Planning Advisory Service Report No. 554). Chicago: American Planning Association. Retrieved from https://www.planning.org/publications/report/9026878/

Ratcliffe, M. M., Merrigan, K. A., Rogers, B. L., & Goldberg, J. P. (2011). The effects of school garden experiences on middle school-aged students' knowledge, attitudes and behaviors associated with vegetable consumption. *Health Promotion Practice, 12*(1), 36–43. https://doi.org/10.1177/1524839909349182

Schmelzkopf, K. (1995). Urban community gardens as contested open space. *Geographical Review, 85*(3), 364–381. https://doi.org/10.2307/215279

Schukoske, J. E. (2000). Community development through gardening: State and local policies transforming urban open space. *N.Y.U. Journal of Legislation and Public Policy, 3*(2), 351–392. https://doi.org/10.2139/ssrn.1426079

Sharp, J., Jackson-Smith, D., & Smith, L. (2011). Agricultural economic development at the rural-urban interface: Community organization, policy, and agricultural change. *Journal of Agriculture, Food Systems, and Community Development, 1*(4), 189–204. https://doi.org/10.5304/jafscd.2011.014.002

Smith, C. M., & Kurtz, H. E. (2003). Community gardens and politics of scale in New York City. *Geographical Review, 93*(2), 193–212. https://doi.org/10.1111/j.1931-0846.2003.tb00029.x

Thibert, J. (2012). Making local planning work for urban agriculture in the North American context: A view from the ground. *Journal of Planning Education and Research, 32*(3), 349–357. https://doi.org/10.1177/0739456X11431692

Tixier, P., & Bonn, H. (2006). Urban horticulture. In R. Veenhuizeen (Ed.), *Cities farming for the future: Urban agriculture for green and productive cities* (pp. 315–347). Silang, Cavite, Philippines: International Institute of Rural Reconstruction & FTC Urban Agriculture.

U.S. Census Bureau. (2011a). *Table 5: Estimates of population change for Metropolitan Statistical Areas and rankings. July 1, 2010–July 1, 2011.*

U.S. Census Bureau. (2011b). *Table 1: Population Change for the United States, Regions, States, and Puerto Rico: 2000 to 2010.* U.S. Census Briefs. Retrieved from https://www.census.gov/prod/cen2010/briefs/c2010br-01.pdf

U.S. Census Bureau. (2018). Historical Poverty Tables: People and Families: 1959-2017. *Table 9: Poverty of People by Region, 1959-2017.* Retrieved from https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-people.html

U.S. Census Bureau, American Community Survey Office. (2018). *Census regions and divisions in the United States.* Retrieved from https://www2.census.gov/programs-surveys/sahie/reference-maps/2017/us-regdiv.pdf

U.S. Department of Agriculture (2017a). *Food insecurity in the United States.* Retrieved from https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/key-statistics-graphics.aspx

U.S. Department of Agriculture (2017b). *Table 2: Households by food security status and selected household characteristics, 2017.* Retrieved from https://www.ers.usda.gov/webdocs/publications/90023/err-256.pdf

Veenhuizen, R. (Ed.). (2006). *Cities farming for the future: Urban agriculture for green and productive cities.* Silang, Cavite, Philippines: International Institute of Rural Reconstruction and FTC Urban Agriculture.

Appendix 1. Urban Agriculture Survey – Selected Questions

1. Approximately how many acres of land in your city are dedicated to urban agriculture?

   No. of Acres: _____

2. Which of the following designate areas for urban agriculture use in your city?

   A) Comprehensive Plan Yes _____ No _____

   B) Neighborhood Plan Yes _____ No _____

   C) Land Use Policy Map Yes ____ No _____

   D) Open Space Plan Yes ____ No _____

   E) Other (Please Specify):_____

3. How long has urban agriculture been implemented within your city?

   No. of Years: _____

4. Out of the series below, please circle the method which your city uses to regulate urban agriculture (circle all that apply):

   A) Urban Agriculture Ordinance.

   B) Zoning Ordinance.

   C) Parks and Recreation Regulations.

   D) Other (Please Specify): _____

   E) No regulation.

5. If known, list below the proportion of urban agricultural land that is under public or private ownership (definition of public ownership includes government and other nonprofit organizations):

   Public: _____%

   Private: _____%

6. Provide the number of types of urban agriculture projects in your city.

   __ Neighborhood Gardens __ Senior Center/Senior Citizen Housing Gardens

__ Public Housing Gardens __ Community Supported Agriculture

__ School Gardens __ Job Training ____ Youth Enterprises

__ Commercial Farm Sites __ Mental Health Centers (shelters, group homes)

__ University Project __ Agricultural Research Demonstration Project

__ Other types (Please specify):

7. Does your city have policies or programs which preserve urban agriculture use on parcels under private ownership?

   Yes: _____ No: _____

   If you answered "Yes" please provide a description of the policies or programs below (you may also use the last page of this survey or attach information to elaborate):

8. Does your city have policies or programs which purchase parcels for public urban agriculture use?

   Yes: _____ No: _____

9. Has urban agriculture use grown or declined in your city over the past 10 years?

   A) Grown

   B) Declined

   If known, how much has urban agriculture use grown or declined in terms of acres of land or number of projects?

   Acres: _____ Number of Projects: _____

10. If urban agriculture has declined in your city circle the following reasons that apply:

    A) Lack of funding.

    B) Lack of available sites.

    C) Conversion of private land to private residential or nonresidential use.

    D) Conversion of public land for community development purposes (e.g., neighborhood redevelopment, affordable housing).

    E) Conversion of land to park or recreation facilities.

    F) Gentrification

    G) Gardeners' lack of interest.

H) Vandalism or theft.

I) Failure of site to sustain itself economically.

J) Changing city priorities.

K) Other (Please specify): _____

11. Does your city coordinate with adjacent jurisdictions in developing urban agriculture areas?

Yes: _____ No: _____

Thank you for your response. Please complete the contact information below:

City & State: _____

Name: _____ Title: _____

Organization: _____

Phone: _____ E-mail: _____

Appendix 2. Responding Cities

Asheville, NC
Augusta, GA
Austin, TX
Baytown, TX
Bossier City, LA
Bristol, TN
Cape Coral, FL
Chapel Hill, NC
Clarksburg, WV
Clarksville, TN
College Station, TX
Columbia, SC
Columbus, GA
Conway, AR
Conway, SC
Corpus Christi, TX
Deltona, FL
Durham, NC
Fairmont, WV
Fort Myers, FL
Fort Worth, TX
Gaithersburg, MD
Houma, LA
Huntsville, AL
Jackson, MS
Jacksonville, FL
Killeen, TX
Kingsport, TN
Lexington, KY
Lubbock, TX
Lynchburg, VA
Marco Island, FL
Maudlin, SC
Melbourne, FL
Montgomery, AL
Myrtle Beach, SC
Norfolk, VA
North Charleston, SC
North Little Rock, AR
Parkersburg, WV
Pensacola, FL
Pompano Beach, FL
Port Arthur, TX
San Antonio, TX
Sandy Springs, GA
Sanford, FL
Sarasota, FL
Summerville, SC
Temple, TX
Tulsa, OK
Washington, DC
Wheeling, WV
Wilmington, DE
Winston-Salem, NC
Winter Haven, FL

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

The motivations and needs of rural, low-income household food gardeners

Kate J. Darby [a] *
Western Washington University

Taylor Hinton [b]
Allegheny College

Joaquin Torre [c]
Western Washington University

Submitted September 14, 2018 / Revised January 8, March 12, and May 24, 2019 / Accepted May 27, 2019 / Published online January 7, 2020

Citation: Darby, K. J., Hinton, T., & Torre, J. (2020). The motivations and needs of rural, low-income household food gardeners. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 55–69. https://doi.org/10.5304/jafscd.2020.092.002

Abstract

In local food systems research and practice, little attention has been given to the motivations and behaviors of low-income household gardeners as food provisioners. In this paper, we examine the motivations, barriers, and practices of food gardening among low- income rural U.S. residents with the goal of informing policies and programs that might support these food provisioning activities. This work draws from ethnographic inquiry, including surveys, interviews, and garden visits with households in rural, Western Pennsylvania. Over half of those surveyed (n=124) grow some of their own food, with higher rates of gardening among higher-income households. Low-income gardeners are most motivated by three things; (1) a desire to save money, (2) pleasure from the practice of gardening and time spent outside, and (3) a connection to spiritual practice. For the low-income gardeners we interviewed, gardening creates and reinforces social connections and cultural

[a] * *Corresponding author:* Kate J. Darby, Department of Environmental Studies, Huxley College of the Environment, Western Washington University – MS 9085; 516 High Street; Bellingham, WA 98225 USA; darbyk@wwu.edu

[b] Taylor Hinton, Environmental Science, Allegheny College; Meadville, PA 16335 USA.
Hinton is now at Secondary Education, Mercyhurst University; 501 East 38th Street; Erie, PA 16546 USA; taylor.r.hinton@gmail.com

[c] Joaquin Torre, Department of Communication Studies, College of Humanities & Social Sciences, Western Washington University – MS 9162; 516 High Street; Bellingham, WA 98225 USA; Joaquin.torre@wwu.edu

Funding Disclosure

This study was supported by funding from Allegheny College and Western Washington University's Huxley College of the Environment.

traditions. For many, gardening is also a political act: a way to guard against an uncertain future and resist a centralized food system. The findings from this study suggest that local food systems programs and policies might better support low-income food-provisioning households by acknowledging and respecting the knowledge and skills held by these individuals, recognizing and supporting the social and cultural role of gardening, and providing structural support around the space and time concerns identified by survey respondents as major barriers to gardening.

Keywords
Household Gardening, Food Security, Rural, United States, Low-Income

Introduction and Literature Review

Research on household-level edible gardens has been limited and has tended to be directed towards the global South or community gardens in the North (Taylor & Lovell, 2014). A recent surge of research has examined the role of urban household gardening (Gray, Guzman, Glowa, & Drevno, 2014; McClintock, Mahmoudi, Simpson, & Santos, 2016; Taylor & Lovell, 2014), but rural gardening as a food-provisioning strategy in the United States remains understudied. Distinctions between rural and urban communities are messy and ill-defined in research and practice,[1] yet the food systems literature gives little attention to the rural end of that spectrum. While claims have been made about the benefits of 'growing your own,' there is much less information as to the scale of food growing activity, particularly in relation to household gardens (Church, Mitchell, Ravenscroft, & Stapleton, 2015). Moreover, there has been limited empirical analysis of the barriers that prevent participation in gardening and local food systems (Schupp, Som Castellano, Sharp, & Bean, 2016). At the same time, household food-provisioning efforts across different geographic, economic, and racial contexts are building alternative food systems that—by design or in practice—disrupt an increasingly corporatized, neoliberal food system.

Household Gardening in the U.S.

Following Kortright and Wakefield (2011), we define home food gardens as "the use of private (owned, rented, or leased) land around a residence for growing edible produce" (p. 39). The National Gardening Association (2014) reports that one-third of U.S. households grew some of their own food in 2013, with a 17% increase between 2008 and 2013. Almost 30% of those households were located in rural areas (National Gardening Association, 2013). Household food gardening has a strong history in the U.S., including European settlers who grew their own food in kitchen gardens and the families who cultivated Victory Gardens during the World Wars. Oddly, the alternative food movement and local food movement have placed little emphasis on food gardening, despite it being a hyperlocal food production approach that has the potential to radically reconsider the relationship between people and their food (De Hoop & Jehlička, 2017; see also McEntee, 2010). The scarcity of literature regarding the barriers to household gardening is remarkable, considering how gardening has been proven to have great potential in improving social and ecological well-being for people and the food system in general (Colasanti & Hamm, 2016; Kabir & Webb, 2009; Mariola 2008).

Households are motivated to grow their own food for many reasons. For some, growing their own food is driven by desires to have produce that tastes better and is of higher quality (Kortright & Wakefield, 2011; NGA, 2009). In their study of household gardeners, Kortright and Wakefield (2011) describe these as "cook gardeners"—those who grow food because they have an interest in producing high-quality ingredients for their meals. Kortright and Wakefield (2011) also describe "aesthetic gardeners"—those who grow edible plants because they add interest and beauty to their gardens, and not necessarily for the food they produce.

Although it is not a sole provider of food security, gardening has been shown to produce substantial amounts of food (Conk & Porter, 2016;

[1] For example, U.S. governmental programs employ no fewer than fifteen different, and often conflicting, definitions of "rural" (Coburn, MacKinney, McBride, Mueller, Slifkin, & Wakefield, 2007).

Dewaelheyns, Lerouge, Rogge, & Vranken, 2015; Kortright & Wakefield, 2011). For example, a study in Laramie, Wyoming—a location with a challenging gardening climate—found that the average community garden plot (253 sq. ft. or 23 sq. m) provided enough food to meet the vegetable consumption requirements for an adult for 9 months (Conk & Porter, 2016). In a case study in Flanders, researchers found that the average household garden produced 28% of household vegetables consumed (Dewaelheyns et al., 2015). Many households in the U.S. see growing much of their own food as a way to save money, especially during recessions (NGA, 2009).

Many studies have also identified physical and mental wellness, as well as the spiritual opportunity to connect and grow with nature, as benefits that stem from gardening and engaging with the outdoors (Duerden & Witt, 2010; Freeman, Dickinson, Porter, & van Heezik, 2012; Kjellgren & Buhrkall, 2010). For some individuals, gardening serves as an important form of physical exercise. One recent study found that 42% of home gardeners in San Jose, CA, spent 1 to 3 hours a week gardening, and 21% spent over 7 hours a week (Gray et al., 2014). Gardening may also promote a sense of mental wellness, and assertions of "ownership and identity" while providing an escape from the trappings of everyday life (Freeman et al., 2012). These motivations also point to gardening as a hobby from which individuals derive pleasure (Kortright & Wakefield, 2011).

Gardening can also be a cultural and social practice. For many gardeners, growing their own food is a way to remain connected to their families and the communities around them (Freeman, 2012; Kortright & Wakefield, 2011). Kortright and Wakefield (2011) identify "teaching gardeners" as those who are motivated to garden so that they may share the experience with their children and families. Gardeners may also be motivated by an interest in cultivating cultural practices (Dewaelheyns et al., 2015). For example, a study of urban gardens in Chicago found that the types of garden plants varied across gardens cultivated by African American, Chinese-origin, and Mexican-origin households. While gardens cultivated by African American households contained tomatoes and collard greens, Chinese-origin households had bitter melon and yardlong beans, and Mexican origin households had *pápalo* and hot pepper (Taylor, Lovell, Wortman, & Chan, 2017). Gardening can also support cultural practices among immigrant families who may use the gardens to memorialize family, mimic landscapes of their home country, practice religion and spirituality, and/or grow plants with cultural significance (Mazumdar & Mazumdar, 2012).

Finally, there are individuals who are motivated to garden by political and environmental considerations. For some, growing food is a way to guard against safety concerns about mass-produced food (NGA, 2009). In a Flanders study, researchers found that their study subjects saw gardening as a place to exercise control and choice and embrace a sense of "freedom" (Dewaelheyns et al., 2015). For many gardeners, growing their own food is an environmental or sustainability practice that reduces their ecological footprint and ameliorates some of the damage of an industrialized, corporate food system while also helping them connect more deeply with nature (Dewaelheyns et al., 2015; Freeman et al., 2012; Kortright & Wakefield, 2011).

Despite the benefits and widespread practice of gardening, there are households that would like to garden but face barriers in doing so. For example, some studies have found low socioeconomic status (SES) to be a significant barrier to home gardening, as individuals and households living in poverty sometimes lack the financial resources to construct a garden and the time to cultivate it (DeLind, 2011; Hinrichs, 2000; Schupp et al., 2016). Moreover, geography can also be a barrier to home gardening. Where people live and the types of households that they occupy can influence how likely they are to garden. Those who own their homes and live in rural areas are more likely to garden than those who are tenants in urban areas (Church et al., 2015; Schupp et al., 2016). Those living in free-standing houses (rather than apartments or row-houses) were less likely to cite space as a barrier to gardening (Schupp et al., 2016). While the amount of space that one has to garden has been found not to be a determining factor, a household preference over how to use a potential gardening area can certainly influence whether one

chooses to garden (Dewaelheyns et al., 2015; Kortright & Wakefield, 2011). A study of youth community gardeners in Minneapolis–St Paul found that those youth who live in apartments saw that as a barrier to gardening at home (Lautenschlager & Smith, 2007).

Local Food Systems, Food Security, and "Traditional Localism"

Local food system (or alternative food system) work responds to several current concerns, such as an increasingly corporatized and industrialized food system, food safety and sustainability, the prevalence of hunger and food insecurity, and cultural values around food production in the U.S. These efforts are often characterized by programs to connect food producers and consumers through community support agriculture mechanisms, farmers markets, and community gardens. Another surge of food systems work in the U.S. addresses concerns of food security, defined by the U.S. Department of Agriculture (USDA) as "access by all people at all times to enough food for an active, healthy life. Food security includes at a minimum: the ready availability of nutritionally adequate and safe foods, and an assured ability to acquire acceptable foods in socially acceptable ways (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies)" (USDA Economic Research Service, 2019, "What Is Food Security," para. 1–3). In 2017, 11.8% of U.S. households were food insecure, and food insecurity rates tend to be higher in rural areas than in urban or suburban communities (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2018). Projects and policies to address food insecurity sometimes dovetail with local food systems projects, although these efforts often operate in tension. Some food systems scholars have argued that the alternative food movement efforts to bolster local food systems have not adequately involved low-income food consumers, nor considered their perspectives, knowledge, and needs in policy and programming (Dupuis & Goodman, 2005; Hinrichs, 2000). Food justice scholarship activism suggest that many of these efforts only bring privileged individuals "into the foodshed" and that many local food systems projects neglect key questions of access, lack social embeddedness, and/or include the cultural appropriation of traditional food systems (Feenstra, 1997; Kloppenburg, Hendrickson, & Stevenson, 1996). In summary, the proliferation of local food systems projects across the U.S. is likely not adequately collaborating with and meeting the needs of low-income communities.

At the same time, local food systems work has largely neglected household-level food gardening as a focus of support (Taylor & Lovell, 2014). This is particularly true for gardening efforts aimed at low-income residents. Despite all of this, there is evidence suggesting that low-income households frequently grow their own food and that doing so helps them address food insecurity and nutrition needs. A study of households in poverty in Iowa found that 29% of rural households had their own garden (Morton, Bitto, Oakland, & Sand, 2008), and the NGA reports a 38% increase in gardening among households earning less than US$35,000 a year between 2008 and 2013 (NGA, 2013). Regardless of household economic standing, a 2009 study by the NGA found that 60% of surveyed food gardeners said economic conditions had at least some impact on their decision to garden (NGA, 2013). A study in San Jose, CA, found that low-income household gardeners saved an average of US$339 a season growing their own vegetables and that they met 60% of their dietary vegetable requirements through gardening (Algert, Baameur, & Renvall, 2014). Similarly, in a study of rural low-income households, Morton et al. (2008) found that families with access to gardens were more likely to achieve nutritional goals for fruit and vegetable intake. In the Cuban context, household gardening has been used as a practice in resilience to socio-ecological change; although hunger is uncommon in Cuba, malnutrition levels are still quite high, and many Cuban residents turn to household gardening as a way to supplement food provided through ration cards (Buchman, 2009). This is not to say that households living in poverty easily make the choice to grow some of their own food. People in poverty may also face different sorts of trade-offs in choosing whether or not to garden. A study of Canadian farm women found that cost was a large barrier to these women growing more food for their own households, and

especially the cost in preserving harvest for winter; also, these women already have high demands on their time, and many do not have time to process and grow more food for their own households despite a desire to do so (McIntyre & Rondeau, 2011). Authors of a recent study on household food gardening in Ohio assert that "it is important to be attentive to the ways in which inequalities, such as those related to SES and housing type, impact the ability of individuals to participate in local food systems via home gardening" (Schupp et al., 2016, p. 763).

Thus, the study of behavior, motivations, and challenges of rural, low-income food gardeners remains a crucial subject that still requires significant attention . Two additional frameworks are useful in helping to understand the motivations of low-income, rural food gardeners: food sovereignty and McEntee's "traditional localism" (2010). Food sovereignty, a concept initially described by the international peasant movement La Via Campesina is described in the 2007 Forum for Food Sovereignty as "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems" (Nyéléni, 2007, para. 3). Rural food gardeners may be motivated by a similar set of values and goals; in her 2012 article on framing food sovereignty, Madeleine Fairbairn suggests that food sovereignty can serve as a more radical, counter-hegemonic approach than food-security framing and shares ideological grounding with extreme localism efforts, such as the Vermont secession movement. Similarly, many rural communities have pushed back on government regulations on milk pasteurization as a way to maintain their control over food systems and create what they see as a healthier dairy product.

McEntee (2010) argues that the most local food systems efforts are driven by "contemporary localism"—a set of ideologies around environmental protection, rural preservation, minimized food miles, and support of small farms. "Contemporary localism" is often represented by "alternative food initiatives" such as farmers markets, community supported agriculture, local food policy efforts, and fair-trade campaigns that do not reflect rural communities' experiences with or values of the local food system (McEntee, 2010). McEntee instead suggests that many rural households embrace a different set of ideologies in the form of "traditional localism," which "is instead guided by a motivation to obtain fresh and affordable food and/or to continue traditional modes of food production" (2010, p. 786). This "traditional localism" framework suggests that rural, low-income gardeners may be driven by a different set of motivations than others engaged in local food systems efforts, and that food provisioning is less driven by environmental and political values than by concerns around food access and cost.

In this applied research effort, we examined these interrelated issues of socioeconomic class, food provisioning, and gardening through an ethnographic study in western Pennsylvania to better understand how and why low-income households grow their own food and what barriers they may face in doing so. This investigation was driven by a broader aim of better understanding the needs and challenges of low-income gardeners in order to better support their food-provisioning efforts, and to highlight the common motivations and concerns of these gardeners to inform food sovereignty-based coalition building.

Applied Research Methods

We conducted our ethnographic work in rural western PA, in and around the small town of Meadville. Founded in 1788 by David Mead, Meadville became a borough in 1823 and a city in 1866 as the Beaver and Erie Canal and the new railroads made it an important trade center. Twenty years later, Meadville became a prominent city, acting as the county seat within Crawford County. In many ways, Meadville reflects its rustbelt designation; the current population (about 13,000) is about 30% lower than the town's population peak (18,972) in 1950 (U.S. Census, 1952; U.S. Census, n.d.-a). The poverty rate hovers around 24% (U.S. Census, n.d.-b). Meadville is a predominantly (91%) white community (U.S. Census, n.d.-c). Until the 1980s, Meadville was an industrial hub, hosting numerous tool and die shops along with other industrial sites. Most notably, Meadville claims to be the birthplace of the zipper and is the

home of American Viscose, Talon, Dads Dog Food, and Channellock tools. Like other rustbelt communities, Meadville now struggles with its economic and cultural identity and faces serious financial constraints and depopulation. The combination of the rust belt and snowbelt status of this town is evident in the visual experience of declining housing stock. Many of the homes in Meadville—the same ones with large icicles in the winter indicating poor insulation, peeling paint, and sagging roofs—also host beautiful and prolific vegetable gardens. This is not surprising, since the region also has a rich agricultural heritage. Agriculture and gardening in Meadville benefit from the glacial till left by retreating glaciers 10,000 years ago. The region surrounding Meadville provides fertile farmland for the region's substantial Amish and Mennonite populations. The Meadville Market House, the longest continually operating market house in the state, hosts a weekly farmers market that draws producers and buyers from across the region. In the spring, the hardware and garden stores in town offer a dazzling array of gardening tools, soil amendments, seeds, and other items. According to U.S. Census categorization (based on population density, land use, and distance between population centers), Crawford County is predominantly rural (U.S. Census Bureau, n.d.-d). Our work grew out of an interest in understanding why people in our region, especially those whose time and financial resources seemingly are limited, grow their own food.

To approach our research goals, we developed a multimethod ethnographic research plan (Handwerker, 2001). This collaborative project drew from the work of undergraduate students at Allegheny College. The students codeveloped this research project with the faculty mentor/instructor.

To develop culturally salient survey questions and to inform our inquiry, we began by investigating the literature to determine relevant areas of inquiry. We also conducted several unstructured interviews with gardeners to inform the response options on our survey instrument. From their responses and the limited literature on household gardening, we developed two survey instruments: one for respondents who currently grew some of their own food, and one for those who did not. The instrument included both open-ended and close-ended questions aimed at understanding gardening behaviors. It included questions about demographic characteristics that helped us identify participants in the second phase of the research. Undergraduate students at Allegheny College conducted surveys with 124 Meadville area residents (see Table 1). This survey effort aimed to achieve three goals: first, to better understand the prevalence, motivations, and practices of household gardening; second, to recruit participants for a more in-depth investigation; and third, as a learning experience for undergraduate research students. Before undergoing data collection, the students received training in survey techniques and research ethics. To achieve the dual pedagogical and methodological goals of the survey, we used a convenience sample to gather responses: students knocked on doors, stood at street corners, and attended community events in the spring and summer of 2012.

Drawing from our survey respondents, we recruited low-income households who garden to participate in a follow-up interview and garden visit, which we conducted in the summer of 2012. Because many practitioners and scholars view the federal poverty income level as well below a living income, our research follows the lead of many assistance programs in defining the experience of poverty as household incomes below 175% of the federally defined poverty line for 2011. In these visits with seven low-income households, we conducted lengthy semistructured interviews (Bernard, 2017) to better understand why and how these families garden. The interview protocol reflected our understanding of gardening motivations and

Table 1. Survey Respondents by Gardening Status and Income Level (*n*=137)

	Low-Income	Higher-Income	Total
Gardeners	39	29	68
Non-Gardeners	46	12	58
Total	85	41	126

Note: Not all respondents indicated their income level; low income is defined as below 175% of the federally defined poverty level.

practices gleaned from the literature, as well as our interests in better understanding gardeners' needs. These visits also included a detailed set of garden observations, including measurements and photographs.

Using Microsoft Excel, a team of students and faculty cleaned the survey data and then analyzed the cleaned data using descriptive statistics. The authors analyzed the qualitative interview data through an inductive, iterative coding process to identify themes, points of consensus, and points of divergence in the responses (Creswell, 2009).

Given the nature of ethnographic research, this study's findings are not intended to be generalizable to all low-income, rural food gardeners, nor even to all low-income, rural food gardeners in our study community. Rather, the findings provide insights about gardeners' experiences and suggest some ways in which practitioners might better support and understand the needs and motivations of low-income, rural food gardeners.

This research was reviewed and approved by the institutional review boards at Allegheny College and Western Washington University. To protect participants' identity, we refer to individual respondents with pseudonyms.

Results and Discussion

The results of this study suggest that gardening is a prevalent behavior among the residents of Meadville, Pennsylvania. Of the 124 total survey respondents, 53% reported that they engaged in some type of fruit or vegetable gardening. Although gardening is a common activity across income groups, higher-income respondents in our study had higher levels of gardening (69%) than lower-income respondents (46%). The in-depth interviews and garden visits provided more details about the structure and content of home gardens. The gardens visited ranged from a small plot with a few tomato plants in the middle of town to a small field in a more rural setting. Tomatoes were the most common plant found in home gardens, with pumpkins, sunflowers, and squash also making an appearance in most gardens.

In our study population of gardeners in the Meadville, PA, area, edible food gardening is prolific, even among low-income household; Meadville area residents garden at higher rates (53%) than the one-third estimated for the U.S. overall (NGA, 2013). Higher rates of gardening among higher-income households are also consistent with previous research, including a recent study in Madison, Wisconsin (Smith, Greene, & Silbernagel, 2013).

Gardening Motivations and Barriers

The survey and interviews included questions about motivations and barriers to gardening. The survey responses from low-income participants who were not growing their own food offered insights about barriers to gardening for this group: 54% reported not having space to garden, 35% reported not having enough time, and 20% reported that their landlord does not allow gardening at their residence. Other reasons cited for not gardening included pet conflicts, a lack of need for additional produce, gardening not being worth it for just one person, poor soil quality, and a lack of interest. The survey results suggest that lower rates of food gardening among low-income households may be related primarily to a lack of space and time to do so. Schupp et al. (2016) found that space and housing type, as well as socio-economic status, affected households' gardening behaviors, with lower-income households, renters, and those in cities having a lower likelihood to garden than those living in apartments or row houses. A study in Portland, Oregon, also found homeownership to be positively correlated with gardening (McClintock et al., 2016). A lack of information or knowledge about gardening was rarely cited as a barrier to gardening, perhaps due to the rich agricultural history and the high rates of gardening in the region.

Motivations for gardening, as reported through the surveys, varied considerably across low-income and high-income gardeners (see Table 2). For low-income participants, gardening is driven by economics and the enjoyment of gardening and the outdoors. Higher-income participants reported that they gardened because they enjoy the outdoors, appreciate the higher quality of produce, and find it relaxing. A recent study of household gardeners in Portland, Oregon, found that low-income households were more motivated to grow food in an effort to improve food security and save money,

Table 2. Motivations for Gardening: Percentage of Gardeners Reporting these Factors among their Top Three Motivations

Low-Income Gardeners (*n*=39)		Higher-Income Gardeners (*n*=29)	
Growing your own food is cheaper than purchasing it	33%	You enjoy being outside	33%
You enjoy gardening	26%	The quality is better than what you can buy at the grocery store	33%
You enjoy being outside	21%	It's relaxing	30%
Gardening makes you feel more connected to God	18%	You enjoy gardening	26%
The quality is better than what you can buy at the grocery store	18%	It's better for the environment	22%
You can control what goes into your food	18%	Gardening is good exercise	19%
Gardening is good exercise	15%	You can control what goes in your food	19%
It's relaxing	15%	Your family gardened when you were a child	19%

while higher-income households were driven by environmental concerns (McClintock et al., 2016). These patterns hold true for our respondents, although the pleasure of gardening was a commonly cited motivation for all income groups in our study.

The semistructured interviews with low-income gardeners added clarification and nuance to our understanding of gardening motivations. The pleasure and recreation provided by gardening were particularly salient to participants, who described great contentment with watching the fruits of their labor grow. John told us, "I enjoy sitting and looking at it once it's all planted and enjoy the view, watch everything grow from that little seed I think is quite interesting." Ethan described mindful contentment with gardening: "If you do it right you have your own food and that's really calming for a person, you know it's good health for a person's psyche." Participants also took great pride in the money-saving aspect of growing their own food. When asked why they garden, one participant said,

> It's more economical—I doubt that we spend 20-25 dollars a week in the grocery store. You know, even in the wintertime. We buy the staples, but we just put a half a pork and a quarter of a beef in the freezer from the local slaughterhouse so we don't have to buy much.

The gardeners we interviewed were also acutely aware of external economic drivers of food and were using gardening as a buffer against them. Ellen pointed out that "the prices of tomatoes in the store are horrible. You pay like [US]$1.77 a pound for vine tomatoes." Betty explained how her family was responding to current economic conditions: "Now with the economy, I'm gonna use—I'm not gonna let anything go to waste. In fact, my husband put an ad in the paper asking for another pressure cooker canner and jars." For most of the gardeners we interviewed, putting up food (canning, freezing, dehydrating), was an important component of their food production.

Table 3. How Did They Learn to Garden (all responses)

	Low-Income Gardeners (*n*=39)	Higher-Income Gardeners (*n*=29)
Parents	74%	68%
Other Family	54%	46%
Friends	34%	29%
Master Gardeners	6%	4%
Books	43%	43%
Websites	29%	32%
Other	17%	29%

Knowledge and Practices

Most of the surveyed participants across both income groups learned to garden from family (see Table 3). The gardeners we interviewed also emphasized the knowledge and skills gained from

family members, especially around canning and food processing. Betty described how she learned to can from her mom, who "would can like 300 quarts of green beans and just huge amounts of things." Friends, books, and websites were other common sources of information about gardening. In our discussion with Betty, she told us about checking in with her neighbors for ideas to prevent worms in broccoli. While accessing other information sources, gardeners tend to rely on general web searches, as well as books from the Rodale and Better Homes and Gardens series. Several participants also mentioned referencing books about square foot gardening, as well as a print newsletter from the local garden store. In the "other" category, many cited "trial and error" or common sense, or previous experience as farmers or in school. In the interviews, the value of experimentation or trial and error emerged as an important form of gaining knowledge about growing food. John told us: "I have learned one thing, don't use horse manure 'cause it grows weeds really good."

Gardeners in the Meadville area employ a variety of common gardening techniques, including seed saving and composting (see Table 4). Very few respondents reported applying pesticides (12%) or herbicides (8%). In the interviews, gardeners explained why they choose certain techniques and opt against others. A majority of the gardeners interviewed cited concerns about the environment, human health, and sustainability as reasons they do not apply pesticides or herbicides. In the interviews, participants talked about how they preferred their own garden produce to vegetables they could purchase at the store because they knew that it was chemical-free. The idea of pesticide-, herbicide-, and synthetic fertilizer–free as "natural" was a common association; Betty told us that she switched back to manure from synthetic fertilizer because it "seems more natural, more healthy and it, you know, replenishes the soil." The participants also expressed a strong concern for ecological sustainability. For example, Jo spoke about letting the clover grow to "help the bees" because she has been seeing fewer of them. And Laura said that she "plants one for the rabbit, one for me. I don't like using sprays. I don't want the bug spray and stuff, poison."

Table 4. Common Gardening Techniques

	Number of respondents	Percentage of gardening respondents (*n*=66)
Composting	43	65%
Seed-saving	43	65%
Application of chemical fertilizers	23	35%
Application of pesticide	8	12%
Application of herbicide	5	8%

Cultivating Cultural, Social, and Political Meaning in Gardening

The interview and survey data about where gardeners get information and learn to garden suggests that household-level gardening is a social practice. Our discussions with gardeners reinforce the cultural, social, and political meaning of gardening. For many of the gardeners we spoke to, gardening and food provisioning connects them more deeply to the place in which they live and to their land. Ethan suggested that gardening made him "force [him]self to be a part of a cycle" and told us that he "really like[d] experiencing the full lifecycle of a garden." Ellen described her experiences growing up in the Fifth Ward, a low-lying neighborhood in the floodplain of French Creek: "We hunted and fished a lot and . . . we had frog legs all the time. And we had a trap line over on French Creek, which I walked with [my father] in the winter before I ever went to school." She also remembered foraging for wild horseradish with her parents.

Gardening connects individuals to their families and the people around them; as Fred said, "It's something that does tend to go with the people" and Ethan describes working on his uncle's farm as a youth as being a formative experience for him. For many of the gardeners, sharing garden produce and labor is a satisfying way to connect with friends and neighbors. Jo regularly puts a table of extra vegetables in front of her house and asks for donations, and John and Laura gave away their extra tomato seedlings to friends and neigh-

bors. Ellen describes how her family shared tomatoes with the neighborhood kids growing up:

> We had a long side porch on our house and when mama was done with all the tomatoes and we used what we could, that whole porch would be filled with tomatoes. We'd just go in and the neighbor kids were allowed. I got so many sores in my mouth [from eating tomatoes]!

Household gardens also often become places for neighborhood kids to connect and help out. As Fred told us, gardening "is a good way to connect with your neighbors—kids like to work in the garden." The social aspect of gardening that emerged from our interviews supports findings of other studies of low-income households who garden (either at their own home or at a community garden). For example, in a San Jose, CA, study of low-income household garden projects, 30% of produce was given away to family and friends, and 80% of participants shared some food with neighbors (Algert, Baameur, Diekmann, Gray & Ortiz, 2016; Gray et al., 2014). A study of Iowa households in poverty found that those living in rural areas were more likely to rely on a social safety net and reciprocity than to utilize redistribution (e.g., food stamps, other government or food bank support) (Morton et al., 2008). The social aspects extend beyond sharing food to sharing information and experiences as well. In this study, gardens seem to serve as a way to reinforce and value traditional ecological knowledge and knowledge exchange (see Buchmann, 2009). In urban settings, home gardens seem to contribute to a growing sense of community, with the majority of participants in a San Jose household garden program agreeing that the garden makes them feel part of a community, they made new friends in the program, and almost half met new neighbors through the program (Gray et al., 2014). This also seems to be the case in this rural context, where gardeners ask their neighbors and family for advice, support, and maybe a few extra tomato starts.

Although this study did not set out to examine gardening as a political act, most of the gardeners we interviewed framed growing their own food as just that—an act largely focused around issues of security and self-sufficiency. For many gardeners, producing their own food is a way to ensure that their family is independent and self-sufficient. For some gardeners, like Jo, this drive to self-sufficiency comes from concerns about the health of food from a conventional store: "it's just when you're using sprays and stuff on the ground, they can say what they want, even spraying the leaves, it's going into that product. I mean it's going into the vegetable . . . and so therefore you're eating it." Similarly, Fred said, "I think there's a lot of problems with our kids with the stuff we're putting in their foods. Like meat, with the amount of steroids they're putting in meat, and we're wondering why our kids are having anger problems." For others, a desire for self-sufficiency stems from broader political or religious considerations about the instability of government and institutions. Betty described why she is dehydrating and putting up more food:

> I'm a little nervous about our world and I've purposed to have a year's supply of food that we actually don't use but just have on hand in case anything happens. I mean, you can't hardly even turn on the TV without them mentioning something . . . I mean even if you just looked at the storms that just happened . . . you wanna be responsible for yourself and your family, and that's why I'm dehydrating . . . food will last longer. And I'm even buying things from the Amish . . . a wheat grinder, a manual one.

On a follow-up visit, Betty showed us her freezer full of meat and a generator. In Jo's case, the concern around security and self-sufficiency connects to the notion of environmental collapse:

> You know, we're destroying everything. I just read a documentary last night . . . plastic bottles . . . this country only recycles 21% of their plastic bottles. The rest either goes in landfills or gets thrown on the ground and ends up in the sea . . . They're saying that plastic can stay in the ground for 600 years before it actually breaks down . . . Well, I think the Amish people and people like myself

> realize what's going on will be the survivors. We'll survive the longest, I'll put it that way. Cause we know what to do.

Paradoxically, these gardeners seem to value both the social experience of gardening and sharing food and labor, and also the individual and household security afforded by growing their own food.

For some of these households, gardening is a more radical act, a way to opt out of economic and governmental structures, or at least a way to address the failure of the market to provide food (see also Morton et al., 2008). In some cases, these concerns seemed to be tied to survivalist mentality, while others were more concerned about pushing up against impending environmental collapse. These political perspectives also suggest a challenge to the corporate food system and hint at values around food sovereignty (see also Alkon & Mares, 2012).

Attitudes regarding household gardening among our study respondents seem to align with food sovereignty principles in three ways. First, our work suggests that gardening may foster knowledge systems and communities of informal resource exchange. Second, gardeners seem to be turning to gardening partially as a way to take control of what enters people's bodies and the environment. Finally, gardening provides a non-market-based approach to food production. Our findings also reinforce some aspects of McEntee's notion of "traditional localism" (2010), with gardening motivations being dominated by concerns around affordability and tradition. In our interviews, though, we also find that rural, low-income household gardeners express environmental values, and our survey findings suggest that these gardeners are largely motivated by maintaining control of what they eat. These findings suggest that rural household gardeners might also be influenced by underlying ideologies and political perspectives, and are not solely motivated by the cost of and access to produce.

This study provides insights about low-income, rural gardeners, although they are limited by the small sample size and limited geographic context. More qualitative, place-based studies like this are needed to understand how to better support gardening practice in diverse settings. We regret not directly interrogating several characteristics of gardeners, including homeownership, gender, cultural heritage, race, ethnicity, and religious affiliation, and suggest that future studies examine these issues.

Implications for Practitioners

At a follow-up visit by two of the authors, a husband and wife greeted us as old friends and immediately pressed two mason jars into my hands from their batch of apple syrup and canned peaches. They talked with pride about how they were able to provide for their family, cultivate a close connection to their food, and be self-sufficient. Gardeners like these represent an important component of food systems, and many opportunities exist to better support their provisioning efforts. Other scholars have pointed out that alternative food movements are missing out on connecting to home food producers (see De Hoop & Jehlička, 2017). Low-income, rural households in our study community value the practice of growing their own food, and doing so provides some sense of increased food security, as well as social, cultural, and political meaning.

The challenge, then, is to find ways to provide support while also acknowledging the tremendous knowledge and cultural value held by many of these communities in order to avoid falling into the information deficit falsehood. These survey results indicate that insufficient knowledge is not a barrier for household-level food provisioning, and the interviews expose the tremendous knowledge and capacity for experimentation held by low-income, rural gardeners. The most ubiquitous form of garden education and support (the Master Gardener program) is not frequently used by the households we surveyed, despite Pennsylvania's large network of volunteers and programs (Penn State Extension, n.d.). So, if these gardeners do not necessarily need more information or education, how can programs and policies better support their provisioning efforts?

The main barriers to gardening identified by gardeners in this study, space and time, are areas that programs and policies could address. For example, a food systems program might build rela-

tionships with landlords and encourage creating lease language that allows gardening or might connect households with limited gardening space to neighbors who are willing to share gardening space. In an aging community like Meadville, creative solutions abound to connect retirees who are interested in gardening to households who are interested but lack the time to do so. These sorts of solutions build on the social value of gardening that emerged in our work. These findings also provide some ideas about how gardening programs might be marketed and framed for low-income, rural households. For example, the low-income gardeners we surveyed grow their own food largely because it saves them money, and they enjoy it. The spiritual value of gardening could also be supported by partnerships with churches and other religious groups. Although gardeners in this study sample possess gardening knowledge and skills, many expressed an interest in ecological issues, such as colony collapse disorder, so education programs aimed at these sorts of issues might be appealing to some low-income gardeners and serve as a way to draw these households to other programs.

This study's findings point to an opportunity to provide additional resources and support for household food production. While most food systems projects that focus on food production—especially those aimed at low-income residents—provide support for community gardens and farms, there is a growing set of programs and organizations that support household-level food production. For example, the La Mesa Verde program with University of California Cooperative Extension Master Gardeners Program in San Jose, CA, helps low-income residents grow their own food by providing free materials to build raised beds (Algert et al., 2016; Gray et al., 2014). After some initial challenges related to high drop-out rates and information-deficit–focused programming, the program shifted its approach, using social connections to help experienced gardeners in the program "train" new gardeners using a community-organizing model (Gray et al., 2014). It also moved from a "needs-based model of service delivery" to an "assets-based model reflecting participatory development and local problem-solving approaches" (Gray et al., 2014, p. 195). Similar organizations dot the country: GrUB,[2] a longstanding nonprofit in Olympia, WA, runs the Food Investment Garden (F.I.G.), which provides raised bed gardens to low-income individuals on a sliding-scale fee schedule, with most low-income households qualifying for free garden construction. The Backyard Garden Program[3] in Gloucester, Massachusetts, provides free backyard raised beds, gardening materials (including seeds and seedlings), mentoring, and training to low-income households, with a modest sliding scale fee (US$10–US$50). The Garden Project, run by the Bellingham (WA) Food Bank, addresses the space challenge of low-income renter households by working with landlords and supporting gardens at public housing communities and a women's shelter.

The Meadville context suggests that practitioners focused on increasing small-scale food production face a missed opportunity for collaboration with others who share similar personal motivations and structural concerns about the U.S. food system. A few hundred miles west of Meadville, in the rustbelt city of Detroit, Michigan, food justice activists have been reclaiming vacant lots for agricultural production for decades, and the city serves as a "laboratory for urban farming" (Whitford, 2010, para. 24). For example, black women activists are growing food through the Detroit Black Community Food Security Network to provide healthy food for their families and to resist the decline of black community centers in the city (White, 2011). A study of urban agriculture participants in Detroit (including the following focus groups: black empowerment urban agriculture, community development urban agriculture, youth, and Hmong) found shared motivations and concerns around creating community, creating trust in the food system, and creating a more localized food system (Colasanti, Hamm, & Litjens, 2012). While food provisioners and activists in Meadville and Detroit face some substantively different structural

[2] http://www.goodgrub.org/fig
[3] http://www.backyardgrowers.org/backyard-gardens

struggles—most notably, black activists in Detroit contend with the racism embedded in planning practices and many food systems programs in the city (White, 2011)—rural household gardeners and urban community gardeners share a desire to create new forms of social relations and food production in response to food systems that have left them out.

Since this research was conducted, a number of new food- and gardening-related programs have been developed in the Meadville area. New gardens are popping up all over the city. This is in part thanks to a new garden network, Grow Meadville, which has supported the development of and signage for 15 gardens in Meadville. Grow Meadville gardens range from traditional community gardens to school gardens, and to "city gardens," where local residents can freely pick produce grown in these spaces. Grow Meadville also runs a summer youth leadership program that has young people working in the garden, cooking with food from the garden, and working together to solve community-based problems. The Mobile Market House began in 2017 and delivers affordable, local produce to low-income neighborhoods who may not otherwise access fresh food. Beyond Meadville, food practitioners from all over Northwest Pennsylvania are coming together to discuss community food systems and beginning to lay the groundwork for a stronger local food system.

Acknowledgment

We are grateful for the efforts of the environmental science students at Allegheny College who administered the surveys for this study.

References

Algert, S. J., Baameur, A., & Renvall, M. J. (2014). Vegetable output and cost savings of community gardens in San Jose, California. *Journal of the Academy of Nutrition and Dietetics*, *114*(7), 1072–1076. https://doi.org/10.1016/j.jand.2014.02.030

Algert, S. J., Baameur, A., Diekmann, L. O., Gray, L., & Ortiz, D. (2016). Vegetable output, cost savings, and nutritional value of low-income families' home gardens in San Jose, CA. *Journal of Hunger & Environmental Nutrition*, *11*(3), 328–336. https://doi.org/10.1080/19320248.2015.1128866

Alkon, A. H., & Mares, T. M. (2012). Food sovereignty in US food movements: Radical visions and neoliberal constraints. *Agriculture and Human Values*, *29*(3), 347–359. https://doi.org/10.1007/s10460-012-9356-z

Bernard, H. R. (2017). *Research methods in anthropology: Qualitative and quantitative approaches* (6th ed.). Lanham, Maryland: Rowman & Littlefield.

Buchmann, C. (2009). Cuban home gardens and their role in social-ecological resilience. *Human Ecology, 37*(6), 705. https://doi.org/10.1007/s10745-009-9283-9

Church, A., Mitchell, R., Ravenscroft, N., & Stapleton, L. M. (2015). 'Growing your own': A multi-level modelling approach to understanding personal food growing trends and motivations in Europe. *Ecological Economics, 110,* 71–80. https://doi.org/10.1016/j.ecolecon.2014.12.002

Coburn, A. F., MacKinney, A. C., McBride, T. D., Mueller, K. J., Slifkin, R. T., & Wakefield, M. K. (2007, March). Choosing rural definitions: implications for health policy (Issue Brief No. 2). Rural Policy Research Institute Health Panel. Retrieved from http://rupri.org/Forms/RuralDefinitionsBrief.pdf

Colasanti, K. J. A., & Hamm, M. W. (2016). Assessing the local food supply capacity of Detroit, Michigan. *Journal of Agriculture, Food Systems, and Community Development, 1*(2), 41–58. https://doi.org/10.5304/jafscd.2010.012.002

Colasanti, K. J. A., Michael W. Hamm, M. W., & Litjens, C. M. (2012). The city as an "agricultural powerhouse"? Perspectives on expanding urban agriculture from Detroit, Michigan. *Urban Geography, 33*(3), 348–369. https://doi.org/10.2747/0272-3638.33.3.348

Coleman-Jensen, A., Rabbitt, M.P., Gregory, C.A., & Singh, A.. (2018). *Household Food Security in the United States in 2017*, ERR-256, U.S. Department of Agriculture, Economic Research Service. Retrieved from https://www.ers.usda.gov/publications/pub-details/?pubid=90022.

Conk, S. J., & Porter, C. M. (2016). Food gardeners' productivity in Laramie, Wyoming: More than a hobby. *American Journal of Public Health*, *106*(5), 854–856. https://doi.org/10.2105/AJPH.2016.303108

Creswell, J. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Los Angeles: SAGE.

De Hoop, E., & Jehlička, P. (2017). Reluctant pioneers in the European periphery? Environmental activism, food consumption and "growing your own." *Local Environment, 22*(7), 809–824. https://doi.org/10.1080/13549839.2017.1289160

DeLind, L. B. (2011). Are local food and the local food movement taking us where we want to go? Or are we hitching our wagons to the wrong stars? *Agriculture and Human Values*, *28*(2), 273–283. https://doi.org/10.1007/s10460-010-9263-0

Dewaelheyns, V., Lerouge, F., Rogge, E., & Vranken, L. (2015). A different perspective on garden grabbing: Mapping the adaptive capacity of home food production. In M. Schrenk, V. V. Popovich, P. Zeile, P. Elisei, & C. Beyer (Eds.), *Proceedings of 20th International Conference on Urban Planning, Region al Development and Information Society* (pp. 13–30). CORP – Competence Center of Urban and Regional Planning. Retrieved from https://lirias.kuleuven.be/1742117?limo=0

Duerden, M. D., & Witt, P. A. (2010). The impact of direct and indirect experiences on the development of environmental knowledge, attitudes, and behavior. *Journal of Environmental Psychology, 30*(4), 379–392. https://doi.org/10.1016/j.jenvp.2010.03.007

DuPuis, E. M., & Goodman, D. (2005). Should we go "home" to eat?: Toward a reflexive politics of localism. *Journal of Rural Studies*, *21*(3), 359–371. https://doi.org/10.1016/j.jrurstud.2005.05.011

Fairbairn, M. (2012). Framing transformation: The counter-hegemonic potential of food sovereignty in the US context. *Agriculture and Human Values, 29*(2), 217–230. https://doi.org/10.1007/s10460-011-9334-x

Feenstra, G. W. (1997). Local food systems and sustainable communities. *American Journal of Alternative Agriculture, 12*(1), 28–36. https://doi.org/10.1017/S0889189300007165

Freeman, C., Dickinson, K. J. M., Porter, S., & van Heezik, Y. (2012). "My garden is an expression of me": Exploring householders' relationships with their gardens. *Journal of Environmental Psychology, 32*(2), 135–143. https://doi.org/10.1016/j.jenvp.2012.01.005

Gray, L., Guzman, P., Glowa, K. M., & Drevno, A. G. (2014). Can home gardens scale up into movements for social change? The role of home gardens in providing food security and community change in San Jose, California. *Local Environment*, *19*(2), 187–203. https://doi.org/10.1080/13549839.2013.792048

Handwerker, W. P. (2001). *Quick ethnography: A guide to rapid multi-method research*. Lanham, Maryland: AltaMira.

Hinrichs, C. C. (2000). Embeddedness and local food systems: Notes on two types of direct agricultural market. *Journal of Rural Studies, 16*(3), 295–303. https://doi.org/10.1016/S0743-0167(99)00063-7

Kabir, M. E., & Webb, E. L. (2009). Household and homegarden characteristics in southwestern Bangladesh. *Agroforestry Systems, 75*(2), 129. https://doi.org/10.1007/s10457-008-9142-5

Kjellgren, A., & Buhrkall, H. (2010). A comparison of the restorative effect of a natural environment with that of a simulated natural environment. *Journal of Environmental Psychology, 30*(4), 464–472. https://doi.org/10.1016/j.jenvp.2010.01.011

Kloppenburg, J., Jr., Hendrickson, J., & Stevenson, G. W. (1996). Coming in to the foodshed. *Agriculture and Human Values*, *13*(3), 33–42. https://doi.org/10.1007/BF01538225

Kortright, R., & Wakefield, S. (2011). Edible backyards: A qualitative study of household food growing and its contributions to food security. *Agriculture and Human Values, 28*(1), 39–53. https://doi.org/10.1007/s10460-009-9254-1

Lautenschlager, L., & Smith, C. (2007). Beliefs, knowledge, and values held by inner-city youth about gardening, nutrition, and cooking. *Agriculture and Human Values, 24*, 245–258. https://doi.org/10.1007/s10460-006-9051-z

Mariola, M. J. (2008). The local industrial complex? Questioning the link between local foods and energy use. *Agriculture and Human Values*, *25*(2), 193–196. https://doi.org/10.1007/s10460-008-9115-3

Mazumdar, S., & Mazumdar, S. (2012). Immigrant home gardens: Places of religion, culture, ecology, and family. *Landscape and Urban Planning, 105*(3), 258–265. https://doi.org/10.1016/j.landurbplan.2011.12.020

McClintock, N., Mahmoudi, D., Simpson, M., & Santos, J. P. (2016). Socio-spatial differentiation in the Sustainable City: A mixed-methods assessment of residential gardens in metropolitan Portland, Oregon, USA. *Landscape and Urban Planning*, *148*, 1–16. https://doi.org/10.1016/j.landurbplan.2015.12.008

McEntee, J. (2010). Contemporary and traditional localism: A conceptualisation of rural local food. *Local Environment*, *15*(9–10), 785–803. https://doi.org/10.1080/13549839.2010.509390

McIntyre, L., & Rondeau, K. (2011). Individual consumer food localism: A review anchored in Canadian farmwomen's reflections. *Journal of Rural Studies, 27*(2), 116–124. https://doi.org/10.1016/j.jrurstud.2011.01.002

Morton, L. W., Bitto, E. A., Oakland, M. J., & Sand, M. (2008). Accessing food resources: Rural and urban patterns of giving and getting food. *Agriculture and Human Values*, *25*(1), 107–119. https://doi.org/10.1007/s10460-007-9095-8

National Gardening Association (NGA). (2014). *Garden to table: A five year look at food gardening in America.* Jacksonville, Texas: Author. Print copy available by contacting NGA's Garden Research division at https://gardenresearch.com/

Nyéléni. (2007). *Declaration of the Forum for Food Sovereignty, Nyéléni 2007*. Retrieved from http://nyeleni.org/spip.php?article290

Penn State Extension. (n.d.). *Master Gardener Program: County highlights.* Retrieved November 18, 2019, from https://extension.psu.edu/programs/master-gardener/about/impacts/2017-18-master-gardener-annual-report/county-highlights

Schupp, J. L., Som Castellano, R. L., Sharp, J. S., & Bean, M. (2016). Exploring barriers to home gardening in Ohio households. *Local Environment, 21*(6), 752–767. https://doi.org/10.1080/13549839.2015.1017807

Smith, V. M., Greene, R. B., & Silbernagel, J. (2013). The social and spatial dynamics of community food production: A landscape approach to policy and program development. *Landscape Ecology*, *28*(7), 1415–1426. https://doi.org/10.1007/s10980-013-9891-z

Taylor, J. R., & Lovell, S. T. (2014). Urban home food gardens in the Global North: Research traditions and future directions. *Agriculture and Human Values, 31*(2), 285–305. https://doi.org/10.1007/s10460-013-9475-1

Taylor, J. R., Lovell, S. T., Wortman, S. E., & Chan, M. (2017). Ecosystem services and tradeoffs in the home food gardens of African American, Chinese-origin and Mexican-origin households in Chicago, IL. *Renewable Agriculture and Food Systems, 32*(1), 69–86. https://doi.org/10.1017/S174217051600003X

U.S. Census Bureau. (n.d.-a). Age and sex. 2010 American Community Survey: S0101. Retrieved November 18, 2019 from https://data.census.gov

U.S. Census Bureau. (n.d.-b). Poverty Status in the past 12 months of families. 2010 American Community Survey 5-Year Estimates: S1702. Retrieved November 18, 2019, from https://data.census.gov

U.S. Census Bureau. (n.d.-c). Race. 2010 American Community Survey 5-Year Estimates: B02001. Retrieved November 18, 2019, from https://data.census.gov

U.S. Census Bureau. (n.d.-d). County rurality level: 2010. Retrieved November 18, 2019, from https://www2.census.gov › geo › docs › reference › County_Rural_Lookup

U.S. Census Bureau. (1952). U.S. Census of Population: 1950. Vol. I., Number of Inhabitants. Washington, D.C.: U.S. Government Printing Office, Retrieved from https://www.census.gov/prod/www/decennial.html#y1950popv1

U.S. Department of Agriculture (USDA), Economic Research Service. (2019). *Measurement.* Retrieved from https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/measurement.aspx

White, M. M. (2011). Sisters of the soil: Urban gardening as resistance in Detroit. *Race/Ethnicity: Multidisciplinary Global Contexts, 5*(1), 13–28. https://doi.org/10.2979/racethmulglocon.5.1.13

Whitford, D. (2010, January 18). Can farming save Detroit? *Fortune, 161*(1), 79–84.

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Integrated food systems governance: Scaling equitable and transformative food initiatives through scholar-activist engagement

Colleen Hammelman [a] *
University of North Carolina at Charlotte

Charles Z. Levkoe [b]
Lakehead University

Julian Agyeman [c]
Tufts University

Sanjay Kharod [d]
New Orleans Food & Farm Network

Ana Moragues Faus [e]
Universitat de Barcelona

Elisa Munoz [f]
New Orleans Food Policy Advisory Committee

Jose Oliva [g]
Food Chain Workers Alliance

Amanda Wilson [h]
Saint Paul University

Submitted January 11, 2019 / Revised April 22 and June 11, 2019 / Accepted June 12, 2019 / Published online January 7, 2020

Citation: Hammelman, C., Levkoe, C. Z., Agyeman, J., Kharod, S., Moragues Faus, A., Munoz, E., Oliva, J., & Wilson, A. (2020). Integrated food systems governance: Scaling equitable and transformative food initiatives through scholar-activist engagement. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 71–86. https://doi.org/10.5304/jafscd.2020.092.003

Abstract

Community-based efforts to transform food systems involve a diverse range of actors and increasingly attempt to focus on public engagement in policymaking processes. These initiatives often emphasize opportunities for more participatory forms of engagement rooted in systems thinking, which recognizes the interconnections between environmental, social, and economic injustices. Similarly, food systems scholars are increasingly engaged in participatory action projects seeking to make productive linkages between academic

[a] * Colleen Hammelman, Assistant Professor, Department of Geography and Earth Sciences, University of North Carolina at Charlotte; 9201 University City Blvd.; Charlotte, NC 28223 USA; +1-704-687-5916; colleen.hammelman@uncc.edu

[b] Charles. Z. Levkoe, Canada Research Chair in Sustainable Food Systems, Department of Health Sciences, Lakehead University; 955 Oliver Road; Thunder Bay, Ontario P7B 5E1, Canada; +1-807-346-7954; clevkoe@lakeheadu.ca

[c] Julian Agyeman, Professor of Urban and Environmental Policy and Planning, Tufts University, Medford, MA USA; julian.agyeman@tufts.edu

[d] Sanjay Kharod, Executive Director, New Orleans Food & Farm Network; New Orleans, LA, USA; sanjay.kharod@noffn.org

[e] Ana Moragues Faus, Ramón y Cajal Research Fellow, Universitat de Barcelona; Avinguda Diagonal, 690; 08034 Barcelona, Spain

[f] Elisa Munoz, Director, New Orleans Food Policy Advisory Committee, New Orleans, LA, USA; elisa@nolafoodpolicy.org

[g] Jose Oliva, Co-Founder, Food Chain Workers Alliance, and Campaign Director, HEAL Food Alliance, Chicago, IL, USA; jose@healfoodalliance.org

[h] Amanda Wilson, Assistant Professor, School of Social Innovation, Saint Paul University, Ottawa, ON, Canada; awilson@ustpaul.ca

research, policymakers, and community organizations in search of tangible food systems change. This collective essay, based on a roundtable discussion at the 2018 annual meeting of the American Association of Geographers (AAG) in New Orleans, describes integrated food governance processes currently underway—particularly those engaging anchoring institutions from civil society, government, and academia—to demonstrate both the promise and the challenges of networked governance efforts in pursuing more equitable food systems. In particular, we focus on how differing anchor institutions engage in translocal governance, coalition building, and adaptation. This research contributes to literature and practice on food systems governance, systems thinking, and anchoring institutions by proposing an analytical framework and providing a series of case studies of integrated governance initiatives for pursuing social and ecological justice in food systems.

Keywords
Anchoring Institutions, Integrated Governance, Engaged Scholarship, Food Systems, Policy, Scholar-Activists

Introduction

Social movement networks focusing on sustainable food systems and the connections with social and ecological justice have made significant headway over the past decades (Alkon & Guthman, 2017; Sbicca, 2018). Beyond developing successful place-based initiatives and creating a significant impact in their local communities, food systems organizations are scaling up their activities to address policy and play a meaningful role in food systems governance. These evolving efforts respond to top-down food policy frameworks that take a fragmented approach, treat symptoms rather than structural causes, and tend to overlook on-the-ground realities, needs, and priorities of people and communities in favor of economic development (Alkon & Guthman, 2017; Blecha & Leitner, 2014).

Community-based efforts involving a wide range of actors across food systems frequently focus on democratic engagement in policymaking processes (Andrée, Clark, Levkoe, & Lowitt, 2019; Desmarais, Claeys, & Trauger, 2017; Kennedy & Liljeblad, 2016). These food governance networks emphasize opportunities for more participatory forms of engagement rooted in systems thinking, which recognizes the interconnections between environmental, social, and economic injustices (Ericksen, 2008). Beyond civil society, there is a growing awareness among policymakers that food systems developed from and shaped by the complex interactions between people, ecosystems, and social forces necessitate more joined-up and integrated governance responses. Similarly, food systems scholars increasingly engage in participatory action projects seeking to make productive linkages between academic research, policymakers, and community organizations in search of tangible food systems change (Anderson, Buchanan, Chang, Rodriguez, & Wakeford, 2017; Levkoe, Brem-Wilson, & Anderson, 2019; Reynolds, Block, & Bradley, 2018). Attempts at participatory and integrated food policy that engages these varied actors across food systems are not without their challenges. They require innovative governance arrangements that cross multiple geographic, scalar, and administrative boundaries, raising numerous questions about how responsibility is apportioned, priorities are set, ideas are implemented, and success is measured.

In this collective essay, based on a roundtable discussion at the 2018 annual meeting of the American Association of Geographers (AAG), we describe such integrated food governance networks—particularly those engaging actors from civil society, food policy councils, and academia—to demonstrate both the promise and challenges of pursuing more equitable and sustainable food systems by addressing policy and programming. We begin with a brief review of the literature on integrated governance and anchoring institutions to establish a framework for pursuing social and ecological justice in food systems. Then we describe several case studies to demonstrate notable successes as well as challenges for implementing this framework among a range of networks. In particular, we focus on how different anchor institutions foster engagement in food systems governance through translocal networks, coalition building, and adaptation. We conclude with suggestions for taking this research, reflection, and action forward.

A Framework for Integrated Food Systems Governance

Since the 1970s, neoliberalism has had a major impact on food systems governance by devolving responsibility from the national and regional level to municipalities, private-public partnerships, and the nonprofit sector (Peck & Tickell, 2002). This shift from government to governance has emphasized self-governing capacities while also opening new arenas of engagement outside traditional decision-making spaces (Blue, 2009). Beyond taking on the devolved responsibility from the state, this has produced tensions surrounding the lack of resources and power available for resistance against the dominant food system (Blue, 2009; Hackworth, 2007). In response, many government laws, institutions, policies, and programs are structured in ways that separate food-related issues, thus failing to consider and address interrelationships. For example, departments of health and agriculture often have contradicting mandates, with the former directing people to eat more nutritious foods while the latter directs farmers to produce more commodity crops (Pothukuchi & Kaufman, 2000; Thibert, 2012). At the same time, many civil society organizations and community groups tend to focus on the local context in particular places, ignoring the ways that external factors impact their work or the broader implications of their efforts. Such narrowly focused, sector-specific interventions fail to address the root causes of vulnerability. Moragues-Faus, Sonnino, & Marsden (2017) identified five food system governance deficiencies that impinge upon food security, namely: the failure to deal with cross-scale dynamics; the inability to address persistent inequalities in food rights and entitlements; increasing geopolitical and sectorial interdependencies; power imbalances and low institutional capacities; and conflicting values of key stakeholders. In response to these challenges, many activists and scholars have called for an integrated approach to food systems governance (Barling, Lang, & Caraher, 2002; MacRae, 2011) and a networked approach to mobilization (Constance, Renard, & Rivera-Ferre, 2014; Levkoe, 2014) that relies on systems thinking among anchor institutions in support of sustainable transitions (Ericksen, 2008; Hinrichs, 2014). In the remainder of this section, we unpack these concepts before presenting our case studies of anchor institutions involved in integrated food systems governance.

Food Systems Governance

The concept of food systems governance can be described broadly as the establishment of rules, practices, and processes that structure the flows of power and control in the food system, from production and harvesting to consumption and waste management (Jessop, 1998; Kennedy & Liljeblad, 2016). Governance relationships go well beyond interactions with the government, as many civil society organizations, small businesses, informal associations, and community groups play an active role in integrated governance processes, from policymaking to the provision of social services (Koc, MacRae, Desjardins, & Roberts, 2008; Mount, 2012; Renting, Schermer, & Rossi, 2012). Civil society networks have taken a wide range of approaches to engagement in governance, with some working closely with the state and corporate sector, while others seek to work outside formal policy and regulation, or to challenge it directly (Goodman, DuPuis, & Goodman, 2012; Stevenson, Ruhf, Lezberg, & Clancy, 2008).

Sustainability transitions theory has been identified by scholars as a way for policymakers to conceptualize and adopt food systems thinking by addressing the gradual, but potentially revolutionary, transition to a more sustainable state (Farla, Markard, Raven, & Coenen, 2012; Hinrichs, 2014; Markard, Raven, & Truffer, 2012). This scholarship examines ways to produce deep-structure changes in food systems (including, for example, energy, environment, transport, health) by recognizing the need to engage multiple private (e.g., firms and industries, consumers) and public (e.g., policymakers, civil society) actors in order to transition to a sustainable future (Geels, 2011). It calls for involving actors across social, technical, and political spheres at multiples scales in order to address wicked problems associated with transitioning complex adaptive systems such as agriculture (Dentoni Waddell, & Waddock, 2017; Lawhon & Murphy, 2011; Pitt & Jones, 2016). This approach enables identification of vertical and horizontal linkages, drivers, and barriers for producing food

system change. Some scholars (such as Marsden, 2013) have identified ways that such transitions thinking can lead to more reflexive agrifood governance in which municipalities pursue engagement across departments and with more nonstate actors in order to link agrifood concerns with health, sustainability, and antipoverty priorities. All these evolving approaches make clear the need to integrate actors across food systems in order to pursue effective food governance that can promote social and ecological justice.

Anchoring Institutions That Integrate Food Systems Governance

Strategies to influence food systems governance are more effective when pursued through networks that include a broad range of actors (e.g., academics, community organizers, producers, harvesters, etc.) and bridge sectors, scales, and places (Andrée et al., 2019). Several stakeholders—including food policy councils, civil society, and academia—serve key bridging roles in efforts to integrate food systems governance. These institutions act as anchors for networks within communities by contributing to regional economic development, rooting groups and people via diverse place-based interventions, bridging between diverse stakeholders, and making fiscal and infrastructure investments (Birch, Perry, & Louis Taylor, 2013; Ehlenz, 2016; Perry, Wiewel, & Menendez, 2009). For example, anchoring institutions can form coalitions with diverse expertise by establishing physical 'third' spaces for organizing and interaction, such as The Warehouse constructed by Syracuse University in its close by Near Westside neighborhood (Cantor, Englot, & Higgins, 2013). Anchor institutions' missions, capital investments, and relationships can tie them geographically to certain places and provide opportunities for leadership in community development. They can also play a valuable role in connecting different people, supporting relationships, and sharing knowledge among and beyond specific places (Levkoe & Stack-Cuttler, 2018; Moragues-Faus & Sonnino, 2019).

An example of an anchoring institution that plays a bridging role and supports network collaboration for food systems governance is the food policy council. Food policy councils bring together a range of stakeholders to identify challenges and propose strategic solutions to food systems problems (Gupta et al., 2018; Harper, Shattuck, Holt-Giménez, Alkon, & Lambrick, 2009; Schiff, 2008). Taking a food systems approach, food policy councils typically exist as nongovernmental organizations but have either formal or informal relationships with municipalities and/or regional governments as they build linkages across sectors (MacRae & Donahue, 2013; Scherb, Palmer, Frattaroli, & Pollack, 2016). Since 2000, the number of food policy councils has increased dramatically; in 2016 there were over 300 across the United States and Canada (Sussman & Bassarab, 2017).

There are also many other civil society organizations acting as anchoring institutions that establish and claim bridging roles in food systems governance (Carlson & Chappell, 2015; Renting et al., 2012). For example, between 2008 and 2011, Food Secure Canada (a pan-Canadian food movement organization) acted as an anchoring institution and played a bridging role by assembling multiple local initiatives and experiences to create a pan-Canadian food policy platform rooted in food sovereignty (Levkoe & Sheedy, 2019; People's Food Policy, 2011). Moragues-Faus and Sonnino (2019) observed in the case study of the Sustainable Food Cities Network (SFCN) in the UK that substantial power can be mobilized through translocal networks that reconfigure the food governance context away from a compartmentalized approach to a model that is integrated, cross-sectoral, and participatory. These are important developments to follow because they represent grassroots efforts to identify food systems problems and to highlight specific ways that place-based, networked initiatives anchored in civil society can scale up to affect policy (Mount, 2012).

Many scholars have also engaged in food systems governance in partnership with local food policy councils and civil society organizations as scholar-activists (see, for example, Andrée, 2019; Orozco, Ward, & Graddy-Lovelace, 2018; Reynolds, Block, & Bradley, 2018). Importantly, the roles of scholars, activists, and scholar-activists can be fluid and contested (Reynolds et al., 2018). Scholarly research may be undertaken by civil society organizations, while academic activities may

have activist implications beyond the university's walls. The examples in this paper call attention to this fluidity of roles that arise in partnerships between anchoring institutions. In addition to academic and organizational partnerships that foster research on local food systems (Levkoe, Andrée et al., 2016; Romano & Metzo, 2015), some research groups (e.g., the Johns Hopkins Center for a Livable Future[1]; Food: Locally Embedded, Globally Engaged [FLEdGE][2]), and food policy councils (e.g., New Orleans Food Policy Advisory Council, as discussed below) are housed in academic institutions and are supported by academics throughout North America. In this way, universities have served as key anchors in governance networks.

Methods

To better understand the ways in which networks are using anchoring institutions to foster integrated governance for building more just and sustainable food systems, Hammelman and Levkoe organized a special session on this topic at the AAG Annual Meeting in New Orleans in April 2018. This session brought scholars and practitioners at the forefront of integrated food systems governance into a conversation about how academics, activists, policymakers, and other actors can better work together in pursuit of common goals. In doing so, it built on similar sessions organized at previous AAG meetings by members of the Geographies of Food and Agriculture Specialty Group (GFASG) (see Levkoe, Hammelman et al., 2018; Levkoe, McClintock et al., 2016). GFASG members identified leaders in food systems governance at national and local scales as participants. Scholars were selected who actively engaged civil society and policy partners (authors of this paper Agyeman and Moragues-Faus), national leaders in food policy practice (authors Oliva and Wilson), and local practitioners engaged in food system governance in New Orleans (authors Kharod and Munoz). These participants were chosen to represent diverse initiatives engaged in building networks by providing deep knowledge grounded in experience pursuing food system change.

Before the AAG session, the panelists met virtually to introduce themselves and organize and structure the discussion. Through collaboratively developing a series of guiding questions, the speakers were invited to discuss the pitfalls and possibilities of integrated food policy. After a brief introduction about how they were engaged with food policy and governance, each participant discussed the following key questions:

- What is the role of social movements and civil society groups in food systems governance?
- How can activists and academics collaborate in this work?
- What have been some notable successes, and what are the challenges?
- How has social and ecological justice been addressed by attempts at integrated food policy?

Following short presentations, the panel engaged in discussion with the audience.[3]

The roundtable discussion was recorded, transcribed, and reviewed by Hammelman and Levkoe to identify key themes and illustrative case studies. The remaining authors further reflected on the case studies and contributed to the framework, analysis of the major themes, and conclusions that make up the remainder of this essay. Several sections reflect on the specific work of an organization or experience of a co-author, but overall the paper represents a synthesis of collective reflections. As such, we refrain from using first-person in favor of the collective first-person plural (we) representations of this work. The following section presents case studies to illustrate the bridging roles of anchoring

[1] For more information on the Johns Hopkins Center for a Livable Future, see https://www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-a-livable-future/index.html

[2] For more information the FLEdGE research network, see https://fledgeresearch.ca/

[3] The 100-minute session, titled Activist-Scholar Roundtable—Toward Integrated Food Systems Governance: Policy, Justice, and Social Movements, was open to all conference attendees and was promoted by the GFASG. Approximately 75 people attended the roundtable presentation and participated in the ensuing discussion.

institutions, particularly food policy councils, civil society, and universities, in integrated food systems governance. The case studies also demonstrate the importance of flexibility and adaptation when seeing success and experiencing challenges. These examples are instructive for both scholarship and emerging practitioners pursuing integrated food systems governance through anchor institutions.

Integrated Food Systems Governance Case Studies

This section presents a series of case studies that collectively demonstrate the current role and potential opportunities of anchor institutions in pursuing integrated food systems governance. We present the case studies in categories relating to food policy councils, civil society organizations, and universities. We begin with examples of the roles of each of these actors in anchoring institutions before considering ways in which anchoring institutions themselves pursue networking opportunities to scale up local efforts and impact governance. Finally, we consider the possibilities and pitfalls that arise in this work.

Perspectives From Within Anchoring Institutions

Anchoring institutions can play different yet complementary roles in governance networks focused on bridging diverse perspectives, sectors, and scales. In some networks, food policy councils can provide direct linkages to government, while civil society engages with grassroots actors and communities, and academics provide research and critical perspectives, and scale up the work of activists. These roles vary by network and context and are often fluid and interconnected. Each of these actors serves an anchoring role through bridging between stakeholders in pursuit of systemic change. In the following case studies, we discuss the ability of such anchoring institutions to empower communities, connect with those most affected by food policy, and foster ongoing coalitions.

Food Policy Councils: New Orleans Food Policy Advisory Council[4]

The New Orleans Food Policy Advisory Council (FPAC) was officially established in 2007 through a resolution from the New Orleans City Council. Prior to that resolution, the Tulane Prevention Research Center (PRC) received a grant from the Robert Wood Johnson Foundation to establish the FPAC with the goal of increasing food access. The initial collaboration between businesses, civil society organizations, and individuals revealed the vast need for fresh and healthy food following Hurricane Katrina, and so the collaborators pursued programs such as the Fresh Food Retailer Initiative in response. Today, as an official advisory body to the New Orleans City Council, the FPAC is a group of 28 organizations, businesses, advocates, and individuals working in three areas: food access, food production, and food business development. The FPAC operates as an independent organization with the support of all member organizations, including the Tulane PRC, which provides administrative and fiscal support in addition to maintaining a voting seat. The FPAC aims to foster policy change and bridge diverse stakeholders in order to gain traction on food systems concerns. In one successful initiative, the original FPAC founders studied community needs and best practices related to food access and issued a set of recommendations to the city, specifically to attract grocers and other food stores back to the city and encourage them to make fresh food available. Following these recommendations, the Fresh Food Retailer Initiative was established in 2011. This initiative was designed to incentivize fresh food access by providing low-cost loans and grants to grocers.

In 2017, the FPAC conducted a food policy assessment and again produced a set of recommendations to policymakers and partners. The assessment was completed by bridging knowledge across community organizations and neighborhoods. It included recommendations to support infrastructure for urban farms and to recognize urban agriculture as a strategy for collecting rainwater and mitigating flooding. These recommendations were eventually included in the City Planning Commission's master plan. One of the major challenges to this has been ensuring that the policies that are recommended are enacted in a way that addresses the

[4] For more information on the New Orleans Food Policy Advisory Council, see http://nolafoodpolicy.org/

realities of the local context and involves community members. The key to this is ensuring that the voice of the community is heard in advocating for the policies that will affect them, their families, and all residents of New Orleans. One way that FPAC pursues this is through regular participation in community and neighborhood association meetings. For example, an urban agriculture working group gathered input throughout the city by presenting at these meetings about its work and seeking feedback on urban agriculture initiatives, awareness of such efforts, and improvements that can be made. Through those consultations, FPAC seeks diverse opinions about specific policy proposals, such as enabling urban farmers to sell products directly on site. As it works to bridge the gap between the people making policy and those most affected, the FPAC strives to understand ways to envision a community-driven approach to food governance.

Civil Society: Food Chain Workers Alliance Good Food Purchasing Policy[5]

The Food Chain Workers Alliance (FCWA) was established in 2008 as a binational coalition of food worker organizations, which includes farmworkers, processing workers, workers in the transportation and warehousing sectors, as well as restaurants and grocery stores. Together it represents roughly 350,000 workers in the United States and Canada. Early on, the FCWA realized that its work should not be trying to convince sustainability or local economy organizations that workers should be at the forefront of their work. Instead, it was about working together with these organizations as part of an anchored, systems approach. The FCWA agreed that in order to create a broad-based network, it had to come up with something creative that would address the food system as a whole. The result was the Good Food Purchasing Policy, which co-director Joann Lo helped to develop as a co-facilitator of a Los Angeles Food Policy Council working group.

The Good Food Purchasing Policy is a procurement policy that can be adopted by large public institutions that consume substantial amounts of food, such as school districts (for example, the Los Angeles Unified School District, which has adopted the GFPP, purchases almost US$150 million of food every year). Through education and negotiation with other organizations working to address issues in the food system, a campaign was launched to encourage widespread adoption of the GFPP. It was important to FCWA to ensure that people at the grassroots remained in leadership roles and were directly engaged in carrying forward these campaigns. Once the GFPP is adopted, the institution agrees to abide by a set of five value categories representing the interconnections in food systems: human health, environmental sustainability, animal welfare, local economies, and labor. Each adoptee agrees to comply with a baseline on all five categories representing the integrated impacts of the policy. For municipalities, the values are written into the contract language that goes out to the food providers. To date, the GFPP has been formally adopted in five cities: Austin, Chicago, Los Angeles, Oakland, and San Francisco. Following the successful development and passage of the GFPP in Los Angeles, the Center for Good Food Purchasing was established to further manage the growing program. Be it school systems or municipalities, the GFPP is taking over public space with a systems-based approach to food rooted in social and ecological justice.

Key to the GFPP's success is the FCWA's multisector, multiracial, demographically representative coalition in every city. In Los Angeles, the first city to pass it (in 2012), the coalition remained active. When some of the major industrial food corporations came up for contract renewal with the Los Angeles Unified School District, the coalition worked to ensure that the GFPP was enforced. This approach to governance is an innovative model led by a civil society organization as the anchor institution. In that role, the FCWA contributes to regional economic development while also bridging between diverse stakeholders by building and sustaining coalitions. Beyond the success of the GFPP itself, the coming together of

[5] For more information on the Food Chain Workers Alliance's Good Food Purchasing Policy, see https://foodchainworkers.org/?page_id=4235

such a diverse group of people around the FCWA planted a seed for future food system change.

Universities: Professor of the Practice

At Tufts University's Department of Urban and Environmental Policy and Planning, author Agyeman established and hired a "professor of the practice" in 2008 with the goal of fostering long-term engagement between the university and community projects. A professor of the practice is someone who has achieved significant accomplishments in community-based work and continues active community involvement while also holding an academic appointment. This initiative demonstrates the potential of a university to be an anchor institution where academics are responsive and engaged in their communities. Agyeman's initial concern was that urban planners often invite community organizations into their classes, thank them, write them a check for an honorarium, and then say goodbye, then repeat this pattern year after year. This is not a relationship with a community but is simply having a community representative sporadically provide input into a class. Penn Loh, a former executive director of Alternatives for Community and Environment (ACE), a Boston-based environmental justice organization, was brought on as the first professor of the practice. This enabled the development of a Community Engagement Strategy for Tufts' Urban and Environmental Policy and Planning (UEP) program. It also bolstered a growing relationship with community organizations as allies rather than just as producers of knowledge to be called on intermittently. Ultimately, having the professor of the practice position allowed Tufts to explore ways to build power in communities to give them a stronger voice in decision making and governance. Loh is a leader in the environmental and food justice world in Boston. On a practical level, this meant that academic faculty and students benefited in terms of access to community-based projects in both the core and elective curriculum. For example, the UEP program requires a studio class in the first year, where students work in small groups with local organizations. Now there are ongoing, year-to-year relationships with community organizations throughout the core curriculum. These projects, integrated into the studio class, involve co-researching community-generated questions. For example, this work has contributed to an emerging food solidarity economy project in Boston, focusing on sharing food resources (Loh & Agyeman, 2019). The project has involved Loh, Agyeman, student researchers, and a range of community organizations in Boston's vibrant food justice and urban agriculture communities. The empirical data for the project was drawn from secondary sources and qualitative interviews by students as well as from Loh and Agyeman's direct engagement with practitioners and projects. Building on existing urban food-sharing practices in Boston's lower-income neighborhoods, the initiative has demonstrated the emergence of an as yet uncoordinated network of food system actors who are building solidarity financing that includes food justice and encompasses all parts of the food system (e.g., taking collective ownership of land, establishing shared growing spaces, developing shared facilities for food businesses, and launching a worker-owned food recycling cooperative). The actors are driven by desires for transformation and are decommodifying the food system and increasing the urban food commons.

These networked efforts pursued by the New Orleans FPAC, FCWA, and Tuft's professor of the practice recognize and enhance people's roles in food systems governance with communities as producers of knowledge and simultaneously enrich the university's programs, while students, in turn, give back to communities. In doing so, these sectors serve as anchor institutions, creating bridges that foster scholar-activist projects.

Bridging Network Anchors

While each of the anchoring institutions described above generated successes individually, their reach and impact at a systems-level are enhanced through connecting their work. This includes building partnerships to implement research and projects in pursuit of sustainable food systems transitions. This section provides illustrative case studies to demonstrate what partnerships look like that strive to break down the barriers between siloed policy actors and provide a new, integrated lens on food system concerns.

Research Informing Practice and Policy: New Orleans Farm and Food Network[6]/596 Acres[7]

The New Orleans Farm and Food Network (NOFFN) was established in 2002 to support the building of a new food economy through increasing markets for farmers, incubating farms, and training new farmers. Its biggest accomplishment has been the ability to catalyze a diverse population that is actively engaged in efforts to ensure that the regional food system is more responsive to social and ecological justice. One way it accomplishes this goal is by serving as a bridge in building partnerships among unlikely allies (such as the New Orleans Business Alliance) involved in the food system.

Learning from its work with activists and scholars and seeing the value of coordination, NOFFN began research projects in partnership with academic and activist scholars to answer questions and respond to problems that arose. For example, NOFFN wanted to create a map of vacant lots that were available through the redevelopment authority. This was part of an Urban Farming Toolkit to assist urban farmers in accessing vacant land. It included paperwork guidance (water access, property liability, farm registration, landowner/tenant farmer agreements, etc.) along with business guidance (market farming, loans, grants). It began by creating a Google map, but quickly realized it did not contain the right information and things were changing so fast that it quickly became out of date. NOFFN reached out to a group called 596 Acres focused on developing tools for land access advocacy. The organization came up with a way of harvesting, representing, and sharing publicly available data on vacant land, in an open and transparent way. This collaborative project forced the redevelopment authority to explain how they were going to dispose of land for farmers. The results also contributed to the Urban Farming Toolkit. The first step in this project was coordinating among actors to initiate research—finding publicly available data and creating a mechanism, which in this case is an app that makes this data accessible to farmers. The second part was having a community organization that was willing to be the advocate for increasing land access. This case study of the NOFFN demonstrates how building partnerships to affect governance can engage in community-based research and work with community stakeholders, but also be adaptable to rapidly changing environments.

Partnerships to Enhance Food Policy Engagement: Food Secure Canada[8]

Food Secure Canada (FSC) is a civil society organization that works to advance the interrelated goals of a healthy, just, and sustainable food system across Canada. As a national network of both individual and organizational members, FSC operates as an intermediary between grassroots food movement organizations and activists on the one hand, and federal policy-makers and government officials on the other, linking grassroots efforts to developments and openings for advocacy at the federal level. Creating a national food policy has been one of the core campaign objectives of FSC over the past decade. There is broad acknowledgment, not only with Canada's food movements, but also across the food system, that the current approach to food policy in Canada is not working, especially for those most marginalized. Recognizing that siloed departments, each with their own objectives and priorities, can only go so far, FSC members argued that an integrated approach was needed that would connect food-related concerns in health and well-being, agriculture, and the environment. New prospects for integrated food systems governance action emerged in 2015 when the Liberal party was elected, offering a much more progressive political agenda. The mandate letter to the new federal minister of agriculture announced a commitment to developing a national food policy and officially began consultations in 2017 via an online survey, a National Food Summit with over 300 participants, regional stakeholder roundtables, along with various meetings and presentations by government officials. In September 2018, the government shared a summary of the feedback provided

[6] For more information on New Orleans Farm and Food Network, see https://www.noffn.org/
[7] For more information on 596 Acres, see http://596acres.org/
[8] For more information about Food Secure Canada, see https://foodsecurecanada.org/

through the consultations, and in the summer of 2019 released the Food Policy for Canada (Government of Canada, 2019).

FSC's approach to this national food policy process has been twofold. First, it engaged directly in the consultation process in an attempt to advance strategic policy principles to provide real gains or useful language to build on in the future. However, FSC's activities were not solely about policy advocacy in the traditional sense. Its focus has also been on movement building, an equally, if not more, important task. Movement building occurred through an intentional focus, not only on the final food policy, but also on mobilizing and engaging organizations and individuals in an attempt to prefigure a participatory and democratic approach to food systems governance, and strengthening the capacity of new and existing networks. This approach envisions policy as not just something that is achieved on paper, but as a space that is created to build relationships and capacity and imagine a different kind of food system.

Reflections on Possibilities and Pitfalls of Integrated Food Systems Governance Through Networks

Operating within integrated governance networks presents many possibilities but is also challenging. It can be messy, uncomfortable, and at times it is not possible to manage tensions. In this section, we reflect on the experiences of anchoring institutions using networks to pursue transformational change via integrated governance mechanisms. In particular, the case studies presented here call for building more creative structures that recognize the various roles played by scholar-activists in the broad categories of civil society, academia, and food policy; recognizing the competing priorities and limitations for each of these actors; and through both ensuring that research can lead to mutually beneficial and actionable outcomes.

Building creative structures

Diversity and creativity are key ideas in building networks. Within food movements, the many different needs and visions do not always work well together. It is important to recognize the different roles that these stakeholders—civil society, academia, and food policy councils—can play in transforming the dominant food system. Some (such as grassroots advocacy groups or tenured professors) can pursue more radical action and question state actions or strategies, while others (such as government-based food policy councils) must pursue reform from within and tread more lightly. Confrontational activities can be as important as those that involve negotiating public policies with governments. In some cases, academics can also provide an important critical voice. Civil society organizations that work in partnership with governments or seek to influence policy decisions do not always feel free to critique government positions. Academics can play an important role in articulating a more critical or long-term vision of food system transformation and in occupying an adversarial space that is difficult for some civil society organizations or food policy councils. For example, during the consultation process for developing a national food policy for Canada, it was useful to have the voices of academics and researchers alongside those of civil society organizations, at times echoing the positions of FSC and at times pushing even further in their articulation of food sovereignty and decolonization. This exemplifies the ways that each anchor institution in a network can leverage its voice.

Embracing a diversity of positions calls for a more fluid and flexible understanding of governance. That is, interactions and alliances that have not established who can participate or how decisions are made are still valuable and can contribute to a transformative project. Unstructured interactions range from campaigns that connect people across the globe to creating spaces of deliberation and networking. For example, the Oxford Real Farming Conference is a space where activists, organizations, public institutions, small farmers, and entrepreneurs come together to address food system challenges in the UK and beyond.[9] These unstructured interactions can be facilitated by individuals, groups, or institutions, which actively create emerging and fluid spaces for wider transformation. Relationships can then be fragile, time-

[9] For more information on the Oxford Real Farming Conference, see http://orfc.org.uk/

bound and even confrontational. However, they can still hold key values such as the capacity to celebrate the diversity of eaters in the food system and allow surfacing of conflicts and new avenues for their resolution.

Recognizing competing priorities and limitations

Just as different institutions pursue different tactics for change, they may also encounter competing priorities and limitations to further collaboration. The rewards for civil society engagement (e.g., galvanizing government and public interest in a topic) do not always align with the rewards for academic engagement (e.g., peer-reviewed publications). Envisioning projects seeking such different outcomes (and timelines) can create tension, while recognizing the value of different types of research projects opens up more avenues for collaborative action.

For FSC, there were many benefits that emerged from the food policy consultation process, some of which remain valuable regardless of the final policy outcomes. The opportunity to contribute to the creation of a national food policy galvanized not only the food movement but also public interest in food issues more broadly. Based on an analysis of the shifts in the government's discourse and stated priorities for the national food policy, FSC (alongside other civil society actors) was successful in pushing the government to adopt more progressive and substantive language (e.g., around food security and land preservation), as well as to force them to include elements in the food policy not present in its original presentation (e.g., the right to food, Indigenous food sovereignty). However, despite these gains, the national food policy appears to remain entrenched in many of the previous divisions that have plagued food policy, thus failing to outline a clear path forward that will integrate health, economic sustainability, and environmental protection.

Similarly, the New Orleans FPAC's 2017 food policy assessment and related recommendations to city council strengthened its relationships with local government. In 2018, city council recognized FPAC's achievements in bridging sectors and research across the food system by designating it as an official advisory body. As the only organization from the food sector serving this role, FPAC makes recommendations to the city council via consultation with individual council members, in quarterly reports, and through a public meeting at the end of each year. It also produces public reports and holds public meetings on food and agriculture matters. These research and policy products are developed by the FPAC as a bridge among many different food system stakeholders, many of which rely on FPAC to be the policy voice for its collaboratives.

In addition to civil society research products, scholar-activist collaborations often seek academic publications (such as this paper). These differing products and related priorities highlight that the rewards for academic work may not align with those of civil society partners. Many academic partners must pursue peer-reviewed publications from such projects in order to receive recognition for the work within their institutions. Yet, civil society partners may find those goals and timelines to be burdensome. In response, a number of academic journals have developed to encourage and support diverse types of contributions. For example, *Local Environment* (co-founded by Agyeman in 1996) provides different avenues for publication, including a regular column that is not peer-reviewed (the *Journal of Agriculture, Food Systems, and Community Development* and the *Canadian Food Studies/La Revue canadienne des études sur l'alimentation* offer similar types of opportunities). With those pieces, practitioners can have their work published fairly quickly, in contrast to the lengthy timeline of peer review and editing for traditional articles. Including these opportunities reflects *Local Environment*'s aim to create a dialogue between academics and practitioners through valuing nontraditional publication platforms. While these are positive developments, more effort should be made to include researchers and practitioners positioned outside the university in the publication and review process (Levkoe, Schembri, & Wilson, 2018), and more academic value needs to be placed on public scholarship (e.g., tweets, blogs, media concepts) that galvanizes public interest in a topic.

Finally, academia is still seen by many civil society practitioners as a privileged space where exploitation—in the form of limited funding and

recognition for community-engaged alternative food systems research—contributes to reinforcing dominant discourses around food system challenges and solutions. Furthermore, academic spaces are contentious spaces where notions of "valid knowledge" are disputed in ways that empower or disempower particular actors and narratives. For these reasons, it is important to build alliances with social movements that help transform academic institutions. Among others, this includes asking what types of knowledge are higher education institutions producing and rewarding? Are universities a public good or a business that needs to generate revenues? Many academics are now engaged in creating trust and working relationships with civil society in a productive way, as evidenced by the case studies presented in this collective essay. This is also evident in action research projects engaging students in co-producing knowledge and actively changing the local foodscape where they live (such as the Food Research Collective at Cardiff University[10]). However, there are many civil society groups that could benefit from action research and co-production processes that do not currently have access to that support. It is urgent to reflect on what kinds of needs are being addressed, who is involved in partnerships, and why. This approach demands a more careful and caring academia that broadens its scope and mission and engages with those places that are out of reach, at the margins, or within everyday and mundane initiatives.

Producing actionable outcomes

Differing civil society and academic incentives also encounter challenges in producing material that spurs concrete, tangible change. In post-Katrina New Orleans, there were many assessments, research studies, and surveys produced by researchers within and outside of the city (sometimes surveying the same neighborhood simultaneously). Unfortunately, much of the research produced sits on library shelves or was published in journals that are inaccessible to the community. This reinforces a sense of distrust toward academic research. The New Orleans FPAC is housed within an academic institution and was founded within Tulane University's Prevention Research Center. It continues to struggle to ensure that its work is relevant, informative, and accessible to food systems decision-makers. For instance, the FPAC recently completed a series of food policy assessments asking key informants, partners, stakeholders, and community groups about the policy gaps and barriers they encounter. The information collected through these assessments made apparent that many people do not understand what food policy is and how it affects their lives. Addressing these concerns, the collaborative committee used the assessment data to create a food system strategic plan (Munoz-Miller, n.d.). The assessment process produced a concrete list of related recommendations on which FPAC and its partners are committed to act. It also raised the FPAC's profile with city council, resulting in the aforementioned resolution authorizing the FPAC as an official advisory body. Food policy councils, civil society organizations, and academic institutions can serve important anchoring roles in bringing to the forefront actions led by those most affected by the negative impacts of the dominant food systems. However, scaling up such work should also serve as a bridge to stakeholders that can produce actionable outcomes.

Conclusion

This paper describes several efforts of integrated food system governance through which food policy councils, civil society, and academics serve as anchoring institutions pursuing systems-level transitions to more just and sustainable food systems. In doing so, we presented case studies of networked approaches from the perspective of different anchoring institutions, the roles that actors can play in these networks, and the possibilities and pitfalls encountered in this work. Each case study provides dimension to our framework of integrated food systems governance, while also providing examples for activists and scholars seeking to establish collaborations for food system change.

[10] For more information about the Food Research Collective, see https://foodresearch.org.uk/publications/participatory-action-research-with-local-communities-transforming-our-food-system/

Food policy councils, civil society organizations, and academic institutions can serve as anchoring institutions to respond to food crises at multiple scales through integrated food systems governance. These networks aim to build coalitions fostering healthy food retail (e.g., New Orleans FPAC) and ensure fair labor and accountability in purchasing chains (e.g., FCWA's Good Food Purchasing Policy) via ongoing partnerships between academics (e.g., the professor of the practice position) and civil society (e.g., creating maps of public data to support redistribution of vacant land), and by networking across all of these actors through public consultations to shift the dialogue on regional and national food policies.

We are convinced that the transition to more just and sustainable food systems will not occur through individually focused efforts. Instead, it will require collaboration among the many sectors and actors that produce and reproduce food systems on a daily basis. We present this collective essay as an invitation to our partners throughout food systems to find avenues to collaborate and build on the contributions made by anchoring institutions so as to have a greater impact on creating food system governance that is responsive to the communities that are most affected by the crisis.

References

Alkon, A., & Guthman, J. (Eds.). (2017). *The new food activism: Opposition, cooperation, and collective action*. Oakland: University of California Press. https://doi.org/10.1525/california/9780520292130.001.0001

Anderson, C., Buchanan, C., Chang, M., Rodriguez, J. S., & Wakeford, T. (2017). *Everyday experts: How people's knowledge can transform the food system*. Coventry, UK: Coventry University, The Centre for Agroecology, Water and Resilience. https://doi.org/10.18552/9781846000751

Andrée, P., Clark, J. K., Levkoe, C. Z., & Lowitt, K. (Eds.). (2019). *Civil society and social movements in food system governance*. New York: Routledge. https://doi.org/10.4324/9780429503597

Barling, D., Lang, T., & Caraher, M. (2002). Joined–up food policy? The trials of governance, public policy and the food system. *Social Policy & Administration, 36*(6), 556–574. https://doi.org/10.1111/1467-9515.t01-1-00304

Birch, E., Perry, D., & Louis Taylor, H. Jr. (2013). Universities as anchor institutions. *Journal of Higher Education Outreach and Engagement, 17*(3), 7–15.

Blecha, J., & Leitner, H. (2014). Reimagining the food system, the economy, and urban life: New urban chicken-keepers in US cities. *Urban Geography, 35*(1), 86–108. https://doi.org/10.1080/02723638.2013.845999

Blue, G. (2009). On the politics and possibilities of locavores: Situating food sovereignty in the turn from government to governance. *Politics and Culture, 2009*(2), 69–79. Retrieved from https://politicsandculture.org/2010/10/27/on-the-politics-and-possibilities-of-locavores-situating-food-sovereignty-in-the-turn-from-government-to-governance/

Cantor, N., Englot, P., & Higgins, M. (2013). Making the work of anchor institutions stick: Building coalitions and collective expertise. *Journal of Higher Education Outreach and Engagement, 17*(3), 17–46. Retrieved from https://ojs01.galib.uga.edu/jheoetest/article/download/2525/2524

Carlson, J., & Chappell, M. J. (2015). *Deepening food democracy*. Institute of Agriculture and Trade Policy. Retrieved from https://www.iatp.org/documents/deepening-food-democracy

Constance, D. H., Renard, M.-C., & Rivera-Ferre, M. G. (Eds.). (2014). *Alternative agrifood movements: Patterns of convergence and divergence*. London: Emerald. https://doi.org/10.1108/S1057-192220140000021018

Dentoni, D., Waddell, S., & Waddock, S. (2017). Pathways of transformation in global food and agriculture systems: Implications from a large systems change theory perspective. *Environmental Sustainability, 29,* 8–13. https://doi.org/10.1016/j.cosust.2017.10.003

Desmarais, A. A., Claeys, P., & Trauger, A. (Eds.). (2017). *Public policies for food sovereignty: Social movements and the state*. New York: Routledge.

Ehlenz, M. (2016). Neighborhood revitalization and the anchor institution: Assessing the impact of the University of Pennsylvania's West Philadelphia Initiatives on University City. *Urban Affairs Review, 52*(5), 714–750. https://doi.org/10.1177/1078087415601220

Ericksen, P. J. (2008). Conceptualizing food systems for global environmental change research. *Global Environmental Change, 18*(1), 234–245. https://doi.org/10.1016/j.gloenvcha.2007.09.002

Farla, J., Markard, J., Raven, R., & Coenen, L. (2012). Sustainability transitions in the making: A closer look at actors, strategies and resources. *Technological Forecasting & Social Change, 79,* 991–998. https://doi.org/10.1016/j.techfore.2012.02.001

Geels, F. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1, 24–40. https://doi.org/10.1016/j.eist.2011.02.002

Goodman D., DuPuis, E. M., & Goodman, M. K. (2012). *Alternative food networks: Knowledge, place and politics*. London & New York: Routledge. https://doi.org/10.4324/9780203804520

Government of Canada. (2019). Food Policy for Canada. Retrieved December 2019 from https://www.canada.ca/en/campaign/food-policy.html

Gupta, C., Campbell, D., Munden-Dixon, K., Sowerwine, J., Capps, S., Feenstra, G., & Kim, J. V. S. (2018). Food policy councils and local governments: Creating effective collaboration for food systems change. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 2), 11–28. https://doi.org/10.5304/jafscd.2018.08B.006

Hackworth, J. (2007). *The neoliberal city: Governance, ideology and development in American urbanism.* Cornell University Press.

Harper, A., Shattuck, A., Holt-Giménez, E., Alkon, A., & Lambrick, F. (2009). Food policy councils: Lessons learned. Food First: Institute for food and development policy. Retrieved from https://foodfirst.org/publication/food-policy-councils-lessons-learned/

Hinrichs, C. C. (2014) Transitions to sustainability: A change in thinking about food systems change? *Agriculture and Human Values, 31*(1), 143–155. https://doi.org/10.1007/s10460-014-9479-5

Jessop, B. (1998). The rise of governance and the risks of failure: The case of economic development. *International Social Science Journal, 50*(155), 29–45. https://doi.org/10.1111/1468-2451.00107

Kennedy, A., & Liljeblad, J. (Eds.). (2016). *Food systems governance: Challenges for justice, equality and human rights*. New York: Routledge.

Koc, M., MacRae, R., Desjardins, E., & Roberts, W. (2008). Getting civil about food: The interactions between civil society and the state to advance sustainable food systems in Canada. *Journal of Hunger & Environmental Nutrition, 3*(2–3), 122–144. https://doi.org/10.1080/19320240802243175

Lawhon, M., & Murphy, J. (2011). Socio-technical regimes and sustainability transitions: Insights from political ecology. *Progress in Human Geography, 36*(3), 354–378. https://doi.org/10.1177/0309132511427960

Levkoe, C. Z. (2014). The food movement in Canada: A social movement network perspective. *Journal of Peasant Studies, 41*(3), 385–403. https://doi.org/10.1080/03066150.2014.910766

Levkoe, C. Z., Andrée, P., Bhatt, V., Brynne, A., Davison, K. M., Kneen, C., & Nelson, E. (2016). Collaboration for transformation: Community–campus engagement for just and sustainable food systems. *Journal of Higher Education, Outreach and Engagement, 20*(3), 23–61. https://openjournals.libs.uga.edu/jheoe

Levkoe, C. Z., Brem-Wilson, J., & Anderson, C. R. (2019). People, power, change: Three pillars of a food sovereignty research praxis. *The Journal of Peasant Studies, 46*(7), 1389–1412. https://doi.org/10.1080/03066150.2018.1512488

Levkoe, C. Z., Hammelman, C., Craven, L., Dandy, G., Farbman, J., Harrison, J., & Mount, P. (2018). Building sustainable communities through food hubs: Practitioner and academic perspectives. *Journal of Agriculture, Food Systems, and Community Development, 8*(2), 107–122. https://doi.org/10.5304/jafscd.2018.082.008

Levkoe, C. Z., McClintock, N., Minkoff-Zern, L. A., Coplen, A., Gaddis, J., Lo, J., . . . Weiler, A. (2016). Forging links between food chain labor activists and academics. *Journal of Agriculture, Food Systems, and Community Development, 6*(2), 129–142. https://doi.org/10.5304/jafscd.2016.062.009

Levkoe, C. Z., Schembri, V., & Wilson, A. D. (2018). Community-academic peer review: Prospects for strengthening community-campus engagement and enriching scholarship. *Engaged Scholar Journal: Community-Engaged Research, Teaching, and Learning, 4*(2), 1–20. https://doi.org/10.15402/esj.v4i2.61745

Levkoe, C. Z., & Sheedy, A. (2019). A people-centred approach to food policy making: Lessons from Canada's People's Food Policy project. *Journal of Hunger & Environmental Nutrition, 14*(3), 318–338. https://doi.org/10.1080/19320248.2017.1407724

Levkoe, C. Z., & Stack-Cutler, H. (2018). Brokering community-campus partnerships: An analytical framework. *Gateways: International Journal of Community Research and Engagement, 11*(1), 18–36. https://doi.org/10.5130/ijcre.v11i1.5527

Loh, P., & Agyeman, J. (2019). Urban food sharing and the emerging Boston food solidarity economy. *Geoforum,99,* 213-222. https://doi.org/10.1016/j.geoforum.2018.08.017

MacRae, R. (2011). A joined-up food policy for Canada. *Journal of Hunger & Environmental Nutrition, 6*(4), 424–457. https://doi.org/10.1080/19320248.2011.627297

MacRae, R., & Donahue, K. (2013). *Municipal food policy entrepreneurs: A preliminary analysis of how Canadian cities and regional districts are involved in food system change.* Toronto Food Policy Council. Retrieved from https://foodsecurecanada.org/resources-news/resources-research/municipal-food-policy-entrepreneurs

Markard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Research Policy, 41,* 955–967. https://doi.org/10.1016/j.respol.2012.02.013

Marsden, T. (2013). From post-productionism to reflexive governance: Contested transitions in securing more sustainable food futures. *Journal of Rural Studies, 29,* 123–134. https://doi.org/10.1016/j.jrurstud.2011.10.001

Moragues-Faus, A., & Sonnino, R. (2019). Re-assembling sustainable food cities: An exploration of translocal governance and its multiple agencies. *Urban Studies, 56*(4), , 778–794. https://doi.org/10.1177/0042098018763038

Moragues-Faus, A., Sonnino, R., & Marsden, T. (2017). Exploring European food system vulnerabilities: Towards integrated food security governance. *Environmental Science & Policy, 75,* 184–215. https://doi.org/10.1016/j.envsci.2017.05.015

Mount, P. (2012). Growing local food: Scale and local food systems governance. *Agriculture and Human Values, 29*(1), 107–121. https://doi.org/10.1007/s10460-011-9331-0

Munoz-Miller, E. (n.d.). *Policy matters: Assessing the policy gap and opportunities in the New Orleans Food System.* New Orleans Food Policy Advisory Committee. Retrieved from http://www.nolafoodpolicy.org/uploads/nolafpac-food-policy-assessment.pdf

Orozco, A. A., Ward, A., & Graddy-Lovelace, G. (2018). Documenting USDA discrimination: Community-partnered research on farm policy for land justice. *ACME: An International E-Journal for Critical Geographies, 17*(4), 999–1023. Retrieved from https://acme-journal.org/index.php/acme/article/view/1514

Peck, J., & Tickell, A. (2002). Neoliberalizing space. In N. Brenner & N. Theodore (Eds.), *Spaces of neoliberalism: Urban restructuring in Western Europe and North America* (pp. 33–57). Oxford, UK: Blackwell. https://doi.org/10.1002/9781444397499.ch2

People's Food Policy. (2011). *Setting the table: A people's food policy for Canada.* Ottawa: People's Food Policy Project. Retrieved from https://foodsecurecanada.org/people-food-policy

Perry, D. C., Wiewel, W., & Menendez, C. (2009). The university's role in urban development: From enclave to anchor institution. *Land Lines, July.* Cambridge, MA: Lincoln Institute of Land Policy..

Pitt, H., & Jones, M. (2016). Scaling up and out as a pathway for food system transitions. *Sustainability, 8*(10), 1025. https://doi.org/10.3390/su8101025

Pothukuchi, K., & Kaufman, J. (2000). The food system: A stranger to the planning field. *Journal of the American Planning Association, 66*(2), 113–124. https://doi.org/10.1080/01944360008976093

Renting, H., Schermer, M., & Rossi, A. (2012). Building food democracy: Exploring civic food networks and newly emerging forms of food citizenship. *International Journal of Sociology of Agriculture and Food, 19*(3), 289–307. https://ijsaf.org/index.php/ijsaf

Reynolds, K., Block, D., & Bradley, K. (2018). Food justice scholar-activism and activist-scholarship: Working beyond dichotomies to deepen social justice praxis. *ACME: An International E-Journal for Critical Geographies, 17*(4), 988–998. Retrieved from https://acme-journal.org/index.php/acme/article/view/1735

Romano, V., & Metzo, K. (2015). *State of the plate, Charlotte & Mecklenburg.* Charlotte-Mecklenburg Food Policy Council. Retrieved from http://www.charlottefoodpolicy.org/uploads/6/5/3/0/65305201/2015_state_of_the_plate.pdf

Sbicca, J. (2018). *Food justice now: Deepening the roots of social struggle.* Minneapolis: University of Minnesota Press. https://doi.org/10.5749/j.ctv3dnnrt

Scherb, A., Palmer, A., Frattaroli, S., & Pollack, K. (2016). Exploring food system policy: A survey of food policy councils in the United States. *Journal of Agriculture, Food Systems, and Community Development, 2*(4), 3–14. https://doi.org/10.5304/jafscd.2012.024.007

Schiff, R. (2008). The role of food policy councils in developing sustainable food systems. *Journal of Hunger & Environmental Nutrition, 3*(2-3), 206–228. https://doi.org/10.1080/19320240802244017

Stevenson, G. W., Ruhf, K., Lezberg, S., & Clancy, K. (2008). Warrior, builder, and weaver work. In C. C. Hinrichs & T. A. Lyson (Eds.), *Remaking the North American food system: Strategies for sustainability* (pp. 33–62). Lincoln: University of Nebraska Press.

Sussman, L., & Bassarab, K. (2017). *Food policy council report 2016*. Retrieved from the Johns Hopkins Bloomberg School of Public Health website: https://assets.jhsph.edu/clf/mod_clfResource/doc/FPC%20Report%202016_Final.pdf

Thibert, J. (2012). Making local planning work for urban agriculture in the North American context: A view from the ground. *Journal of Planning Education and Research, 32*(3), 349–357. https://doi.org/10.1177/0739456X11431692

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Counting local food consumption: Longitudinal data and lessons from Vermont

David Conner [a] *
University of Vermont

Ellen Kahler [c] and Jake Claro [d]
Vermont Sustainable Jobs Fund

Florence Becot [b]
Ohio State University

Annie Harlow [e]
Addison County Relocalization Network

Submitted May 22, 2019 / Revised July 2, 2019 / Accepted July 25, 2019 / Published online January 20, 2020

Citation: Conner, D., Becot, F., Kahler, E., Claro, J., & Harlow, A. (2020). Counting local food consumption: Longitudinal data and lessons from Vermont. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 87–100. https://doi.org/10.5304/jafscd.2020.092.007

Abstract

As interest in local food systems as a community development tool increases, scholars and practitioners are looking for methods to count progress toward benchmarks. This paper reports on efforts to count local food consumption as part of a statewide strategic plan for food systems development in Vermont. It provides longitudinal data from three waves of counting (2011, 2014, and 2017), finding increases over time due to both increased consumption and improved counting methods. The paper reflects on successes and challenges over the study period, focusing on data availability, key assumptions, and limitations. It concludes with future directions of inquiry into measuring food relocalization efforts.

Keywords

Local Food, Community Development, Methods, Consumption

Introduction

Local food systems continue to draw the interest of scholars and practitioners because of their potential to contribute to economic development as well as

[a] * *Corresponding author:* David Conner, Associate Professor, Department of Community Development and Applied Economics, University of Vermont; 205H Morrill Hall; Burlington VT 05405 USA; david.conner@uvm.edu

[b] Florence Becot, Ph.D. Candidate, Rural Sociology, Ohio State University.

Becot is now Associate Research Scientist, National Farm Medicine Center, Marshfield Clinic Research Institute; becot.florence@marshfieldresearch.org

[c] Ellen Kahler, Executive Director, Vermont Sustainable Jobs Fund; 3 Pitkin Court #301E; Montpelier, VT 05602 USA; ellen@vsjf.org

[d] Jake Claro, Farm to Plate Director, Vermont Sustainable Jobs Fund; 3 Pitkin Court #301E; Montpelier, VT 05602 USA; jake@vsjf.org

[e] Annie Harlow, Executive Committee, Addison County Relocalization Network; P.O. Box 65; Middlebury, VT 05753 USA: annieharlowahh@gmail.com

Funding Disclosure

Funding for this research comes from the Vermont Sustainable Jobs Fund and Vermont Agricultural Experiment Station.

Authors' Note

Authors Kahler and Claro work for the Vermont Sustainable Jobs Fund, which administers the Vermont Farm to Plate program.

social and public health goals (Conner & Garnett, 2016; Conner & Levine, 2007; Low et al., 2015; Martinez et al., 2010). A growing body of research has examined the economic impact of actual or proposed initiatives (Conner, Knudson, Hamm, & Peterson, 2008; Hughes, Brown, Miller, & McConnell, 2008; Jablonski & Schmit, 2016; Swenson, 2006). Furthermore, the 2016 U.S. Department of Agriculture (USDA) Economics of Local Food Systems toolkit (Thilmany McFadden et al., 2016) and a recent special issue of this journal on the utilization of the toolkit principles (Thilmany McFadden & Jablonski, 2019) point to the importance of developing methods and metrics to assess relocalization efforts. A major data gap that remains to assess these relocalization efforts is the quantity of local food consumed at a larger scale, such as at the state level. This data gap is largely due to the unavailability of data through secondary datasets. In this paper, we replicate and build upon a previous study (Conner, Becot, Kahler, Sawyer, Hoffer, & Berlin, 2013) to assess how local food consumption has changed in Vermont between 2010 and 2017. By looking at changes over time, our article speaks to the outcomes of Vermont's extensive relocalization effort. To the best of our knowledge, no other state has undertaken a comprehensive counting of local food and beverage consumption over time. To be clear, local food counts such as ours are imperfect due to large remaining data gaps; however, these estimates provide key benchmarks and insights towards a greater understanding of the role played by local food systems in community and economic development.

Vermont, a small rural New England state with an historical emphasis on the dairy and maple sugar sectors, provides an interesting case study site, since it has extensively invested in its local food system and is seen by some as a national leader on this effort. In 2009, the state legislature signaled that the food system is a significant part of its overall economic development strategy through the passage of the Farm-to-Plate Investment Program (2009). This investment program tasked the nonprofit Vermont Sustainable Jobs Fund to coordinate a systematic approach to food system development with an emphasis on economic development and jobs in the food system along with improving food access to all Vermonters, including supporting legislation. The Farm-to-Plate (FTP) investment program has since led to one of the most comprehensive statewide food plans in the United States. This plan is coupled with a coordinated network of actors in the public and private sectors who are implementing the plan. In a state with a population just over 625,000, the network includes about 350 members—representing a mix of nonprofits organizations, businesses, educational institutions, and health-care facilities.

Early on, FTP set the target for local food to reach 10% of total food consumption in the state by the year 2020 (Vermont Sustainable Jobs Fund, 2011). To monitor progress toward that goal, FTP commissioned a University of Vermont research team that measured local food and beverage consumption in 2010, 2014, and 2017. While we have previously reported on the methods we used for our first wave of data collection (see Conner et al., 2013), in this article we discuss how we have built on our original method over two more waves of local food consumption assessment. This article has relevance for other states, counties, and municipalities across the U.S. who have developed food system plans and are at varying stages of developing metrics to track progress toward their stated goals. After presenting our methods and results, we discuss the implications of our approach to data collection and findings using the USDA Economics of Local Food Systems toolkit (Thilmany McFadden et al., 2016) as a framework. While the first two waves of data collection were completed before the release of the toolkit, it not only provides a framework for individual local food systems projects assessment efforts, but also provides a framework to begin comparative work conducted across time and space toward a greater understanding of the economics of local food systems.

Literature Review

Local Food as a Conduit to Economic and Community Development

Local food has long been seen as a conduit to economic and community development. First, increasing local food consumption can stimulate

the economy as local business owners purchase inputs and hire labor to meet the increased demand. Second, scholarship has long shown how the structure of farm operations, including ownership structure and scale, affects communities. Starting with Walter Goldschmidt's (1947) work and the hypothesis named after him, scholars have shown that industrialized farming overall has had a negative impact on the social and economic well-being of rural communities (Goldschmidt, 1947; Lobao, 1990; Lobao & Stofferahn, 2008). Then, through the concept of civic agriculture, Lyson (2004) highlighted the ways in which smaller and family-owned operations are embedded within the social and economic fabric of their community. Placing local food production at the center of the community development strategy, then, would provide an avenue toward social, environmental, and economic sustainable development. More recently, empirical studies have pointed to the differences in the expenses of different types of farm operations. Compared to farm operations that do not participate in the local food system, farm operations participating in the local food system tend to purchase more of their inputs locally and tend to hire more labor (Jablonski & Schmit, 2016).

As interest in local food has grown, so has interest in measuring the economic contribution and impact of local food initiatives. Previous studies have assessed increased purchases of local foods by consumers (Conner et al., 2008; Rossi, Johnson, & Hendrickson, 2017; Swenson, 2006), increased sales at farmers' markets (Becot et al., 2018; Hughes et al., 2008; Hughes & Isengildina-Massa, 2015; Myers, 2004; Otto & Varner, 2005), through food hubs (Jablonski & Schmit, 2015; Schmit, Jablonski, & Mansury, 2013) and through institutions (Becot et al., 2018; Becot, Conner, Imrie, & Ettman, 2016; Christensen, Jablonski, Stephens, & Joshi, 2017; Tuck, Haynes, King, & Pesch, 2010). Scholars have pointed out the importance of using sound methods and data. Although recent studies have worked to address some of these methodological challenges (Becot et al., 2018; Jablonski & Schmit, 2016; Rossi et al., 2017; Swenson, 2006), a lack of adequate data is still the biggest challenge (Conner, Becot, & Imrie, 2016; Thilmany McFadden et al., 2016; Rossi et al., 2017). The lack of data on local food sales at the macro level, such as the state or county, could explain the paucity of economic contribution studies. To our knowledge, previous studies using a macro-level approach have either used hypothetical scenarios (Conner et al., 2008; Swenson, 2006) or focused on the agricultural sector without considering other sectors of the food system (Rossi et al., 2017).

Estimates of Local Food Sales

Despite the increase in the number of local food systems initiatives within the last 15 to 20 years, only a handful of studies have tried to measure current local food consumption. Miller et al. (2015) used parameters from an input-output model to estimate the economic contribution of Michigan's local food system. Timmons, Wang, & Lass (2008) used USDA production and consumption data to establish an upper bound of local food production for Vermont. They found, for example, that Vermont produced more dairy but fewer fruits and vegetables than it can consume. A few years later, Conner et al. (2013) used a mix of primary and secondary data from 2011 to estimate local food sales from the agricultural and food manufacturing sector as well as from restaurants, food co-ops, and institutions. They estimated that in 2010, spending on local food in Vermont composed about 2.5% of all food expenditures; they revised this estimate up to 5% due to known data gaps. Their study had important limitations, including not adequately measuring local food sold through traditional retail venues as well as not accounting for commodity milk sales. As a result, they highlighted several challenges connected to local food measurement, including (1) consistently counting dollars at the same place in the supply chain (e.g., farmgate or retail or some consistent point in between); (2) avoiding double counting (e.g., counting both a distributors' sales to a school and the school's purchase from the distributor); (3) determining how to count processed foods that use little or no locally grown ingredients; (4) determining the source and processing location of commodity fluid milk; and (5) encouraging stakeholders to

provide their data in a consistent format to researchers. Since then, a meta-analysis of food modeling research revealed several crucial limitations to these types of research (Horst & Gaolach, 2016). First, aligning with the economics of local food system literature, Horst and Gaolach (2016) lament the lack of standardized and scale-relevant data on production and consumption. Second, they call for greater focus on the policy implications of foodshed scenarios, while urging caution around the complexity of the issues.

Recognizing the need to develop a better understanding of local and regional local food activity, the need for credible measurement, and the need for resources for local organizations to build their capacity, USDA partnered with a team of researchers to develop *The Economics of Local Food Systems: A Toolkit to Guide Community Discussions, Assessments and Choices* (Thilmany McFadden et al., 2016). The toolkit provides a roadmap that begins with topics relevant to a broad audience, such as discussing how to properly frame the research question and assemble a team to answer it (module 1), the types of secondary data available, how to use these data sources and their limitations (module 2), primary data collection and data analysis (module 3), data visualization and sharing of data with the community (module 4), and measurement of broader economic contribution modelling (modules 5 through 7). Because the first four modules are germane to our work, we use the modules of the toolkit as the backdrop of our discussion section.

Methods

The project was well defined: measure the amount of food grown and processed food in Vermont or within 30 miles of its borders (the official state local food definition) that is consumed in Vermont. In this section, we describe how we built on our first data collection efforts in 2010 and how we refined our approach in 2014 and 2017 (hereafter referred to as waves 1, 2, and 3). Interested readers can refer to Conner et al. (2013) for more details on the first wave of data collection. Before we detail each step of the process, we discuss the project team and the general approach to the project.

The Project Team and General Approach

For each wave of data collection, the project team was composed of researchers from the University of Vermont (UVM), members of the FTP team from the Vermont Sustainable Jobs Fund, and independent food systems consultants. The UVM members led the research project, including design of the data collection tool and data analysis. The FTP members brought general oversight, funding, food systems knowledge, and relationships with key stakeholders. Last, the consultants in waves one and three (a different consultant for each of these two waves) brought further knowledge of the food system and relationships with key stakeholders. There was some turnover in project members over the three waves as individuals changed organizations. However, institutional memory and consistency in the approach were preserved in three key ways. First, two of the team members (one from UVM and one from FTP) participated in all three waves. Second, all documents, including data collection tools and data analysis procedures, were accessible by the research team across the three waves. Third, members who had worked on previous waves of the project provided informal guidance as needed.

The general approach to the project over the three waves varied little. We started each wave of data collection with a project kickoff meeting to plan basic methods and timelines. Then we had two to three phone calls over the course of the project to discuss progress and methodological issues as they arose. After the team agreed on the data collection tool, FTP members contacted stakeholders to request data (more on the stakeholders below). The rationale was that an entity known across the state would introduce the research project. Stakeholders were instructed to send their data to the UVM team for data entry and analysis. The goal was to ensure confidentiality and independence of the data collected by leveraging the credibility of a research institution. Last, UVM team members in the first two waves and a consultant in the third wave followed up with stakeholders through phone calls and email during data collection, in order to encourage participation. Each time, FTP also followed up with some key stakeholders with whom existing relationships and trust

were deemed important, such as supermarket chains or large food distributors.

Defining Local and What Food Items Count as Local

Because the definition of what is local has bearings on the data collection and data analysis approach, the project team had extensive discussions about the definition during the first project kick-off meeting in 2010. A major difficulty relates to the diversity of definitions. In some cases, the definition is based on a distance, while in others the definition is based on a geographical boundary. Ultimately, the team used the state of Vermont legislature's definition of local food to guide its inquiry, which is defined as Vermont or within 30 miles (48 km) of its borders.

The team also had extensive discussions about which processed food items should be included. The driving criteria were the sources of the ingredients and the ownership structure of the food manufacturer (locally owned or not). Certain food items were not counted when local water was the main ingredient and when ownership of the company was not local (e.g., soda bottled by a large corporation in the state vs. locally owned and operated breweries) (see Conner et al., 2013, for more information).

Data Needs and Data Collection Efforts

To estimate the amount of local food consumed, we needed two types of data: total food and beverage consumption and local food sales. Total food and beverage consumption was the easiest data to obtain since they are available through the Consumer Expenditure Survey (U.S. Bureau of Labor Statistics [BLS], 2011; 2016; 2019). For each wave, we either used the data for the relevant year or adjusted the most recent available data for inflation. In the first wave of the project we only included food consumption data, while in the second and third waves we included beverages (alcoholic and other).

As mentioned earlier, there is no publicly available dataset with a complete estimate of local food sales at the county or state level. Therefore, we used primary and secondary data, with our approach changing the most between waves one and two. Starting with secondary data, we used two main sources of data across the three waves: (1) data from the Census of Agriculture and (2) data from the Nonemployer Statistics (NES). The Census of Agriculture provides data on direct sales from farmers to consumers through community supported agriculture operations (CSAs), farmers markets, and farm stands[1] (USDA National Agricultural Statistics Service, 2007; 2012; 2017). The NES provides data on small-scale food producers with no paid employees (U.S. Census Bureau, n.d.). While the nonemployer economic census does not provide data on the location of sales, we assumed that since these are small businesses, they likely sell their products close to the point of production. Starting in wave two, we added an estimate of local food sales through independent grocery stores (Desai, Roche, Kolodinsky, Harlow, & Nilan, 2013).We adjusted the 2013 estimate for inflation for waves two and three; hence for wave three, we assumed that these sales levels have not changed other than by the rate of inflation. However, anecdotal evidence suggests that sales have increased in these stores, so our estimate for wave three may be conservative.

We collected primary data to fill data gaps for sales through distributors and/or involving retailers and institutions. In wave one, we created a list of stakeholders likely to have data on local food sales, including businesses, state agencies, institutions, and nonprofit organizations. Then, in waves two and three, we added stakeholders that were not contacted previously because we previously did not know about them, they were new businesses, or they had grown to a point where their inclusion was important. Our list grew from 29 stakeholders in wave one, to 60 in two, and to 73 in wave three (Table 1). While the percent of organizations that provided data decreased between wave one and two and stabilized in wave three, the number of organizations that provided data actually increased

[1] Our study predates the release of the 2017 Census of Agriculture, which includes sales to intermediated market channels such as food hubs. We chose to not include these new data as we would not have been able to account for double counting. However, a modification of the data collection instrument tool should allow us to assess potential double counting in future years.

Table 1. Number of Organizations Contacted and Percent that Provided Data by Wave

	Wave 1 (2010)		Wave 2 (2014)		Wave 3 (2017)	
Type of organization	Number contacted	Provided data (in %)	Number contacted	Provided data (in %)	Number contacted	Provided data (in %)
Beer and Wine Distributor	n.a.	n.a.	n.a.	n.a.	4	25.0
Distributor	n.a.	n.a.	8	50.0	5	60.0
Nonprofit Organization	1	100.0	5	20.0	7	28.6
Farmer/Processor	n.a.	n.a.	n.a.	n.a.	4	75.0
Food Coop	15	46.7	15	46.7	16	6.3
Food Hub	5	60.0	8	50.0	10	70.0
Food Manufacturer	n.a.	n.a.	8	37.5	9	77.8
Industry Group	n.a.	n.a.	n.a.	n.a.	2	100.0
Institution	7	100.0	10	40.0	9	44.4
Retailer	n.a.	n.a.	3	33.3	1	0.0
State Agency	1	100.0	3	66.7	4	25.0
Vineyard	n.a.	n.a.	n.a.	n.a.	2	100.0
Total contacted	**29**	**69.0**	**60**	**43.3**	**73**	**45.2**

across the three waves since we contacted more organizations in each wave. Our experience with the third wave of data collection provides an example of the constantly changing environment and overlaps within the food system that we observed in three waves of data collection. As mentioned earlier, a total of 73 requests for primary data were sent out by the FTP team during the last wave of data collection, and we received data from 33 stakeholders. Despite following up, 20 respondents did not provide data, including five institutions and four nonprofit organizations. For the remaining 20 respondents, either we obtained the data through other means, such as through an industry organization or distributor, or we learned that they were not collecting local sales data.

We refined our data collection instrument over time. In wave one, we simply asked stakeholders to report on the total volume of local foods. This could be local food that they had sold if they were a distributor or retailer, or local food that they had purchased if they were an institution. We categorized the location based on who provided the data. In waves two and three, we asked stakeholders for a breakdown by food category (e.g., meat, vegetables) and buyer type or destination (to hospitals, schools, retailers). While some stakeholders provided the breakdown of their data, others were either unable or unwilling to. Thus, when calculating the percent of sales by category and destination, we have large percentages listed as "uncategorized."

Data Extrapolation

Even after obtaining primary data there were still a few data gaps, the largest being supermarket sales, commodity dairy, and alcohol. In waves two and three, we used a combination of primary and secondary data to fill these three data gaps. To estimate local food sales by the three major supermarket chains operating in Vermont, we used data obtained from one of the major supermarket chains (primary data) and extrapolated to estimate sales from the two other chains using Vermont market share data and total sales for the retail sector (secondary data) (Marchat, 2017). In wave two, we estimated the same level of local food sales across the three chains, while in wave three we assumed different levels of local food sales. These decisions were informed by the independent consultant's knowledge of the retail market in Vermont.

Our approach to estimating the quantity of Vermont-produced commodity dairy sold in the state changed somewhat between waves two and three. In two, we used estimates of the percent of

Vermont milk sold by the two bottlers who sell 85% of the fluid milk in Vermont, along with the estimated milk fluid consumption in Vermont (U.S. BLS, 2016; U.S. Census Bureau, 2013). An agricultural economist specializing in dairy and a Vermont Agency of Agriculture, Food and Markets (VAAFM) staff member vetted our approach and deemed it appropriate considering data limitations. In wave three, we were given access to unpublished data from VAAFM on the amount of milk produced that remained in the state (primary) and data from the Consumer Expenditure Survey and population census data to estimate total consumption (secondary) (U.S. BLS, 2019; U.S. Census Bureau, 2017). VAAFM data showed that 57.5% of milk produced in Vermont stayed in the state, with the rest being exported to southern New England and New York state. We netted out all dairy purchases for which we had primary data to calculate the final figure.

Our approach to estimating alcohol sales also changed between waves two and three. In wave two, we used store prices for beer, wine, and cider from three locations (one supermarket, one liquor store, and one food co-op) along with data from the Vermont Department of Taxes, which included gallons sold for alcohol produced in Vermont. Of note, the data from the Vermont Department of Taxes did not include small breweries and wineries that use one of the largest distributors, and there are no estimates on that amount. Furthermore, despite our attempts, we were also not able to obtain data on local liquor sales. In wave three we obtained data directly from the craft beer industry association and several large wineries but were unable to get local distillers or local cider maker sales information.

Data Clean-up and Tally

We entered all sales data and estimates into a Microsoft Excel document. While in wave one we only had aggregate sales and used the name of the data source to categorize the destination (e.g., schools, hospitals, grocery stores), in waves two and three we used two tabs to track data by destination and by food type (e.g., meat, dairy, vegetable). For the three waves, we screened the data to avoid double-counting. For instance, double-counting would have occurred if we had both included a distributor's sales to an institution *and* that institution's purchases from the distributor, or if we had included a manufacturer's sales to a grocer and the grocer's purchase from the manufacturer. When in doubt, we used a conservative approach by eliminating any problematic data points.

To calculate the percentages of the total sales by destination and category, we summed the figures in each row and divided them by the total food sales with a known category or destination. A final category for "uncategorized" products was created by subtracting the total from category and destination, respectively, from the overall. Lastly, to calculate the percent of local food consumed in the state, we divided total local sales by the total food and beverage consumption (as mentioned earlier, total consumption data is from the consumer expenditure survey). To assess changes over time, the 2017 data were then combined and compared to 2010 and 2014 results (adjusted for inflation). All results were shared by the research team and vetted by the project team.

Assumptions and Limitations

We now turn to our main assumptions and limitations, most of which are not unique to this research. Indeed, we noted earlier that the lack of complete and accurate data is a critical challenge of local food sales studies. First, we assumed the accuracy and completeness of the secondary data. For example, on the one hand, the agricultural census data might under-report direct sales of agricultural and value-added products to consumers. This is because some of these transactions are likely cash transactions, which are more difficult to track. On the other hand, we assumed that food processing businesses without employees sell their production locally when they could also sell some of their production through mail orders or travel to sell their production in other states. However, we are not aware of data that would enable us to corroborate this assumption. Second, the quality of data provided by stakeholders varies. For instance, some stakeholders have automated tracking systems for local food and thus their data are likely more accurate and complete, while other stakeholders provided 'back of the envelope' calculations. Third,

because of large data gaps connected to supermarket sales, commodity dairy, and alcohol, we used a mix of primary and secondary data to fill the gaps. While we erred on the conservative side, we currently are not aware of data that would enable us to estimate the margin of error. Furthermore, our approach to estimate dairy and alcohol changed between waves two and three due to access to new data and/or due to stakeholders not providing data for both waves. The lack of consistency across the two waves is problematic, and we are not aware of data that would also allow us to triangulate the accuracy of our estimates. Finally, we present the data for the three waves to assess progress over time. However, because we refined our data collection approach over time, wave one is not directly comparable with waves two and three. An increase in local food consumption over time is, therefore, likely due to both an increase in sales but also a more complete accounting. We speak to these nuances when we present the results of waves two and three.

Results

In this section, we provide an overview of our results, including changes in the proportion of local food and beverage consumption across the three waves of data collection, local sales by location, and local sales by product type.

Local Food and Beverage Consumption Trends

Between 2010 and 2017, our estimates indicate that the proportion of local food and beverage consumption has increased from 5% in 2010 to 9.7% in 2014 and 13.9% in 2017. When removing alcohol from the two and three data (since we did not collect data for beverages in wave one), we find that the proportion of local food consumed increased from 5% in 2010 to 9% in 2014 and 11.2% in 2017. To further remove some of the uncertainties due to the changes in stakeholders who provided data, we also isolated stakeholders who provided data in 2014 and 2017. Of the 16 providers who provided data in waves two and three, 13 reported an increase totaling about US$258 million. Note, however, that these numbers are not directly comparable to the overall local food sales as many were netted out as double counting.

Local food and beverage sales by location

A look at local food and beverage sales by location provides further evidence of the upward trend (Table 2). The direct-to-consumer category provides perhaps the best point of reference, since the data source in that category (direct sales from the census of agriculture and sales from the nonemployer survey) remained constant. In nominal dollars, the sales in that category increased by US$27 million. At the same time, the share of direct-to-consumer sales in the total decreased in

Table 2. Local Food Sales in Vermont, 2010–2017, by Location (Adjusted for Inflation, 2017 Base Year)

	Wave 1 (2010)		Wave 2 (2014)		Wave 3 (2017)	
	Sales (US$)	Share of total (%)	Sales (US$)	Share of total (%)	Sales (US$)	Share of total (%)
Hospitals	880,533	1.5	1,680,811	0.0	1,315,651	0.4
Higher Education	1,594,773	2.8	3,985,074	2.1	5,767,185	1.9
K-12 Schools	199,067	0.3	754,384	0.4	1,041,054	0.3
Food Stores	6,714,067	11.8	96,454,210	50.3	98,506,335	31.7
Restaurants	9,337,479	16.4	18,448,295	9.6	9,694,307	3.1
Distributors	52,450	0.1	1,258,322	0.7	7,825,245	2.5
Direct to Consumer Sales	27,229,696	47.8	46,471,115	24.3	73,597,707	23.7
Uncategorized	10,814,426	19.0	22,375,724	11.7	33,679,898	4.7
Other Local Businesses	189,675	0.3	149,051	0.1	64,201,533	10.9
Total local food sold	**$57,012,166**	**100.0**	**$191,576,987**	**100.0**	**$310,350,103**	**100.0**

2014 and 2017. This could be due, in part, to increasing our data collection efforts and due to the inclusion of beverages. The decrease may also be an indication of the growing importance of other market channels including distributors, food stores, and institutions, which have all increased in dollar terms over time. Indeed, since the early 2010s several initiatives have provided support to institutions to purchase more local food. This includes planning and implementation grants from the state of Vermont and technical assistance from nonprofits such as the Vermont Farm to School Network. Food stores also have worked to increase their offerings of local food to respond to consumer demand. The largest category of growth was "Other Local Businesses," which is due in large part to sales of alcohol (US$59 million), especially local craft beer.

Local Food and Beverage Sales by Food Category

Looking at the local sales by food category, we find that sales in many categories declined in both absolute terms from 2014 to 2017 (as a reminder, sales by food category were not measured in 2010) (Table 3). The decrease is due largely to fewer key stakeholders providing data broken down by food type in 2017 compared to 2014. For sales that were categorized by type, the biggest increase was in beverages, again due to the effect of craft beer sales. Dairy and manufactured food sales also increased in absolute terms (but declined as a percentage). Finally, while the emphasis of local food initiatives has often been on fruits and vegetables, we note that in Vermont, these two categories represent a small share of the total compared, for example, to processed/manufactured food, dairy, or beverages. In a state with a short growing season, this is an important reminder of the diversity of opportunities within the local food system.

Discussion

As local food systems continue to draw the interest of scholars and practitioners because of their potential to contribute to economic and community development, we used Vermont as a case study to assess the extent to which relocalization efforts are paying off. We also discussed how we have refined our approach over three waves of data collection to fill a major current data gap, which is the aggregate amount of local food consumption. We organize our discussion of the process, findings, and reflections around the 2016 USDA Economics of Local Food Systems toolkit (Thilmany McFadden et al., 2016). While we had completed two waves of data collection when the toolkit was released, our project aligned with many of the rec-

Table 3. Local Food Sales in Vermont, 2014–2017, by Food Category (Adjusted for Inflation, 2017 Base Year) [a]

	2014		2017	
	Amount (US$)	Share of total (%)	Amount (US$)	Share of total (%)
Meat	8,093,639	4.2	3,924,102	1.26
Eggs	4,071,889	2.1	695,222	0.22
Vegetables	5,595,055	2.9	1,854,309	0.60
Fruits	1,008,423	0.5	1,619,232	0.52
Dairy	28,743,410	15.0	39,044,212	13.12
Processed/manufactured food	39,711,334	20.7	44,317,361	14.28
Baked good	14,581,122	7.6	533,456	0.17
Uncategorized	57,631,406	30.1	138,708,040	44.69
Beverages [b]	32,140,710	16.8	77,979,011	25.13
Total amount of local food sold	**$191,576,988**	**100.0**	**$310,350,104**	**100.0**

[a] We did not collect data on food category in 2010.
[b] Does not include water.

ommendations of the USDA toolkit. Furthermore, the toolkit provides a framework for greater comparisons of the impact of local food systems projects across time and geographical areas. Beyond documenting local food consumption using a longitudinal approach, we hope that the description of our process and our reflections might be helpful to those interested in undertaking a similar project.

Module 1 of the USDA toolkit is about framing the assessment process. This includes engaging community members, developing scope and objectives, and evaluating needed resources. Our project had a well-defined research question (i.e., what is the amount of local food consumed in Vermont), which was inspired by an informal conversation between the director of FTP and a newly arrived UVM faculty member in early 2010s. From there, a team was assembled with the intention of leveraging the diversity of knowledge and networks across team members. As mentioned above, the FTP members and independent food systems consultants brought their knowledge of the local food system and leveraged their networks to encourage participation. The UVM team members brought in their research expertise and independence to preserve the confidentiality of those who reported their data. Once the team was assembled and obtained funding for the first wave,[2] the team defined the scope of the project and inventoried the needed resources. Defining the scope of the project during the first project kick-off meeting included discussing the definition of local food and food items to be included. The scope of the project was redefined in waves two and three to reflect the development of the local food system in Vermont. This included, for example, the inclusion of alcoholic beverages. Finally, because FTP team members had already developed a strong understanding of the data available and data needs in preparation of the Farm to Plate Strategic Plan in 2010, the discussion of needed data resources was minimal.

Module 2 of the toolkit is about using secondary data, including identifying secondary data sets and evaluating their usefulness to project objectives. We used secondary data when available. The use of secondary data not only reduces the cost of data collection, but data generated by federal agencies are key to developing comparable approaches to local food assessments. We note that starting with the 2017 Census of Agriculture, the USDA is now collecting data on farmers' sales to intermediated market channels such as food hubs. While our study predates the release of the latest census, these data should reduce the burden of data collection in future waves. Other secondary data sources that maybe useful as comparisons or supplements to our methods are the 2015 USDA Local Food Marketing Practices survey (USDA NASS, 2015) and the parameters from input-output models (Miller et al., 2015). These data may also help triangulate findings.

Module 3 of the toolkit is about generating and using primary data, including developing methods for sampling, data collection, and analysis. The bulk of our work involved collecting primary data, and we refined our approach over time as discussed in the methods section. Aware that tallying local food sales or purchases would require time for most stakeholders, we asked for what we believed was the essential information (i.e., amount broken down by location and food category). For each wave, many stakeholders were willing and able to provide local sales data. Time and effort spent cultivating relationships of trust with local stakeholders, often under the auspices of FTP, were vital factors in obtaining primary data. However, the inability or unwillingness of some stakeholders to provide the 2017 data divided by category or destination resulted in large "uncategorized" entries which greatly inhibited our ability to make comparisons over time. Besides the time investment required from stakeholders to respond to our request, data collection fatigue might play a role. As interest by various groups to track local food sales continues (for example, by funders, government agencies, or researchers), data collection fatigue will likely continue to negatively affect data collection and data quality. This also means that longitudinal

[2] Funding for the first wave of data collection was provided by a UVM Center for Rural Studies minigrant that funded partnerships between UVM researchers and Vermont food system's practitioners. Funding for the second and third waves of data collection was provided by the VSJF from various foundation sources.

analyses, which are already limited, will become increasingly difficult to implement. The issue of data collection fatigue further points to the importance of collaborating and concentrating data collection efforts. Is there value at the state or federal level in creating local food data clearinghouses? Might relatively simple adaptations to existing federal data collection efforts be made? Some of this work has begun, as evidenced by the inclusion of a new question about local food marketing channels on the 2017 Census of Agriculture.

Regarding the data analysis phase, researchers have cautioned against using arbitrary assumptions in the absence of data (O'Hara & Pirog, 2013). As we explained in the methods section, while we worked to ground our assumptions in limited evidence and using team members' knowledge of the food system, the lack of data and assumptions represent key limitations of our work. We described our assumptions and limitations in the methods section but, for example, the extrapolation of supermarket sales from one major retail chain to the other two is our biggest assumption. Despite our efforts, only one retail chain shared its data. Given the large magnitude of these sales, any error here would be greatly magnified. One of the guiding principles of our data analysis across the three waves has been our transparency about the process and our use of conservative estimates.

Module 4 of the toolkit is about engaging the community with the data, including developing strategies for identifying and communicating significant results with stakeholders. While our data collection efforts have several limitations, our findings show that since 2010 the proportion of local food consumption has increased and that FTP has likely reached its target of 10% of total food consumption in the state by the year 2020 three years early (estimated at 13.9% for 2017). From the beginning, the team has used the communication of the results as a strategy to show progress toward strengthening the local food system. In particular, we have shared the results of the last two data waves at the 2015 and 2018 FTP Gathering, an annual conference of Vermont food systems stakeholders. Furthermore, we have disseminated the results through press releases, on the FTP website, in the FTP annual report, and presented them to the Vermont Legislature's House and Senate agriculture committees. Although the data is anonymized, we have found that presenting them to the public and legislators provides an incentive to those sharing data because it attracts positive attention to their businesses' or institutions' contribution to total local purchasing and economic development in the state. For those working in the food system, the data provide a means of evaluating progress, along with insights on broad market trends on types of foods being purchased and where Vermonters are or are not purchasing local food. This information can then be used to determine strategic priorities, policy interventions, or evaluate program or policy effects on local food expenditures in certain market channels (e.g., have K-12 schools' local food purchases increased in conjunction with Farm to School programming and grants?). Additionally, for organizations in the food system the release of the data gives them a larger context and a means to communicate their own impacts and priorities to members (existing and prospective) and/or funders.

Modules 5 through 7 of the toolkit are about analyzing the linkages of local foods to local economies through economic contribution or impact studies. At this time, we have not conducted a formal input-output analysis. Previous research has shown the importance of customizing the production function for more accurate estimates of the economic contribution (Hardesty et al., 2016; Jablonski & Schmit, 2016). This would require that we collect data from farmers and also food manufacturers participating in the local food system.

Conclusion

Until systematic and comprehensive tracking of local food sales is possible (and we note that that might not be a realistic proposition), local food consumption estimates such as ours should not be taken at face value due to the large data gaps. Rather, these estimates provide one piece of the puzzle toward tracking progress in food relocalization efforts and toward understanding larger trends. As food relocalization efforts continue to be framed as a means toward community and economic development, we note that much of the recent empirical work (including our own work)

has been focused on economic indicators such as economic activity generated and local food multipliers, local sales, or number of jobs created in the food system. While this may not be a frontier in research, more work should aim to assess the extent to which food relocalization efforts have broader social effects on the community as theorized through the concept of civic agriculture (Lyson, 2004) and as advocated by stakeholders and politicians. While some scholars have called on the use of the community capitals or rural wealth creation frameworks (Gasteyer, Hultine, Cooperband, & Curry, 2008; Schmit, Jablonski, Minner, Kay, & Christensen, 2017), we see opportunities in adapting the work grounded in the Goldschmidt hypothesis. Influential in the sociology of food and agriculture, this literature has a long history of assessing the impact of the structure of agriculture on the social and economic well-being of communities. Through their review of key studies grounded in the Goldschmidt hypothesis, Lobao and Stofferahn (2008) provide insights into the type of indicators and data that have been used over the years. Furthermore, Welsh (2009) proposed to build on this work through a conceptual model that integrates the impact of changing market structures and the role played by public policy. Both of these, thus far, have received limited attention in the local food literature, yet likely play a crucial role in reshaping the food system.

References

Becot, F., Conner, D., Imrie, D., & Ettman, K. (2016). Assessing the impacts of local hospital food procurement: results from Vermont. *Journal of Foodservice Management and Education, 10*(1), 1–7. https://fsmec.org/journal/

Becot, F. A., Sitaker, M., Kolodinsky, J. M., Morgan, E. H., Wang, W., Garner, J., . . . Seguin, R A. (2018). Can a shift in the purchase of local foods by Supplemental Nutrition Assistance Program (SNAP) recipients impact the local economy? *Renewable Agriculture and Food Systems*. Advance online publication. https://doi.org/10.1017/S1742170518000327

Christensen, L., Jablonski, B., Stephens, L., & Joshi, A. (2017). *Economic impacts of farm to school—Case studies and assessment tools*. Chicago: National Farm to School Network. Retrieved from http://www.farmtoschool.org/Resources/EconomicImpactReport.pdf

Conner, D., Becot, F., & Imrie, D. (2016). Critical reflections on the USDA local food economics toolkit. *Journal of Agriculture, Food Systems, and Community Development*, *7*(2), 117–125. https://doi.org/10.5304/jafscd.2017.072.001

Conner, D., Becot, F., Hoffer, D., Kahler, E., Sawyer, S., & Berlin, L. (2013). Measuring current consumption of locally grown foods in Vermont: Methods for baselines and targets. *Journal of Agriculture, Food Systems, and Community Development, 3*(3), 83–94. https://doi.org/10.5304/jafscd.2013.033.004

Conner, D. S. & Garnett, B. R. (2016). Economic and environmental drivers of fruit and vegetable intake among socioeconomically diverse adults in Vermont. *Journal of Hunger and Environmental Nutrition*, *11*(2), 263–271. https://doi.org/10.1080/19320248.2015.1128862

Conner, D. S., Knudson, W. A., Hamm, M. W., & Peterson, H. C. (2008). The food system as an economic driver: Strategies and applications for Michigan. *Journal of Hunger and Environmental Nutrition, 3*(4), 371–383. https://doi.org/10.1080/19320240802528849

Conner, D. S. & Levine, R. (2007). Circles of association: The connections of community-based food systems. *Journal of Hunger and Environmental Nutrition*, *1*(3), 5–25. https://doi.org/10.1300/J477v01n03_02

Desai, S., Roche, E., Kolodinsky, J., Harlow, A., & Nilan, C. (2013). *Exploring the next frontier: Increasing local food sales at Vermont's independent retailers*. Montpelier: Vermont Sustainable Jobs Fund. Retrieved from https://www.vtfarmtoplate.com/resources/independent-grocers-assessment-released

Farm-to-Plate Investment Program, 10 V.S.A. § 330. (2009). Retrieved from https://legislature.vermont.gov/statutes/section/10/015A/00330

Gasteyer, S., Hultine, S. A., Cooperband, L. R., & Curry, M. P. (2008). Produce sections, town squares, and farm stands: Comparing local food systems in community context. *Southern Rural Sociology, 23*(1), 47–71. http://journalofruralsocialsciences.org/index.htm

Goldschmidt, W. (1947). *As you sow: Three studies in the social consequences of agribusiness*. Montclair, New Jersey: Allanheld, Osmun.

Hardesty, S., Christensen, L. O., McGuire, E., Feenstra, G., Ingels, C., Muck, J., . . . Oneto, S. (2016). *Economic impact of local food producers in the Sacramento region*. Davis: University of California at Davis. Retrieved from http://sfp.ucdavis.edu/files/238053.pdf

Horst, M. & Gaolach, B. (2016). The potential of local food systems in North America: A review of foodshed analyses. *Renewable Agriculture and Food Systems, 30*(5), 399–407. https://doi.org/10.1017/S1742170514000271

Hughes, D. W., Brown, C., Miller, S., & McConnell, T. (2008). Evaluating the economic impact of farmers' markets using an opportunity cost framework. *Journal of Agricultural and Applied Economics, 40*(1), 253–265. https://doi.org/10.1017/S1074070800028091

Hughes, D. W., & Isengildina-Massa, O. (2015). The economic impact of farmers' markets and a state level locally grown campaign. *Food Policy, 54*, 78–84. https://doi.org/10.1016/j.foodpol.2015.05.001

Jablonski, B. B. R., & Schmit, T. M. (2016). Differential expenditure patterns of local food system participants. *Renewable Agriculture and Food Systems, 31*(2), 139–147. https://doi.org/10.1017/S1742170515000083

Lobao, L. (1990). *Locality and inequality: Farm and industry structure and socioeconomic conditions*. Albany: State University of New York Press.

Lobao, L., & Stofferahn, C. W. (2008). The community effects of industrialized farming: Social science research and challenges to corporate farming laws. *Agriculture and Human Values, 25*(2), 219–240. https://doi.org/10.1007/s10460-007-9107-8

Low, S. A., Adalja, A., Beaulieu, E., Key, N., Martinez, S., Melton, A., … Jablonski, B. B. R. (2015). *Trends in U.S. local and regional food systems: A report to Congress* (Report No. AP-068). Washington, D.C.: U.S. Department of Agriculture (USDA), Economic Research Service. Retrieved from https://www.ers.usda.gov/publications/pub-details/?pubid=42807

Lyson, T. A. (2004). *Civic agriculture: Reconnecting farm, food, and community*. Lebanon, New Hampshire: Tufts University Press.

Marchat, A. (2017). *A look inside: Northeast market review 2017*. Retrieved from https://www.theshelbyreport.com/2017/09/25/northeast-market-review-2017/

Martinez, S., Hand, M., Da Pra, M., Pollack, S., Ralston, K., Smith, T., … Newman, C. (2010). *Local food systems:Concepts, impacts , and issues* (Report No. ERS-97). Washington, D.C.: U.S. Department of Agriculture (USDA), Economic Research Service. Retrieved from https://www.ers.usda.gov/webdocs/publications/46393/7054_err97_1_.pdf?v=0

Miller, S. R., Mann, J., Barry, J., Kalchik, T., Pirog, R., & Hamm, M. W. (2015). A replicable model for valuing local food systems. *Journal of Agricultural and Applied Economics, 47*(4), 441–461. https://doi.org/10.1017/aae.2015.19

Myers, G. S. (2004). *Howard County Farmers' Market economic impact study 2004*. Howard Co. (MD) Economic Development Authority, Agricultural Marketing Program.

O'Hara, J. K., & Pirog, R. (2013). Economic impacts of local food systems: Future research priorities. *Journal of Agriculture, Food Systems, and Community Development, 3*(4), 35–42. https://doi.org/10.5304/jafscd.2013.034.003

Rossi, J. D., Johnson, T. G., & Hendrickson, M. (2017). The economic impacts of local and conventional food sales. *Journal of Agricultural and Applied Economics, 49*(4), 555–570. https://doi.org/10.1017/aae.2017.14

Schmit, T, M., Jablonski, B. R. R., & Mansury, Y. (2013). *Impacts of local food system activities by small direct-to-consumer producers in a regional economy: A case study from upstate NY* (Working paper 2013-16). Ithaca, New York: Charles H. Dyson School of Applied Economics and Management, Cornell University. Retrieved from http://publications.dyson.cornell.edu/research/researchpdf/wp/2013/Cornell-Dyson-wp1316.pdf

Schmit, T. M., Jablonski, B. B. R., Minner, J., Kay, D., & Christensen, L. (2017). Rural wealth creation of intellectual capital from urban local food system initiatives: Developing indicators to assess change. *Community Development, 48*(5), 639–656. https://doi.org/10.1080/15575330.2017.1354042

Swenson, D. (2006). *The economic impacts of increased fruit and vegetable production and consumption in Iowa: Phase II* (Leopold Center Pubs and Papers No. 5-2006). Retrieved from Iowa State University Digital Repository website: http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1159&context=leopold_pubspapers

Thilmany McFadden, D., Conner, D., Deller, S., Hughes, D., Meter, K., Morales, A., . . . Tropp, D. (2016). *The economics of local food systems: A toolkit to guide community discussions, assessments and choices*. Washington, D.C.: USDA, Agricultural Marketing Service. Retrieved from https://www.ams.usda.gov/publications/content/economics-local-food-systems-toolkit-guide-community-discussions-assessments

Thilmany McFadden, D., & Jablonski, B. B. R. (Eds.). (2019). Economics of local food systems: Utilization of USDA AMS Toolkit principles [Special issue]. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3). https://doi.org/10.5304/jafscd.2019.08C.014

Timmons, D., Wang, Q., & Lass, D. (2008). Local foods: Estimating capacity. *Journal of Extension*, *46*(5), Art. 5FEA7. Retrieved from http://www.joe.org/joe/2008october/a7.php

Tuck, B., Haynes, M., King, R., & Pesch, R. (2010). *The economic impact of farm-to-school lunch programs: A Central Minnesota example*. Retrieved from http://www.cura.umn.edu/sites/cura.advantagelabs.com/files/publications/CAP-162.pdf

U.S. Bureau of Labor Statistics [U.S. BLS]. (2011). *Consumer expenditures—2010* (News release USDL-11-1395). https://www.bls.gov/news.release/archives/cesan_09272011.pdf

U.S. BLS. (2016). *Consumer expenditures in 2014* (BLS Reports No. 1063). Retrieved from https://www.bls.gov/opub/reports/consumer-expenditures/2014/home.htm

U.S. BLS. (2019). *Consumer expenditures in 2017* (BLS Report No. 1080). Retrieved from https://www.bls.gov/opub/reports/consumer-expenditures/2017/home.htm

U.S. Census Bureau. (n.d.). *Nonemployer Statistics (NES)*. Retrieved from https://www.census.gov/programs-surveys/nonemployer-statistics.html

U.S. Census Bureau. (2013). Vermont Quick Facts. Retrieved from https://www.census.gov/data/datasets/2013/econ/nonemployer-statistics/historical-datasets.html

U.S. Census Bureau. (2017). Vermont Quick Facts. https://www.census.gov/data/datasets/2017/econ/nonemployer-statistics/2017-ns.html

U.S. Department of Agriculture, National Agricultural Statistics Service [USDA NASS]. (2007). *2007 Census of Agriculture—State Data: Vermont. Table 2. Market value of agricultural products sold including landlord's share and direct sales: 2007 and 2002* [Table]. Retrieved from https://www.nass.usda.gov/Publications/AgCensus/2007/Full_Report/Volume_1,_Chapter_1_State_Level/Vermont/st50_1_002_002.pdf

USDA NASS. (2012). *2012 Census of Agriculture—State data: Vermont. Table 2. Market value of agricultural products sold including landlord's share and direct sales: 2012 and 2007* [Table]. Retrieved from https://www.nass.usda.gov/Publications/AgCensus/2012/Full_Report/Volume_1,_Chapter_1_State_Level/Vermont/st50_1_002_002.pdf

USDA NASS. (2015). 2015 Local Food Marketing Practices Survey. Retrieved from https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Local_Food/

USDA NASS. (2017). *2017 Census of Agriculture—State data: Vermont. Table 2. Market value of agricultural products sold including landlord's share, food marketing practices, and value-added products: 2017 and 2012* [Table]. Retrieved from https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_State_Level/Vermont/st50_1_0002_0002.pdf

Vermont Sustainable Jobs Fund. (2011). *Farm to Plate strategic plan*. Montpelier: Vermont Sustainable Jobs Fund. Retrieved from https://www.vtfarmtoplate.com/plan/

Welsh, R. (2009). Farm and market structure, industrial regulation and rural community welfare: Conceptual and methodological issues. *Agriculture and Human Values, 26*(1–2), 21–28. https://doi.org/10.1007/s10460-008-9184-3

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Measuring the importance of local food in the Chicago foodshed

Steven R. Miller [a] and John T. Mann [b] *
Michigan State University

Submitted May 6, 2019 / Revised June 28 and July 29, 2019 / Accepted July 29, 2019 / Published online January 20, 2020

Citation: Miller, S. R., & Mann, J. T. (2pp020). Measuring the importance of local food in the Chicago foodshed. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 101–122. https://doi.org/10.5304/jafscd.2020.092.008

Abstract

The study is motivated by the need to develop cost-effective tools to estimate the value and size of local food systems. Organizations in need of such evaluations often cannot afford the large price tag for the type of in-depth analysis they desire, and thus alternative, cost-effective methods are the next best choice. We use a recent evaluation of the Chicago foodshed to demonstrate one such cost-effective tool. Expansion of local sales constitutes import substitution, where local foods supplant existing imports. The proposed input-output (I/O) modeling method combines a "follow the money" approach with one that isolates total contributions of the local food systems, and uses an alternative definition of local foods. The approach modifies the underlying IMPLAN data and uses secondary data to account for other changes. The method is applied to a multicounty region comprising four states; the method's limitations are also discussed.

Keywords

Local Food Systems, Input-Output Model, Import Substitution, IMPLAN

Introduction

A major challenge for local food system (LFS) advocates is managing the intersection of policy, measurement of economic impacts, and practice. There is a growing body of literature that applies different methods to measure the economics of LFSs; some examples include Conner et al., 2013; Jablonski, Schmit, and Kay, 2016; Mann et al., 2018; Miller et al., 2015. Civic leaders apnd program managers wish to know how their efforts contribute over time, but impact studies are not able to provide sufficient monitoring to gauge progress or failure toward meeting common targets for LFSs. For policy-makers and advocates, the absence of estimates of the size of an LFS hinders the monitoring and evaluation of the importance of the LFS on local economies.

Because the size of an LFS is difficult to assess, many previous economic impact studies limited

[a] Steven R. Miller, Assistant Professor, Department of Agricultural, Food, and Resource Economics, and Director, Center for Economic Analysis, Michigan State University.

[b] * *Corresponding author:* John T. Mann, Assistant Professor, Department of Agricultural, Food, and Resource Economics; Justin S. Morrill Hall of Agriculture; 446 W. Circle Drive, Room 88; East Lansing, MI 48824-1039 USA; +1-517-355-2153; mannjoh3@msu.edu

their focus to key local foods outlets such as farmers markets or food hubs (Henneberry, Whitacre, & Agustini, 2009; Hughes, Brown, Miller, & McConnell, 2008; Jablonski et al., 2016; O'Hara & Pirog, 2013; Otto & Varner, 2005). These survey methods are difficult to implement and can be costly, and concluding such studies' estimates of the size of an LFS falls short of capturing the size and economic value of the broader LFS that may span well beyond direct-to-consumer sales (Low et al., 2015; O'Hara & Pirog, 2013). It is also difficult to generalize outcomes due to differences in economic and environmental factors underlying the data collection. On the opposite spectrum, recent studies have set out to establish the potential size of LFSs under the hypothetical scenario that consumers meet the U.S. Department of Agriculture (USDA) recommended dietary guidelines through local foods (Conner et al., 2013; Conner, Knudson, Hamm, & Peterson, 2008). While this approach is highly replicable and regional estimates are comparable across studies, it may also face criticism, for example, in terms of defining local foods or the availability of less aggregated data sources when smaller regional units are of interest. At the same time, the use of secondary data, where possible, is attractive when budgets directed to measuring LFSs are small.

More recently, Shideler and Watson (2019) demonstrated the use of the Local Food Impact Calculator (LFIC), a tool intended for non-economists that provides a basic impact measure given responses to a few simple questions. The LFIC uses a production-based on LFS assumptions and relies on the 2014 Agriculture Resources Management Survey data to develop the traditional input-output (I/O) multiplier. While a cost-effective and efficient tool, there may be more complex scenarios such that organizations interested in evaluating their LFS need additional guidance and assistance to address. Additionally, some scenarios may incorporate secondary data or information that these organizations have little practical experience using.

This article is motivated by an interest in developing inexpensive baseline measures of the size of LFSs for the purposes of monitoring and evaluating program outcomes.[1] More specifically, we estimate the size of the LFS using the same underlying software used to estimate its economic impacts. As such, we demonstrate how standard economic I/O models can provide a low-cost, replicable estimate of the baseline of broader regional food systems. These estimates can be the basis for measuring changes in and economic impacts of LFSs. This study also breaks new ground by providing a net assessment of the size and contribution of an LFS within a major metropolitan area, specifically a 38-county region that includes the Chicago metropolitan area (which comprises counties across four states). Estimates in this study are limited by excluding the contribution of livestock agriculture and meat processing, which may have a material impact on the true size of the LFS (Low et al., 2015; Martinez et al., 2010). To accomplish the goals of this study, we restrict our definition of local food to food produced and consumed in a region regardless of the marketing channel used to reach consumers. What follows is a brief discussion of the use of the I/O modeling applied to LFSs, a description of the methods and strategies employed in this study, a discussion of results, and, finally, a few concluding remarks.

Previous Research

While the literature on local food has grown significantly over the past two decades, a number of unresolved challenges that affect the framework, results, and policy implications of such studies remain. This examination of the Chicago study region is not an exception, as the two major hurtles encountered include defining the LFS and the methods used to estimate the size of it. The main issue is the interconnectedness between the definition of local food and the specific method for measuring the system. The current literature does not provide a clearly delineable definition of what constitutes local food (Hand & Martinez, 2010; Low et al., 2015; Martinez et al., 2010). Increasingly, elements of the supply chain's local orienta-

[1] This motivation is in line with broader efforts intended to help improve rural entrepreneurial and innovations ecosystems, thus increasing rural economic opportunities (Lyons, Miller, & Mann, 2018).

tion, such as large verses small firms, may also influence definitions (Low et al., 2015; Thilmany McFadden, 2015). For example, Thilmany McFadden (2015) points out that definitions may be further securitized as more corporate farms enter the local foods arena and local food consumers increasingly expect that their values and those of the corporate farms be more closely aligned. For analysts, data limitations (and budget constraints) in measuring the impact often dictate the definition and approach used to measure the economic impacts of LFSs (Miller et al., 2015).

The most recent attempts to measure LFSs have approached the issue from one of two general frameworks: (1) methods that allow for flexible definitions; and (2) definitions facilitated by specific modeling methods. Defining an LFS by the specific goods offered in the region's farmers markets and consumed locally asserts that data requirements for estimating the LFS accurately reflects the unique basket of goods and region that provides it (Hughes et al., 2008; Otto & Varner, 2005). However, collecting such data is labor- and cost-intensive, and contextually specific to the LFS studied. As a result, such data is not widely available and findings cannot be generalizable outside of the study region.

Most studies investigating the impact of LFSs set the basis of analysis on directly measurable local food transactions, like direct-to-consumer (DTC) sales at farmers markets or community supported agriculture (CSAs). Such studies generally show a positive return for farmers as compensation for taking on the marketing effort of directly selling to consumers (Brown, 2002; Low & Vogel, 2011; Martinez et al., 2010). That is, they are able to capture the trade margins that farms earn that would otherwise be captured by wholesalers and retailers. However, studies that estimate economic impacts based on local food sales often overlook two offsetting effects (Boys & Hughes, 2013; Hughes, et al., 2008; Hughes & Boys, 2015). First, growers who sell through local channels give up potential revenues by not selling through conventional channels (Swenson, 2010). Second, consumer expenditures on local foods imply a reduction of expenditures on foods through conventional channels (Boys & Hughes, 2013; Hughes, et al., 2008; Hughes & Boys, 2015; Schmit, Jablonski, & Mansury, 2013). Studies that fail to account for these offsetting effects implicitly assume that (1) all local food sales are derived from new production; and (2) all conventional food sales are imports with no local intermediation (Lee, Miller, & Loveridge, 2017). Once accounting for these offsetting effects, the net economic impacts will be much smaller, to the extent that the overall impact may be smaller than the actual value of the local food making up the LFS (Boys & Hughes, 2013; Hughes, et al., 2008; Hughes & Boys, 2015).

Researchers are in the early stage of exploring methods for holistically measuring the value of LFS that entails direct-to-consumers, intermediated channels, and processed-food channels to consumers. This coincides with advances in access to secondary data on local food sales that promise to be more inclusive than one-off, survey-based venue data. Low and Vogel (2011) used the ongoing farm-level survey data from the Agricultural Resource Management Survey (ARMS), collected and provided by the USDA, to estimate DTC sales, with the limitation that it omits intermediated and processor sales. The USDA National Agricultural Statistics Service (USDA NASS) has made promising inroads in understanding the structure of LFSs through the Local Food Marketing Practices Survey of the Census of Agriculture (conducted every five years). This survey expands the definition of local food transactions beyond DTC by also addressing sales to restaurants, food hubs, and others (USDA NASS, 2015), but is limited to recognizing differences in farm-level production practices between conventional and small, local-oriented producers. Despite being an improvement in access to farm-level data for representation of LFSs, the data are still limited in defining the local food as that sold through conventionally defined local food channels and fails to recognize the full extent of the local food production and processing captured in the local economy.

Studies on the economic impacts of LFS often rely on the IMPLAN economic simulation software and data (Çela, Knowles-Lankford, & Lankford, 2007; Cooke & Watson, 2011; Henneberry, Whitacre, & Agustini, 2009; Hughes et al., 2008; Jablonski, Schmit, & Kay, 2016; Miller et al., 2015;

Otto & Varner, 2005). IMPLAN's default model parameters represent the production practices and household purchases patterned after national averages across all firms. However, LFS researchers recognize that participants in LFSs exhibit purchasing and selling behavior that may differ significantly from the conventional food systems that dominate IMPLAN's parameters (Hughes et al., 2008; Jablonski, Schmit, & Kay, 2016; Swenson, 2009). Jablonski and Schmit (2016) caution that standard production functions underlying IMPLAN will not be representative of differences in the value chains between local and conventional food channels. This concern about the appropriateness of national coefficients for representing local food systems is not unique to LFS researchers. Lazarus, Platas, and Morse (2002) show that regional variations in hog production may erode estimate precision of regional hog production using IMPLAN's national parameters. Despite known deficiencies in using nationally parameterized IMPLAN production functions, IMPLAN remains a mainstream resource for estimating economic impacts of LFS. Thus, it may also make sense to apply the same tool for estimating economic impacts to that of estimating the overall size of the LFS.

Methods for augmenting national I/O parameters for regionalized models are well established (Jackson, 1998). Hughes, Brown, Miller, and McConnell (2008) advocated for more research on estimating the unique production attributes of smaller farms with DTC sales. More recently, Jablonski and Schmit (2016) set out to modify IMPLAN's regionalized I/O table to reflect local farm practices selling direct-to-consumers in New York using proprietary and USDA survey data. A recent toolkit commissioned by the USDA Agricultural Marketing Service (USDA AMS) details the practices and standards for effective economic impact estimates of local food systems (Thilmany McFadden et al., 2016). In that toolkit, the topic of augmenting standard IMPLAN data to reflect small producer production practices is relegated to an advanced modeling section for the initiated. Finally, Conner, Becot, and Imrie (2016) highlight the challenges in applying these prescribed advanced modeling techniques, noting steep data requirements and the resistance of suppliers along the value chain to participate in primary data collection efforts.

The approach applied in this study does not focus on agri-food channels conventionally categorized as making up the LFS, but rather tracks all channels by which food produced in the local economy comes to be consumed in the local economy. This includes DTC and intermediated sales, as well as sales arising through processed foods. Hence, rather than focusing this study on modifications to the agri-food production functions that fit the local food mantra, our study is limited in focus to the application for measuring the size, not the impact, of local food systems. Further, it applies the same software used for estimating impacts to estimating the size of the local food system and is consistent with the data used to estimate impacts. Given the study methods, this also means that the definition of local is restricted geographically to the study region. That is, all food produced and consumed in the study regions, regardless of marketing channel (from DTC to conventionally produced foods that wind up being consumed within the study region). Thus, this definition may deviate from more traditional ways in which some think about local food.[2] Unfortunately and based on the design of the approach, this is one major limitation. However, the approach used here can accommodate researchers wishing to apply more stringent definitions of "local" through modifications of the transactions table. This step is outside the scope of this study.

Methods

We used IMPLAN to estimate the size of the LFS, and this was the basis for estimating the LFS's economic impacts and for gauging changes over time. We believe this approach affords consistency with the underlying data. It is also consistent with how

[2] As an example, consider a tomato used for manufacturing ketchup. Conceivably, a tomato may be produced, processed, and consumed all in the same region. While this example may adhere to a strict geographical definition of local, as Thilmany McFadden (2015) points out, this type of definition may not match up other characteristics or perceptions about locally produced food.

local food is defined in this study—as that which is produced, processed (if applicable), and ultimately consumed in the same region, regardless of the channel used to reach final the consumers. This definition assumes that locally sourced food traversing conventional food channels is as much a part of the LFS as that sold through DTC channels, such as farmers markets, CSAs, etc.

The approach used in this study was developed by combining aspects of several prior studies, including Conner et al., (2008), Cooke and Watson (2011), Miller at al., (2015), Swenson (2009), Thilmany McFadden et al., (2016), Watson, Cooke, Kay, and Alward (2015), and Watson, Kay, Alward, Cooke, and Morales (2017). Due to the technical nature of the discussion on the approach, we include a more detailed description of the methods in an appendix. We also believe the information provided in the appendix is relevant to those interested in replicating our effort, although that is outside the main objective of this study.

Study Region Data

The LFS study region is made up of 38 counties around and including Chicago, where 14 counties make up the Chicago-Joliet-Naperville IL-IN-WI Core Based Statistical Area (CBSA). The county I/O data came from 2013 state packages for Illinois, Indiana, Michigan, and Wisconsin (which make up the LFS region) for use with IMPLAN Pro 3.1 (IMPLAN Group LLC, 2015). However, data accounting for changes are discussed in more detail in the next paragraph, and modifications to the underlying I/O model were discussed in the previous section and subsections. All 38 counties were aggregated into a single region for analysis, and the model was closed up to the household level.[3] To facilitate calculations, sectors were aggregated into 2-digit NAICS categories. However, crop-producing sectors were broken out, and a second manufacturing category was created from manufacturing for food processing sectors. This allowed the analysis to isolate intermediate agricultural purchases for food processing from those for non-food manufacturing. The sector aggregation is presented in Table 1. It is notable that a sizeable portion of grain production in the study region tends to go toward nonfood manufacturing sectors.

We collected additional data for assessing agricultural production from multiple USDA sources (USDA, 2012, 2013; USDA Economic Research Service, 2016; USDA Farm Service Agency, 2016; USDA NASS, 2013; USDA NASS Cropland Data Layer, 2016). These data provided the agricultural production statistics by county for comparing with IMPLAN transactions, and highlighted regions where specialty crops are grown. Specialty crops are particularly interesting from an LFS perspective because they are more closely aligned with local food channels than commodity-type row crops like corn and soybeans (Martinez et al., 2010). Unfortunately, there are many omissions in the NASS data collection, which become more pronounced at finer geographic granularity. We found that the USDA NASS Cropland Data Layer for 2015 was most useful for identifying regions of crop production, but it also has shortcomings in accuracy of the size of acres in any commodity category and in the ability to identify small fields of commodity production (Han, Yang, Di, & Yue, 2014; USDA NASS Cropland Data Layer, 2016). Regardless, the Cropland Data Layer indicates that a significant portion of the area's agricultural fields is in soybeans and corn production. Consistent with the Cropland Data Layer distinguishing sweet from dent corn, county-level USDA Farm Service Agency (USDA FSA) data show that in 2015 about 0.1% of planted corn acres in the model region had intended use as fresh, while grain, seed and processed were the most common intended uses by far (USDA FSA, 2016). That is, a significant share of corn production in the region will not go toward human consumption as sweet corn.

[3] Counties included in Illinois: Boone, Cook, DeKalb, DuPage, Ford, Grundy, Iroquois, Kane, Kankakee, Kendall, La Salle, Lake, Lee, Livingston, McHenry, Ogle, Will, and Winnebago; in Indiana: Elkhart, Jasper, Kosciusko, Lake, LaPorte, Marshall, Newton, Porter, Pulaski, St. Joseph, and Starke; in Michigan, Berrien, Cass, and Van Buren; in Wisconsin, Jefferson, Kenosha, Milwaukee, Racine, Walworth, and Waukesha.

The Cropland Data Layer shows that specialty crops, like vegetables, melons, and fruit, are grown throughout the region and are often intermixed with row crop acreage. While largely dispersed, there are regions where specialty crops tend to co-locate. Specifically, the crop profile in southwest Michigan, including Berrien, Cass, and Van Buren counties, reflects significant clustering of grapes, cherries, apples, and blueberries. Other specialty crops appear but with less dominance, including cucumbers, dry beans, celery, and asparagus. On the other side of Lake Michigan and south of Milwaukee is another area with specialty crop clusters. These clusters include cabbage, greens, and dry beans, among others. In summary, there were some 7 million acres (2.8 million hectares) planted to crops in the modeling region in 2015, where specialty crops made up less than 2% of that acreage. This sizeable acreage is primarily allocated to row-crop production of corn

Table 1. Model Aggregates

Model Industry Aggregates	30 Food Processing
11 Ag, Forestry, Fish & Hunting	Flour milling
Grain farming	Rice milling
Vegetable and melon farming	Malt mfg
Fruit farming	Wet corn milling
Tree nut farming	Soybean and other oilseed processing
Greenhs., nrsry., & floriculture	Fats and oils refining and blending
21 Mining	Breakfast cereal mfg
22 Utilities	Beet sugar mfg
23 Construction	Sugar cane mills and refining
31-33 Manufacturing	Non-chocolate confectionery mfg
30 Food Processing	Chocolate and confectionery mfg from cacao beans
42 Wholesale Trade	Confectionery mfg from purchased chocolate
44-45 Retail trade	Frozen fruits, juices and vegetables mfg
48-49 Transportation & Warehousing	Frozen specialties mfg
51 Information	Canned fruits and vegetables mfg
52 Finance & insurance	Canned specialties
53 Real estate & rental	Dehydrated food products mfg
54 Professional- scientific & tech svcs	Fluid milk mfg
55 Management of companies	Creamery butter mfg
56 Administrative & waste services	Cheese mfg
61 Educational svcs	Dry, condensed, and evaporated dairy product mfg
62 Health & social services	Ice cream and frozen dessert mfg
71 Arts- entertainment & recreation	Animal, except poultry, slaughtering
72 Accommodation & food services	Meat processed from carcasses
81 Other services	Rendering and meat byproduct processing
92 Government & non NAICs	Poultry processing
	Seafood product preparation and packaging
	Bread and bakery product, except frozen, mfg
	Frozen cakes and other pastries mfg
	Cookie and cracker mfg
	Dry pasta, mixes, and dough mfg
	Tortilla mfg
	Roasted nuts and peanut butter mfg
	Other snack food mfg
	Coffee and tea mfg
	Flavoring syrup and concentrate mfg
	Mayonnaise, dressing, and sauce mfg
	Spice and extract mfg
	All other food mfg

and soybeans. However, it provides a sizeable foodshed for feeding Chicago residents.[4]

Results

Estimated Local Food Benchmarks

Table 2 shows local uses and production for the Chicago study area as reported by tracing the data through the transactions aggregated regional table, as described in the Methods section. In addition to sales, Table 2 reports other key measures of economic activity, including employment, labor income, and contributions to gross regional product. Starting with the Sales/Output column, which provides estimates of the value of production and uses at producer's prices, the four crop-producing sectors generated an estimated US$3.97 billion in output in 2013. About US$2.52 billion was exported outside the region for consumption or processing, leaving US$1.46 billion for local uses. This implies

Table 2. Estimated Baseline Local Foods Economics

	Sales/Output (US$000,000s)	Employment	Earnings (US$000,000s)	GRP (US$000,000s)
Total Output	**3,973.3**	**16,635**	**316.5**	**193.8**
Less Exports	2,515.0	10,079	160.5	57.4
Contribution to Import Substitution	**1,458.3**	**6,556**	**156.0**	**136.5**
Local Supply to Food Processors	644.3	2,835	57.6	41.1
Local Fresh				
Households	134.77	1,114	61.1	89.2
Retail/Wholesale	0.03	0	0.0	0.0
Food Service	2.66	16	1.0	1.4
Institutions	2.71	14	0.7	0.9
Total Local Fresh	**140.16**	**1,145**	**62.7**	**91.5**
Local Processed				
Households	101.67	210	13.1	22.2
Retail/Wholesale	0.20	0	0.0	0.0
Food Service	21.66	45	2.8	4.7
Institutions	6.44	13	0.8	1.4
Total Local Processed	**129.97**	**268**	**16.8**	**28.4**
Total (Local Fresh + Local Processed)				
Households	236.44	1,324.37	74.20	111.37
Retail/Wholesale	0.23	0.66	0.04	0.06
Food Service	24.32	61.13	3.78	6.15
Institutions	9.15	27.20	1.50	2.30
Total Local	**270.13**	**1,413**	**79.5**	**119.9**

Note: Columns may not sum due to rounding.
Sources: IMPLAN and authors' calculations.

[4] Further framing issues were uncovered through anecdotal evidence provided by interviews with several Chicago area wholesale distributors specializing in local food channels. Accordingly, wholesalers suggest that growers selling through wholesale intermediaries generally do not receive price premiums over other channels. In other words, local food premiums earned by farmers are not necessarily earned only through direct selling to final uses. Rather, growers can earn premiums by selling commodity mixes sought by different local food channels. In this, those growers willing to work with specialty wholesalers to provide those difficult to market crops, can find a willing buyer. Low competition for such locally grown specialty crops not commonly supplied in this region, like lettuce, can yield returns to successful growers.

that roughly 37% of the Chicago study region production is consumed or processed locally. Of this, about US$0.64 billion is sold to local food processors.

Raw or unprocessed plant-based foods have two mutually exclusive channels for local consumption: unprocessed (fresh) or processed. In addition to the US$644.3 million raw foods purchased by processors, local households purchased US$134.8 million, food services purchased US$2.7 million, institutions purchased US$2.7 million, and about US$30,000 is earned in retail and wholesale margins.[5] The local foods' share of locally processed foods amounted to US$101.7 million purchased by households, US$21.7 million by food service, and US$6.4 million by institutions. In total, households spent about US$270.1 billion in locally sourced fresh and processed foods.

IMPLAN provides fixed ratios to output for estimating employment, labor income, and contributions to annual gross regional product. Accordingly, expected direct employment in the Chicago study region limited to local foods is about 1,413, with annual income topping US$79.5 million. Finally, total local food output from farm to household generates about US$119.9 million to the gross regional product.

The IMPLAN data also allow us to estimate the total household expenditures for food, for comparison with other estimates. Here, only household expenditures on crop products and processed foods are considered. According to a recent study, residents in the Chicago study region purchase about US$19.9 billion in fresh and processed foods (USDA NASS, 2015), where about 1.4% is provided by local suppliers of crops. In a similar analysis for the state of Michigan, Miller et al. (2015) found that local sources supplied about 17% of Michigan food demand.[6] This comparison is briefly discussed in the next section.

Relative Economic Contributions

Findings in this section draw heavily from the work of Watson et al. (2015, 2017), and the methods were presented in the Methods section. Table 3 shows the distribution of sector sales, where intermediate sales are as related to other producing industries. The local final sales column shows the value of purchases that consumers make at the producers' prices. For grains, this largely would be

Table 3. Sector Demand Profiles (all in US$ Millions)

	Intermediate Sales	Local Final Sales	Total Local Sales	External Sales	Output
Ag, Forestry, Fish & Hunting	1,827.4	106.7	1,934.1	2,124.8	4,058.9
Grain farming	1,048.3	24.8	1,073.1	2,655.1	3,728.2
Vegetable and melon farming	26.5	82.8	109.3	25.9	135.2
Fruit farming	32.5	26.7	59.2	48.4	107.6
Tree nut farming	0.3	0.4	0.7	1.5	2.3
Greenhouse, nursery, and floriculture	57.3	78.2	135.5	162.4	297.9
Food Processing	5,010	6,322	11,332	28,726	40,059

Source: IMPLAN and authors' calculations.

[5] Retail and wholesale margins may posit a conservative fallacy of strictly relying on the regional transactions table for allocating expenditures, as such margin estimates are largely weighted toward the low-margin conventional food channels. Based on conversations with wholesalers and distributors in the Chicago study region, we believe these baseline margins for locally sourced foods are low.

[6] Note that this includes DTC as well as conventionally produced and marketed foods that remained in Michigan for consumption. The authors point out that the definition used for this study is strictly geographic: food produced and consumed within the state bounders. However, the authors do not necessarily advocate for this definition of local. To put this value into context and using the 2015 Local Food Marketing Practices Survey and NASS Michigan Field Office data, total DTC in 2015 accounted for roughly 4.4% of all food produced in Michigan. If this value were consistent in the 2012 (the year of the referenced study), it implies that just under 13% of the locally produced and consumed food in Michigan came from conventional sources.

whole corn purchases that may take place directly from the grower, or through an intermediary, and are reported as prices the grower receives. The total local sales are the sum of intermediate and local final sales. External sales reflect exports from the region. Output is the sum of total local and external sales. Evident in Table 3 is that grain farming and food processing sales are largely driven by external purchases, as external sales accounts for roughly 71% of output. This is one potential explanation for the stark difference in the proportion of local food shares in the state Michigan (17%) compared to the Chicago study region (1.4%) (Miller et al., 2015). The Chicago study region has a high concentration of grain production, whereas Michigan has greater shares of specialty crops, although much of the Chicago region grain production is not for human consumption. Another aspect is the high population density compared to number of acres allocated to farming. With less farm output per capita, the Chicago-area food system is more reliant on food imports than the state of Michigan.

While Table 3 reports direct effects, Table 4 shows the sector impact distribution through secondary effects. The direct base column depicts exogenous, or export sales. The indirect base consists of secondary transactions to other sectors in the Chicago study region required in producing the agricultural commodities or processed foods. As export sales drive these secondary transactions, the sum of the direct and indirect base is the total economic base or the export base. The local purchases column is the sum of intermediate (industry purchases) and household purchases for local output. The ratio gives an indication of the extent that the sector supplies external markets relative to local markets. As demonstrated in the Table 3, it is also clear in Table 4 that grain production is much more tied to external markets, while vegetable and melon farming production is directed toward local uses in higher proportions.[7]

Estimated Impact of a 10% Increase in Local Uses

Next, we perform a hypothetical analysis of changes in local demand and assess how such changes will impact the Chicago study region's economy. Crop sector farm total export sales are decreased by 10% and added to by local sector purchases in proportion to current baseline purchases such that there is no net change in local crop production. Table 5 shows the simulated change in sales by the agricultural sector. In this example, both intermediate and local final uses of agricultural crops increase by 10%. However, no assumption is made on changes in intermediate and final demand for local processed foods. The findings highlight the importance of recognizing the dynamic relationship of the production function to changes in local demands.

Table 4. Base versus Gross Output (US$ Millions)

	Direct Base	Indirect Base	Total Base	Local Purchases	Ratio TB/LP
Ag, Forestry, Fish & Hunting	2,124.8	1,570.3	3,695.1	4,058.9	0.91
Grain farming	2,655.1	2,644.8	5,299.9	3,728.2	1.42
Vegetable and melon farming	25.9	19.4	45.3	135.2	0.33
Fruit farming	48.4	38.2	86.6	107.6	0.80
Tree nut farming	1.5	1.2	2.7	2.3	1.20
Greenhouse, nursery, and floriculture	162.4	143.6	306.0	297.9	1.03
Food Processing	28,726.0	22,814.0	51,540.0	40,059.0	1.29

Source: IMPLAN and authors' calculations.

[7] A more detailed examination of fruit farming reveals that high concentrations of grape production occur in eastern counties. Similarly, the core of blueberry, cherry, and apple production occur in the three counties of Southeast Michigan that are included in the region. The nature of this concentration, just as the nature of grain production concentration throughout the region, likely favors export markets.

Table 5. Scenario Changes in Sales (US$ Millions)

	Change in Sales ($ millions)	
	Local	Exports
Grain farming	1,073.1	–1,073.1
Vegetable and melon farming	109.3	–109.3
Fruit farming	59.2	–59.2
Tree nut farming	0.7	–0.7
Total	1,242.4	–1,242.4

Source: IMPLAN and authors' calculations.

Table 6. Net Sales Impacts (US$)

Sector	Output Impact
11 Ag, Forestry, Fish & Hunting	8,756
Grain farming	269,824
Vegetable and melon farming	2,058
Fruit farming	480
Tree nut farming	6
Greenhouse, nursery, and floriculture production	27
21 Mining	336
22 Utilities	7,857
23 Construction	7,384
31-33 Manufacturing	42,661
30 Food Processing	1,344
42 Wholesale Trade	25,601
44-45 Retail trade	7,809
48-49 Transportation & Warehousing	13,464
51 Information	6,518
52 Finance & insurance	37,598
53 Real estate & rental	47,570
54 Professional- scientific & tech svcs	12,562
55 Management of companies	3,633
56 Administrative & waste services	6,094
61 Educational svcs	2,272
62 Health & social services	11,167
71 Arts- entertainment & recreation	1,833
72 Accommodation & food services	4,781
81 Other services	5,174
92 Government & non NAICs	3,372
Total Sales Net Effect	530,182

Sources: IMPLAN and authors' calculations.

Table 6 shows the sector-by-sector net impacts of simulations described in the Methods section, indicating that the total impact of diverting US$1.242 billion in exports for local consumption generates a net change of US$530,182 in local sales. This estimate includes both direct and secondary transactions. As may be expected, the largest source of net impacts is the grain in the farming sector, largely stemming from the significant share of the direct change in transactions. It may be unrealistic to assume that Chicago consumers will absorb US$1.073 billion in new, unprocessed grain production. However, processors that use grains in producing milled products may have some capacity to increase purchases from local sources. Additionally, a change in local demand from the Agriculture, Forestry, Fish and Hunting sector was not modeled, yet it is evident they benefit from this change. This may occur, as the sector often provides services and inputs in the crop production sector. Other sectors also experience a change in sales as the transactions reverberate throughout the economy.

Applying fixed ratios for employment, earnings, and gross regional product to output, Table 7 reports standard economic impact metrics. Here, the US$530,182 net change in sales is expected to give rise to about 2.4 regional jobs with annual labor income of US$94,301. The jobs created are expected to generate annual wages of about US$39,751. Additionally, this simulation shows contributions to gross regional product will grow by about US$150,267.

Identification of Important Sectors

The goal of the next step is to select the most relevant industry sectors in terms of local foods, while

Table 7. Summary of Impacts

Regional Measure	Value
Change in Sales	$530,182
Change in Employment	2.4
Change in Labor income	$94,301
Change in GRP	$150,267
Average annual earnings	$39,751

Source: IMPLAN and authors' calculations.

maintaining as simplified a model as possible. Thus, we limit consideration to changes in model inputs per unit of output (i.e., technical coefficients) of the key food purchasing industries and of households for the five agricultural producing sectors. We successively increase the sector demand for locally produced agri-food products by 20% and measure the percent change in all industry sector multipliers,[8] weighted by the sector output. These findings are reported in Table 8. Results indicate that increasing local food processing purchases of grain farming output by 20% generates relatively larger secondary effects than increasing wholesale or retail purchases. Here, increasing food processor purchases will likely result in a 10.1% increase in overall multipliers of the Chicago study region. This compares with approximately no change in multipliers for the two trade sectors. Alternatively, higher-income household purchases tend to generate larger economywide impacts than lower-income household purchases. This mostly reflects scale effects, where higher-income house holds purchased US$5.53 million from local grain farming in 2013, compared to US$0.7 million for the lowest-income group. Hence, a 20% increase in the higher income group constitutes a much larger direct effect change in local demand than the same for the low-income group.

Figure 1 shows the effect graphically from a 20% change in household purchases, largely reproducing the household agri-food impacts shown in Table 8. It is evident that directing local grain outputs to households is likely to generate smaller impacts than promoting local fruit, vegetables, and nut output.

As is evident in Figure 1, impacts are largest for higher-income groups, where higher income groups tend to exhibit higher aggregate expenditures in the Chicago study region. Table 9 shows the IMPLAN baseline expenditures of the commodity types by household type, showing a near uniform increase in total expenditures with higher

Table 8. Percent Change in Aggregate Multipliers Corresponding to Row Changes in Demand for Column Commodities

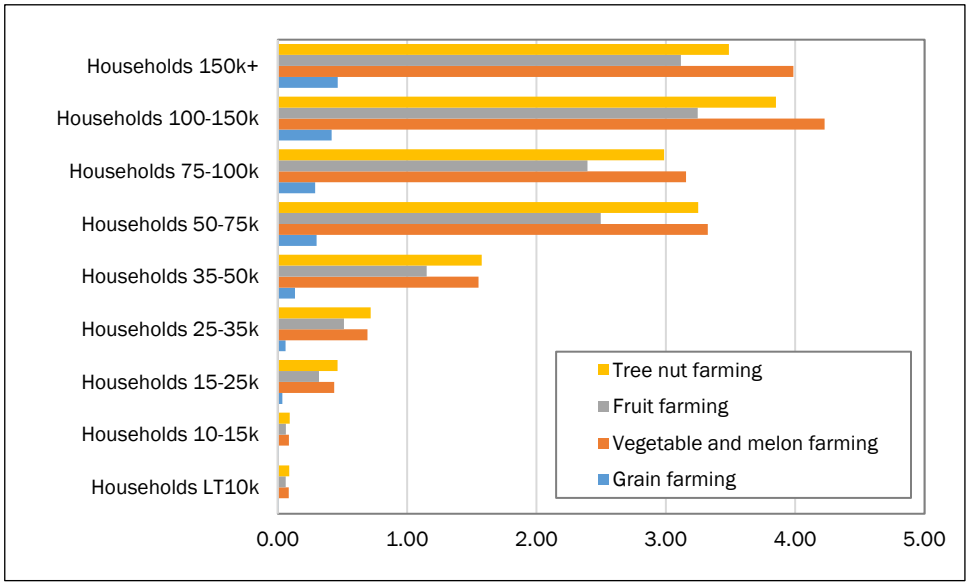
	Grain farming	Vegetable and melon farming	Fruit farming	Tree nut farming	Food Processing
Food Processing	10.1105	1.9431	4.0146	3.1077	4.5826
Wholesale Trade	0.0000	0.0015	0.0033	0.0056	0.0817
Retail trade	0.0015	0.0015	0.0035	0.0056	0.0277
Educational svcs	0.0358	0.1071	0.0190	0.0236	0.8750
Health & social services	0.0083	0.1191	0.0037	0.0061	2.1583
Arts- entertainment & recreation	0.0015	0.0201	0.0280	0.0446	0.2413
Accommodation & food services	0.0388	0.2552	0.0406	0.0534	6.4642
Households <US$10k	0.0065	0.0843	0.0617	0.0884	0.1516
Households US$10–15k	0.0070	0.0864	0.0629	0.0926	0.1524
Households US$15–25k	0.0350	0.4363	0.3188	0.4623	0.7788
Households US$25–35k	0.0596	0.6932	0.5111	0.7183	1.2644
Households US$35–50k	0.1336	1.5519	1.1512	1.5768	2.8792
Households US$50–75k	0.2999	3.3239	2.4966	3.2503	6.3702
Households US$75–100k	0.2895	3.1565	2.3936	2.9866	6.2062
Households US$100–150k	0.4168	4.2272	3.2456	3.8515	8.5544
Households US$150k+	0.4638	3.9861	3.1158	3.4874	8.3376

Sources: IMPLAN and authors' calculations.

[8] Households are assumed to not generate multiplier impacts but rather increase direct demand for agri-food output and hence generate secondary impacts measured in the multiplier changes.

income groups. To verify this observation, regression equations (results not shown) were estimated by commodity of the results in Figure 1 against the total expenditures in Table 9, and show a close association between household category baseline expenditures and changes in the corresponding multipliers.

Figure 1. Percent Change in Aggregate Multipliers from 20% Change in Household Purchases in Local Food Purchases



Source: Data from IMPLAN.

Summary and Conclusions

The impetus of this research arose from a request to build talking points around the economic merit and feasibility of expanding Chicago's LFS. The research approach was directed at overcoming some of the obstacles for measuring LFSs and has relevance to modeling the economic impact of regional import substitution programs in general. A framework for measuring the value of LFSs, estimating the relative economic contribution of LFSs, and setting policy targets for expanding such systems is outlined within a standard I/O framework. Our secondary goal is to contribute to the growing body of literature that uses secondary data to model an LFS by providing an example that includes a multicounty region made up of parts of several states and scenarios affecting the size of the LFS.

Table 9. Baseline Household Purchases of Local Agri-food Production (US$ Millions) by Household Income

	Grain farming	Vegetable and melon farming	Fruit farming	Tree nut farming
Households < US$10k	0.704	2.910	0.910	0.017
Households US$10–15k	0.498	1.953	0.607	0.012
Households US$15–25k	1.325	5.235	1.633	0.031
Households US$25–35k	1.482	5.464	1.720	0.032
Households US$35–50k	2.335	8.597	2.722	0.049
Households US$50–75k	4.144	14.552	4.665	0.080
Households US$75–100k	3.677	12.706	4.112	0.068
Households US$100–150k	5.072	16.306	5.342	0.084
Households US$150k+	5.528	15.093	5.026	0.074

Source: IMPLAN.

The findings suggest that a small share of total nonprotein food consumption in the 38-county region that makes up the Chicago study area is supplied by local sources. We then simulated an increase in local food demand across all sectors and households and gauged the economic impact where local food purchases supplant export sales in a one-to-one ratio. Net impacts were calculated based on changes in the underlying transactions table. The results suggest that local food is likely a weak driver of economic growth in the study region, which is a large urban center.

The approach outlined in this article also con-

siders some of the challenges identified by past efforts at measuring the economics of LFSs. First, we adhere to a strict geographic definition of local. More specifically, the approach includes all channels by which food may traverse from grower to consumer and addresses the critique that local foods assessments fail to capture intermediate channels to consumers (Low et al., 2015). Thus, the definition of local includes channels beyond more traditional ideas in term of local foods, such as farmers markets, CSAs, etc. Second, in measuring the contribution of LFSs to the larger economy, a full accounting of opportunity costs was captured within the estimated equations. Finally, the analysis is not limited to final uses but rather establishes a framework for interpreting the value of intermediate demands and indirect channels that local food traverses to final consumption. The approach applied here can be readily applied to any defined geography, and it establishes a framework for measuring not just the impact but the actual size of the local food system, allowing practitioners to develop a baseline by which to measure changes over time.

A major limitation of this study, however, is that the transactions data used in the I/O model rely heavily on traditional marketing channels data and that distinct value chains of local food channels are not captured. Thus, results should be considered with caution. Future efforts applying this or a similar approach may want to address this shortfall. However, the framework applied is flexible enough to facilitate measuring LFSs under different definitions of what constitutes local food. As IMPLAN does not break out value chains of local food from conventional channels, the underlying data must be modified to reflect the selected definition of local food.

One direction for future research may include integrating livestock production into the local food baseline estimates. This study did not include direct measures of livestock production that make up the local food chain, in part because of the intertwined relationships of crop production as livestock feed used in livestock production. Prior work suggests that livestock production may make up a sizable component of LFSs.

References

Boys, K. A., & Hughes, D. W. (2013). A regional economics–based research agenda for local food systems. *Journal of Agriculture, Food Systems, and Community Development, 3*(4), 145–150. https://doi.org/10.5304/jafscd.2013.034.012

Brown, A. (2002). Farmers' market research 1940–2000: An inventory and review. *American Journal of Alternative Agriculture, 17*(4), 167–176. Retrieved from https://www.cambridge.org/core/journals/american-journal-of-alternative-agriculture

Casler, S. D., & Hadlock, D. (1997). Contributions to change in the input-output model: The search for inverse important coefficients. *Journal of Regional Science, 37*(2), 175–193. https://doi.org/10.1111/0022-4146.00050

Çela, A., Knowles-Lankford, J., & Lankford, S. (2007). Local food festivals in Northeast Iowa communities: A visitor and economic impact study. *Managing Leisure, 12*(2–3), 171–186. https://doi.org/10.1080/13606710701339470

Conner, D., Becot, F., & Imrie, D. (2016). Critical reflections on the USDA local food economics toolkit. *Journal of Agriculture, Food Systems, and Community Development*, *7*(2), 117–125. https://doi.org/10.5304/jafscd.2017.072.001

Conner, D., Becot, F., Hoffer, D., Kahler, E., Sawyer, S., & Berlin, L. (2013). Measuring current consumption of locally grown foods in Vermont: Methods for baselines and targets. *Journal of Agriculture, Food Systems, and Community Development, 3*(3), 83–94. https://doi.org/10.5304/jafscd.2013.033.004

Conner, D. S., Knudson, W. A., Hamm, M. W., & Peterson, H. C. (2008). The food system as an economic driver: Strategies and applications for Michigan. *Journal of Hunger and Environmental Nutrition, 3*(4), 371–383. https://doi.org/10.1080/19320240802528849

Cooke, S. & P. Watson (2011). A comparison of regional export enhancement and import substitution economic development strategies. *Journal of Regional Analysis and Policy, 41*(1), 1–15. Retrieved from https://jrap.scholasticahq.com

Han, W., Yang, Z., Di, L., & Yue, P. (2014). A geospatial web service approach for creating on-demand cropland data layer thematic maps. *Transactions of the ASABE, 57*(1), 239–247. https://doi.org/10.13031/trans.57.10020

Hand, M. S., & Martinez, S. (2010). Just what does local mean? *Choices, 25*(1), 13–18. Retrieved from http://www.choicesmagazine.org/

Henneberry, S. R., Whitacre, B., & Agustini, H. N. (2009). An evaluation of the economic impacts of Oklahoma farmers markets. *Journal of Food Distribution Research, 40*(3), 64–78. https://doi.org/10.22004/ag.econ.99760

Hewings, G. J. D. (1984). The role of prior information in updating regional input-output models. *Socio-Economic Planning Sciences, 18*(5), 319–336. https://doi.org/10.1016/0038-0121(84)90040-5

Hughes, D. W., & Boys, K. A. (2015). What we know and don't know about the economic development benefits of local food systems. *Choices, 30*(1), 1–6. Retrieved from http://www.choicesmagazine.org/

Hughes, D. W., Brown, C., Miller, S., & McConnell, T. (2008). Evaluating the economic impact of farmers' markets using an opportunity cost framework. *Journal of Agricultural and Applied Economics, 40*(1), 253–265. https://doi.org/10.1017/S1074070800028091

IMPLAN Group LLC. (2015). IMPLAN Pro (version 3.1). Retrieved December 30, 2015, from http://www.implan.com/index.php?option=com_content&view=article&id=153&Itemid=1702

Jablonski, B. B. R., & Schmit, T. M. (2016). Differential expenditure patterns of local food system participants. *Renewable Agriculture and Food Systems, 31*(2), 139–147. https://doi.org/10.1017/S1742170515000083

Jablonski, B. B. R., Schmit, T. M., & Kay, D. (2016). Assessing the economic impacts of food hubs on regional economies: A framework that includes opportunity cost. *Agricultural and Resource Economics Review, 45*(1), 143–172. https://doi.org/10.1017/age.2016.9

Jackson, R. W. (1998). Regionalizing national commodity-by-industry accounts. *Economic Systems Research, 10*(3), 223–238. https://doi.org/10.1080/762947109

Lazarus, W. F., Platas, D. E., & Morse, G. W. (2002). IMPLAN's weakest link: Production functions or regional purchase coefficients? *Journal of Regional Analysis and Policy, 32*(1), 33–47. Retrieved from https://jrap.scholasticahq.com

Lee, G.-E., Miller, S. R., & Loveridge, S. (2017). Modelling local food policy and greenhouse gas emission due to transportation. *Journal of Regional Analysis and Policy, 47***(**1), 75–87. Retrieved from https://jrap.scholasticahq.com

Lindall, S., Olson, D., & Alward, G. (2006). Deriving multi-regional models using the IMPLAN national trade flows model. *Journal of Regional Analysis and Policy, 36*(1), 76-83. Retrieved from https://jrap.scholasticahq.com

Low, S. A., Adalja, A., Beaulieu, E., Key, N., Martinez, S., Melton, A., … Jablonski, B. B. R. (2015). *Trends in U.S. local and regional food systems: A report to Congress* (Report No. AP-068). Washington, D.C.: U.S. Department of Agriculture Economic Research Service. Retrieved from https://www.ers.usda.gov/publications/pub-details/?pubid=42807

Low, S. A., & Vogel, S. J. (2011). *Direct and intermediated marketing of local foods in the United States* (Economic Research Report No. 128). Washington, D.C.: U.S. Government Printing Office. https://doi.org/10.2139/ssrn.2114361

Lyons, T. S., Miller, S. R., & Mann, J. T. (2018). A new role for land grant universities in the rural innovation ecosystem? *Journal of Regional Analysis and Policy, 48*(2), 32–47. Retrieved from https://jrap.scholasticahq.com

Mann, J., Miller, S., O'Hara, J., Goddeeris, L., Pirog, R., & Trumbull, E. (2018). Healthy food incentive impacts on direct-to-consumer sales: A Michigan example. *Journal of agriculture, Food Systems, and Community Development, 8*(1), 97–112. https://doi.org/10.5304/jafscd.2018.081.006

Martinez, S., Hand, M., Da Pra, M., Pollack, S., Ralston, K., Smith, T., … Newman, C. (2010). *Local food systems:Concepts, impacts , and issues* (Report No. ERS-97). Washington, D.C.: U.S. Department of Agriculture Economic Research Service. Retrieved from https://www.ers.usda.gov/webdocs/publications/46393/7054_err97_1_.pdf?v=0

Miller, R. E., & Blair, P. D. (2009). *Input-output analysis: Foundations and extensions.* Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/CBO9780511626982

Miller, S. R., Mann, J., Barry, J., Kalchik, T., Pirog, R., & Hamm, M. W. (2015). A replicable model for valuing local food systems. *Journal of Agricultural and Applied Economics, 47*(4), 441–461. https://doi.org/10.1017/aae.2015.19

O'Hara, J. K., & Pirog, R. (2013). Economic impacts of local food systems: Future research priorities. *Journal of Agriculture, Food Systems, and Community Development, 3*(4), 35–42. https://doi.org/10.5304/jafscd.2013.034.003

Otto, D., & Varner, T. (2005). *Consumers, vendors, and the economic importance of Iowa farmers' markets: An economic impact survey analysis.* (Leopold Center Pubs and Papers No. 145). Retrieved from Iowa State University Digital Repository website: https://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1146&context=leopold_pubspapers

Round, J. I. (1983). Nonsurvey techniques: A critical review of the theory and the evidence. *International Regional Science Review, 8*(3), 189–212. https://doi.org/10.1177/016001768300800302

Schmit, T, M., Jablonski, B. R. R., & Mansury, Y. (2013). *Impacts of local food system activities by small direct-to-consumer producers in a regional economy: A case study from upstate NY* (Working paper 2013-16). Ithaca, New York: Charles H. Dyson School of Applied Economics and Management, Cornell University. Retrieved from http://publications.dyson.cornell.edu/research/researchpdf/wp/2013/Cornell-Dyson-wp1316.pdf

Sherman, J., & Morrison, W. J. (1950). Adjustment of an inverse matrix corresponding to a change in one element of a given matrix. *The Annals of Mathematical Statistics, 21*(1), 124–127. https://doi.org/10.1214/aoms/1177729893

Shideler, D., & Watson, P. (2019). Making change through local food production: Calculating the economic impact of your local food project. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3), 165–177. https://doi.org/10.5304/jafscd.2019.08C.011

Stevens, B. H., Treyz, G. I., Ehrlich, D. J., & Bower, J. R. (1983). A new technique for the construction of non-survey regional input-output models. *International Regional Science Review, 8*(3), 271–286. https://doi.org/10.1177/016001768300800306

Swenson, D. (2009). *Investigating the potential economic impacts of local foods for Southeast Iowa* (Leopold Center Publications and Papers No. 66). Ames: Iowa State University. https://lib.dr.iastate.edu/leopold_pubspapers/66

Swenson, D. (2010). *The economic impact of fruit and vegetable production in southwest Iowa considering local and nearby metropolitan markets* (Leopold Center Publications and Papers No. 65). Ames: Iowa State University. https://lib.dr.iastate.edu/leopold_pubspapers/65

Thilmany McFadden, D. (2015). What do we mean by "local foods"? *Choices, 30*(1), 1–6. Retrieved from http://www.choicesmagazine.org/

Thilmany McFadden, D., Conner, D., Deller, S., Hughes, D., Meter, K., Morales, A., . . . Tropp, D. (2016). *The economics of local food systems: A toolkit to guide community discussions, assessments and choices*. Washington, D.C.: USDA, Agricultural Marketing Service. Retrieved from https://www.ams.usda.gov/publications/content/economics-local-food-systems-toolkit-guide-community-discussions-assessments

Tiebout, C. M. (1956). The urban economic base reconsidered. *Land Economics, 32*(1), 95–99. https://doi.org/10.2307/3159580

U.S. Department of Agriculture (USDA). (2012). *2012 Census of Agriculture: County Profile*. Washington, D.C.: Government Publishing Office.

USDA. (2013). *2012 Census of Agriculture: State level data*. Washington, D.C.: Government Publishing Office.

USDA Economic Research Service. (2016). *Food prices and spending*. Retrieved September 9, 2019, from http://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/food-prices-and-spending.aspx

USDA Farm Service Agency (USDA FSA). (2016). Crop acreage data. Retrieved from https://www.fsa.usda.gov/news-room/efoia/electronic-reading-room/frequently-requested-information/crop-acreage-data/index

USDA National Agricultural Statistics Service (USDA NASS). (2015). 2015 Local Food Marketing Practices Survey. Retrieved from https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Local_Food/index.php

USDA NASS. (2013). 2012 Census of Agriculture. *Table 1. State summary highlights: 2012*. Washington, D.C.: USDA. Retrieved from https://www.nass.usda.gov/Publications/AgCensus/2012/Full_Report/Volume_1,_Chapter_2_County_Level/

USDA NASS Cropland Data Layer. (2016). *Published crop-specific data layer*. Washington, D.C.: USDA-NASS. Retreived from https://www.nass.usda.gov/Research_and_Science/Cropland/SARS1a.php

Waters, E. C., Weber, B. A., & Holland, D. W. (1999). The role of agriculture in Oregon's economic base: Findings from a social accounting matrix. *Journal of Agricultural and Resource Economics, 24*(1), 266–280. Retrieved from http://www.waeaonline.org/publications/jare

Watson, P., Cooke, S., Kay, D., & Alward, G. (2015). A method for improving economic contribution studies for regional analysis. *Journal of Regional Analysis and Policy, 45*(1), 1–15. Retrieved from https://jrap.scholasticahq.com

Watson, P., Kay, D., Alward, G., Cooke, S., & Morales, A. (2017). A method for evaluating the economic contribution of a local food system. *Journal of Agricultural and Resource Economics, 42*(2), 180–194. Retrieved from http://www.waeaonline.org/publications/jare

Woodbury, M. A. (1950). *Inverting modified matrices* (Memorandum Report No. 42). Princeton, New Jersey: Statistical Research Group, Princeton University.

A. Appendix

This appendix is provided for the interested reader to demonstrate how the approach was carried out using IMPLAN. We incorporate the relevant literature motivating the approach as well as technical references for the procedures carried out. This study (above) provides a real-world application of the approach in which an LFS consists of parts of multiple states and includes a high level of diversity in terms of food production, ranging from conventionally produced row crops to specialty crops. We also include a hypothetical scenario that a typical policy make may pose and consider different factors and consequences of such a scenario.

A1. Measuring Local Food Benchmarks

Quantifying the size of the local food system requires understanding the construction behind the standard I/O model. We start with a standard representation of the regional industry-by-industry social accounting matrix as presented in Watson et al. (2015) and shown in Table A1. In the industry-by-industry specification, commodities are mapped into corresponding industries that produce and purchase those commodities, such that the industry category is representative of the value of commodities transacted. The transactions table underlies most regional I/O models, including IMPLAN, for calculating economic impacts. More importantly for this analysis, the transactions table shows, with a significant level of detail, the annual transactions that firms and households make with supplying industries. For the three-industry example provided here, reading down the industry column shows what the corresponding industry purchased for the production of q_i output. Industry 1 purchases z_{11} from its own industry, z_{21} from industry 2, z_{31} from industry 3, pays out v_1 to households and to indirect business taxes, and purchases m_1 imports as intermediate inputs. The sum of these purchases will equal the industry's output, q_1, as the sum of all intermediate purchases (industry sales and imports) and payments to factors and profits (incomes).

Table A1. Compacted Example of Industry-by-Industry Input-Output Table

		Industry Purchases					
		1	2	3	Consumption	Exog. Demands	Totals
Industry Sales	1	z_{11}	z_{12}	z_{13}	c_1	x_1	q_1
	2	z_{21}	z_{22}	z_{23}	c_2	x_2	q_2
	3	z_{31}	z_{32}	z_{23}	c_3	x_3	q_3
Income		v_1	v_2	v_3		x_4	v
Imports		m_1	m_2	m_3	m_4		m
Totals		q_1	q_2	q_3	c	x	q

Reading across an industry row shows who buys a given industry's output. Here, industry 1 sells z_{11} to itself, z_{12} to industry 2, and z_{13} to industry 3 as intermediate inputs to their production. It also sells c_1 to local consumers and exports x_1 outside the region to other domestic or global markets. Since every industry's expenditure represents another industry's revenue, the value of any industry's production will equate with the value of its sales.

By dividing all cells by their corresponding column totals, cell entries indicate the share of output, local consumption, and regional exports that make up each corresponding sector. These are the technical coefficients underlying a standard regional economic impact model. The industry column vectors of the table of technical coefficients represent unit production functions, or how much of each input is necessary to produce US$1's worth of output. From this, one can deduce that a decrease in imports will necessarily result in an increase in some combination of other industry inputs, such that the column continues to sum to one.

IMPLAN derives regionalized technical coefficients from the national technical coefficients, regionalized

by the share of inputs supplied locally (IMPLAN Group LLC, 2015). That is, the regional technical coefficients are national unit production functions adjusted for local availability. IMPLAN Pro. 3.0 introduced improved methods for estimating the local shares, or regional purchase coefficients (RPCs), based on a doubly constrained transportation-gravity model specification (Lindall, Olson, & Alward, 2006). The resulting RPCs for each commodity are applied across their respective rows of the national table of technical coefficients. This equal treatment of all purchasing sectors poses a shortcoming of using I/O models not based surveys to estimate sectors' contributions to the local economy (Round, 1983), as doing so implies that households purchase from local sources in equal shares as intermediary purchasers. Economists have found no satisfactory way of relaxing this assumption without incurring the high costs of surveying buyers and sellers in the study region (Stevens, Treyz, Ehrlich, & Bower, 1983). However, augmenting the base transactions table with surveys of selected sectors has proven to be a viable approach to differentiating local food from conventional foods in estimating impacts (Jablonski & Schmit, 2016; Swenson, 2010).

To exemplify how the industry-by-industry transactions table shown in Table A1 can quantify local food transactions, suppose the three industries in this example represent agricultural production (industry 1), food processing (2), and retail trade (3). As described in Miller et al., (2015), three equations can represent the value of local foods that are retained in the region as unprocessed or processed direct sales to consumers or as intermediated sales through more conventional channels.

To illustrate, consider that agricultural producers (z_{11}) sell to both food processors (z_{12}) and directly to consumers (c_1). Treatment of retail intermediation through retail channels is described below. Farm sales of local food can be estimated as the row sum of purchases as follows:

$$(1)\ Local\ Direct\ Sales = z_{11} + z_{12} + c_1$$

Processors take agricultural inputs and generate sales of processed foods. However, processors also purchase inputs including non-agricultural inputs like packaging and energy as well as imported agricultural inputs in the production of final goods. The goal is to account for the share that is supplied by local agricultural producers. Local food's share of food processor contribution (or the value added as this stage) is captured by the first term in equation 2. Since only the share that is not exported should be retained as local, the local purchases of manufacturing contribution is multiplied by the share of processed output that remains local, as captured in the second term in equation 2.[9]

$$(2)\ Local\ Processed\ VA = \left(\frac{z_{12}}{q_2 - v_2} v_2\right)\left(\frac{q_2 - x_2}{q_2}\right)$$

The value of trade transactions is captured in the final equation. Trade transactions require special considerations, as the trade sector transactions z_{13} only estimates the margins the trade sectors earn in handling goods for final sale. For fresh produce sales, the trade revenue is simply z_{13}. Capturing the retail margin value of local processed foods traded requires capturing retail margins of locally grown produce purchased by consumers and the share of retail margins earned from the sale of processed foods that are sourced locally:

$$(3)\ Local\ Trade = z_{13} + \left(\frac{z_{12} + Local\ Processed\ VA}{q_2}\right) z_{23}$$

[9] For clarity, this is not a conventional definition of local food in the context of what some consumers may expect from farmers markets. Instead, it is strictly a geographic definition. However, the concept of local food is evolving due in part to the inclusion of processed local foods, intermediaries, and holistic approaches to estimate the value of local foods systems (Miller et al., 2015).

This example illustrates the extent of measuring local agricultural production that remains in the local economy, that is, the output of the LFS. Using fixed ratios of employment to output by sector will provide employment direct effects of the LFS. Alternative definitions of local can be incorporated through modifications of production functions that reflect the selected definition of local foods as described in Thilmany McFadden et al. (2016).

A2. Measuring Economic Contribution of Local Foods

Cooke and Watson (2011) and Watson et al. (2015, 2017) used the social accounting matrix as the basis for valuing the economic contributions of LFSs. Methods drew on approaches for measuring the changes in interregional transactions from import substitution. Starting with Cooke and Watson (2011), the framework establishes a standard I/O economic impact specification derived from Table A1 as:

$$(4)\ \mathbf{q} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{x}$$

In equation 4, $\mathbf{q}$ is an N vector of total outputs that is reproduced as some multiple of the N vector of exogenous demands, $\mathbf{x}$. The NxN matrix $(\mathbf{I} - \mathbf{A})^{-1}$ is derived from Table A1, where the $\mathbf{I}$ matrix is an NxN identity and the $\mathbf{A}$ matrix of technical coefficients have elements $a_{ij} = z_{ij}/q_j$. This matrix is also called the Leontief inverse (or $\mathbf{L}$) and the *total requirements matrix* because summing down a column shows the total value of direct and secondary inputs required for generating US$1 of the corresponding sector output. The vector of industry I/O multipliers, $\mathbf{k}$, is calculated as the corresponding column sums of the $\mathbf{L}$ matrix. That is, the model structure is invariant to changes in production.

Changes in local purchase behavior, however, change the underlying structure of the local economy and will exhibit changes in the multipliers. For example, from Table A1, if industry 2 increases local purchases from industry 1 then $\Delta z_{12} > 0$ and $\Delta m_2 < 0$. In other words, the local inter-industry purchases deepen, reducing leakages from the economy. This deepening of the local economy decreases reliance on imports indicated as $\Delta\mathbf{k} \geq \mathbf{0}$. From this framework, a new multiplier for industry 1 ($k_1 + \Delta k_1$) multiplied by the change in local demand (Δz_{12}) to provide estimates of the economic impact of changes in local food demand. For small changes in local demand, Δk_1 will be small.

This approach gets more complicated when attempting to apply it to changes in local final demands. Local purchases for final consumption compete against imported goods for final consumption and exhibit an element of import substitution. Since it is for final consumption, such purchases should not feed back into the local economy as changes in the production process. Hence, institutional purchases of locally sourced foods should be treated as changes in exogenous demand, subject to fixed multipliers (Miller et al., 2015).

Watson et al. (2015; 2017) provided another framework for interpreting industry contribution to local economies. By diagonalizing the vector of final demands in equation 4, the output vector is transformed to an NxN matrix of outputs.

$$(5)\ \bar{\mathbf{q}} = \mathbf{L} \cdot \hat{\mathbf{x}}$$

In equation 5, the symbol ^ above the vector of exogenous demands denotes the NxN diagonalized vector $\mathbf{x}$, where each value x_i is placed on the diagonal as $\hat{x}_{ii}$, and off-diagonal elements are set to zero. Additionally, a bar (¯) is added to the $\mathbf{q}$ matrix to delineate it from the vector of total outputs, $\mathbf{q}$. According to Waters, Weber, and Holland (1999), a sector's export base is the component of a sector's output that fulfills export production, and can be estimated as the column sum of all production sectors of $\bar{\mathbf{q}}$ (industry sectors), as:

$$(6)\ EB_i = \sum_j \bar{q}_{ij}, \text{ where } j \in industry\ sectors$$

Alternatively, reading across the $\overline{\mathbf{q}}$ rows will reproduce the vector of total outputs $\mathbf{q}$. A sector's export base can be larger or smaller than the sector's total output because its contribution to the export base captures the intermediate input's contribution. From Table A1, subtracting the column of exogenous (export) demands $\mathbf{x}$ from the total output column $\mathbf{q}$, will provide a measure of contributions to import substitutions, that is, a vector of supply to local uses. Comparing the value of export base to the values of import substitutions indicates the contribution a sector makes to wealth creation in the region (Watson et al., 2015). Thus, wealth is created by exporting and generating an inflow of payments, while selling to local uses averts an outflow of funds for importing goods.[10]

A3. Measuring Net impacts of Local Food Sales

It is important to recognize that directing current production to local uses has an opportunity cost of not directing that output to exports (Conner et al., 2008; Swenson, 2009; Thilmany McFadden et al., 2016). It may be tempting to model the economic impacts of local food sales from receipts of farmers markets, but that overlooks the fact that by selling through the farmers market, the grower did not sell the same produce through other channels. However, the impacts should be the net of the export value foregone (Swenson, 2009). At the same time, it may be that local production may substitute for exported production if new land enters into the production framework. This consideration, is outside the scope of our approach but could be incorporated into future applications if changes in land use are known. For this study, we highlight here that the net economic effects of increasing LFSs can be estimated in two parts. The first part is the associated impacts of reducing food sector exports. The second is the increased local uses of the food sector output.

The export impacts of a change in output can be calculated with the standard I/O equation as follows:

$$(7)\ \Delta\mathbf{Q}^{\boldsymbol{E}} = \mathbf{L}^{\mathbf{0}} \cdot \Delta\mathbf{F}^{\boldsymbol{E}},$$

where, $\mathbf{L}^{\mathbf{0}}$ is the baseline Leontief inverse, $\Delta\mathbf{F}^{\boldsymbol{E}}$ is the value of direct sales (in this case change in export sales), and $\Delta\mathbf{Q}^{\boldsymbol{E}}$ is the vector of the total change in output required for generating $\Delta\mathbf{F}$ final sales, including direct and secondary effects. Equation 7 is the standard export-oriented economic impact relationship, where the Leontief matrix reflects fixed local expenditure patterns. Alternatively, increasing local demand shifts the relationships that underlie the Leontief inverse. The impact of an increase in local demand, holding exports constant, can be estimated as:

$$(8)\ \Delta\mathbf{Q}^{\boldsymbol{L}} = \mathbf{L}^{\mathbf{1}} \cdot \Delta\mathbf{F}^{\boldsymbol{L}},$$

where $\mathbf{L}^{\mathbf{1}}$ is the modified Leontief inverse reflecting a greater share of industry and consumer purchases of food imports being supplied by local producers, $\Delta\mathbf{F}^{\boldsymbol{L}}$ is the value of output diverted to local consumption, and $\Delta\mathbf{Q}^{\boldsymbol{L}}$ is the vector of total change in output required for generating $\Delta\mathbf{F}^{\boldsymbol{L}}$ in output.

Combining equations 7 and 8 provides an estimate of a one-to-one shift from exports to local sales. The net effects, **NE**, are calculated as combined impacts such that:

$$(9)\ \mathbf{NE} = \Delta\mathbf{Q}^{\boldsymbol{L}} + \Delta\mathbf{Q}^{\boldsymbol{E}} = \mathbf{L}^{\mathbf{1}} \cdot \Delta\mathbf{F}^{\boldsymbol{L}} + \mathbf{L}^{\mathbf{0}} \cdot \Delta\mathbf{F}^{\boldsymbol{E}}$$

Modeling a simple diversion of exports to local sales results in an additive inverse equality as:

[10] The economic base drives the local economy (Waters, Weber, & Holland, 1999), as the causal association is from basic to non-basic economic activity. This approach to assessing the sector contribution to economic activity, however, is subject to the critiques of economic base theory, as summarized in Tiebout (1956).

$$(10)\ \Delta\mathbf{F}^{\boldsymbol{L}} = -\Delta\mathbf{F}^{\boldsymbol{E}}$$

Substituting equation 10 for $\Delta\mathbf{F}^{\boldsymbol{E}}$ into equation 9 and simplifying provides:

$$(11)\ \mathbf{NE} = (\mathbf{L^1} - \mathbf{L^0}) \cdot \Delta\mathbf{F}^{\boldsymbol{L}}$$

The net effect of diverting production from export sales to local uses is the change in the Leontief inverse multiplied by the value of goods diverted to local use (Miller & Blair, 2009, p. 574). Given that changes in local uses are positive, the multipliers associated with $\mathbf{L^1}$ will be larger than those of $\mathbf{L^0}$, yielding a positive net impact. The total aggregate impacts are simply the sum of industry net effects ($\sum_i NE_i$).

A4. Inverse Importance Coefficients

Equation 11 provides a basis for understanding the potential impact of increasing local demand, but in the context that all users increase their purchases in equal proportion to current expenditures.[11] A policy analyst may be interested in the relative impacts of targeting sectors as purchasers of locally sourced commodities. In other words, shifting local demand from imports to local suppliers may be more impactful for some sectors than others. From an economic development planning perspective, this is analogous to identifying the intermediate uses of locally sourced goods that will generate the largest economic impact. This line of inquiry follows that of "important coefficients" of a matrix inverse (Miller & Blair, 2009, p. 567). From Table A1 and following Cooke and Watson (2011), an increase in industry 2's purchases of industry 1 output, $\Delta z_{12} > 0$, may generate relatively larger or smaller secondary impacts than, say, a change in industry 3 purchases from industry 2, Δz_{32}. By assessing the relative size of economywide impacts from each successive z_{ij}, one can assess the relative merit of focusing economic development efforts on key industry linkages.[12]

Important coefficients underlying the social accounting matrix (SAM) are identified by the proportional change in the size of the largest impacted total requirements matrix elements to the change in a direct requirements matrix element. Given a technical requirements matrix $\mathbf{A}$ derived from a transactions table $\mathbf{Z}$, a change in any set of elements produces a new technical requirements matrix $\mathbf{A}^*$. The total requirements matrix $\mathbf{L}$ is derived as:

$$(12)\ \mathbf{L} = (\mathbf{I} - \mathbf{A})^{-1}$$

The post-change total requirements matrix is calculated as:

$$(13)\ \mathbf{L}^* = (\mathbf{I} - \mathbf{A}^*)^{-1}$$

Proportional changes in the elements of $\mathbf{L}$ are calculated as:

$$(14)\ \mathbf{P} = 100 \cdot (\mathbf{L}^* - \mathbf{L}) \oslash \mathbf{L},$$

where $\oslash$ denotes elementwise division. Equation 14 calculates an NxN matrix of percent changes. Iterating through each element of the technical coefficient matrix, Hewings (1984) suggests that a coefficient generates

[11] Here, the net impact calculation is analogous to an increase in the sector's regional purchase coefficient (RPC), as applied equally to all purchasing sectors.

[12] A survey of the research in this area can be found in Casler and Hadlock (1997). This analysis follows Sherman and Morrison (1950) and Woodbury (1950) in assigning changes to an inverse matrix from changes in its primal form. Miller and Blair (2009) show the equivalent application in I/O modeling.

a significant change in the economy if it generates at least one **P** coefficient whose absolute value exceeds some predetermined benchmark, β, which could be established by expectations given prior literature. $\mathbf{P}_{rs}$ is significant if $p_{ij} > \beta$ for all $i = 1, \dots, N$ and $j = 1, \dots, N$, where *r* and *s* represent the row and column of the iterated element of the **A** matrix. Alternatively, important coefficients can be identified by comparing the percent change in resulting multipliers, as:

$$(15)\ \mathbf{PM} = 100 \cdot \mathbf{i}' \cdot \left((\mathbf{L}^* - \mathbf{L}) \oslash \mathbf{L}\right).$$

In equation 15, the vector **i** is an N column summing vector of ones and **PM** is a 1xN vector of the percent change in the size of sector multipliers. A change in one technical coefficient, a_{rs}, will result in changes in all sector multipliers. To gauge overall influence in the regional economy, a weighted average of the percent change in **PM** coefficients is calculated as:

$$(16)\ APM = \sum_{j=1}^{N} PM_j \cdot \left(Q_j \middle/ Q\right),$$

where APM is a scalar aggregate percent change in multipliers, and $Q = \sum_i^N Q_i$. The term in parentheses represents the weights of industry shares of total industry output. Larger values of APM denote changes in the technical coefficients that generate larger overall changes in regional output through indirect and induced effects.

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Incentivizing the reduction of pollution at U.S. dairies: Addressing additionality when multiple environmental credit payments are combined

Tibor Vegh [a] * and Brian C. Murray [a]
Duke University

Submitted November 8, 2018 / Revised March 28 and August 16, 2019 / Accepted August 28, 2019 / Published online January 27, 2020

Citation: Vegh, T., & Murray, B. C. (2020). Incentivizing the reduction of pollution at U.S. dairies: Addressing additionality when multiple environmental credit payments are combined. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 123–139. https://doi.org/10.5304/jafscd.2020.092.010

Abstract

This article examines the intricacies of environmental credit generation from concentrated animal feeding operation (CAFO) farm systems. Livestock production generates large amounts of manure (solid and liquid waste) and consumes a high volume of water that producers must manage to control odors and reduce pollution. To mitigate environmental impacts such as nutrient releases and greenhouse gas emissions, anaerobic digesters (ADs) can be used in CAFOs to avoid certain nutrient releases and capture the methane (CH_4) produced when manure is broken down anaerobically. Policy incentives have increased the use of ADs to reduce waste volumes and produce biogas for energy or bioelectricity, but the overall digester adoption rate is still very low (U.S. Environmental Protection Agency [U.S. EPA], 2010; 2014). To cover the higher cost of AD adoption relative to other forms of waste management, farmers may supplement the revenues they generate from the conventional outputs of a livestock operation (e.g., milk or meat) by selling credits into environmental markets. One question that arises is whether a single operation can sell into multiple credit markets by "stacking" credits—that is, receiving multiple separate environmental payments to finance the conversion to AD technology. The issue is that the use of stacked credits introduces the possibility that some of the stacked credits might be for benefits that are "non-additional" in that they do not produce incremental pollution reductions and thus are suspect for use in offsetting a buyer's pollution. This article describes the stacking problem and explores possible solutions, such as temporal constraints on credit issuance and discounting credits to account for additionality problems.

Keywords

Ecosystem Service, Anaerobic Digester, Credit Stacking, Carbon, Nutrient, Greenhouse Gas Emissions, Dairy Industry

[a] Nicholas Institute for Environmental Policy Solutions, Duke University, Durham, NC 27708 USA.

* *Corresponding author:* Tibor Vegh, Nicholas Institute for Environmental Policy Solutions, Duke University, Box 90335, Durham, NC 27708; +1-919-613-8721; tibor.vegh@duke.edu

Abbreviations Used

AD	Anaerobic digester
AFO	Animal feeding operations
BMP	Best management practices
CAFO	Concentrated animal feeding operation
CAR	Climate Action Reserve
CCA	Clean Air Act
CWA	Clean Water Act
ELGs	Effluent limitation guidelines
ESs	Ecosystem services
GHG	Greenhouse gas
K	Potassium
MRV	Measurement, reporting, and verification
N	Nitrogen
NMP	Nutrient management plan
NPDES	National Pollutant Discharge Elimination System
NPSs	Nonpoint sources
O&M	Operating and maintenance
P	Phosphorus
PSs	Point sources
REC	Renewable energy certificate
RPS	Renewable portfolio standard
TMDL	Total maximum daily load
USDA	U.S. Department of Agriculture
U.S. EPA	U.S. Environmental Protection Agency
U.S. GAO	U.S. Government Accountability Office
VSs	Volatile solids
WLA	Waste load allocation

Introduction

Protein consumption is increasing worldwide, and much of it is produced under some type of concentrated animal feeding operation (CAFO). Making these CAFO operations more environmentally sound is essential to improving local water and air quality and to mitigating climate change risks. Livestock waste containing nutrients such as nitrogen (N), phosphorus (P), and potassium (K) is typically treated on-site and subsequently applied to the land as a fertilizer. CAFOs, and especially dairies (the focus of this article), are farm systems that produce significant amounts of these nutrients, on the order of 80 pounds (80 pounds) of manure, containing 0.45 pounds (0.20 kg) of nitrogen, and 0.07 pounds (0.03 kg) of phosphorus, per day for each 1,000-pound (454 kg) dairy cow (USDA NRCS, 1992). Nutrient application rates that exceed plant uptake can generate excessive release into waterways, causing serious environmental damage. Various studies have demonstrated that N and P in dairy waste can lead to eutrophication problems in ecosystems (Smith, Tilman, & Nekola, 1999). Decomposing manure also emits methane (CH_4), a greenhouse gas (GHG) with approximately 25 times the 100-year global warming potential of carbon dioxide (CO_2) (Myhre et al., 2013). It also emits ammonia (NH_3) and hydrogen sulfide (H_2S), which contribute to localized air pollution. Thus, manure management at CAFOs has an effect on climate and the environment through changes in GHG emissions and air and water quality.

To lessen environmental impact, CAFOs need to meet water and, potentially, air quality standards under the Clean Water Act (CWA; 33 U.S.C. §1251 et seq., 1972) and Clean Air Act (CAA; 42 U.S.C. §7401 et seq., 1970). For compliance, CAFOs have been employing various technologies to reduce contaminants in their waste streams. These treatment methods include both aerobic (with oxygen) and anaerobic (without oxygen) processes and the filtration of wastes in wetlands (Arvanitoyannis & Giakoundis, 2006).

Anaerobic digesters (ADs) can be used in CAFOs to capture the methane produced when manure is broken down anaerobically. Policy incentives, primarily through voluntary adoption with cost-share or other forms of subsidy, have increased the use of this relatively mature technology to reduce waste volumes and in some cases to produce biogas for energy with the captured methane, but the overall digester adoption rate is still very low (U.S. EPA, 2018).

To cover the higher cost of AD adoption relative to other forms of waste management, farmers may supplement the revenues they generate from the conventional outputs of a livestock operation (e.g., milk or meat) by attempting to sell credits into multiple environmental markets. If they use the captured biogas to produce electricity on-site, they may be able not only to reduce their own on-site energy costs or sell power to the electrical grid, but also to sell renewable electricity certificates (RECs) to buyers seeking credit for using renewable power.

Another possible revenue source is GHG

credits, also known as carbon credits, and nutrient credits are examples of products sold in environmental markets that could help livestock producers cover the cost of installing and operating ADs. These credits, as described further below, can be used as marketable "offsets" that buyers can use to help meet their GHG reduction goals, renewable energy goals, nutrient pollution reduction goals (either regulatory or voluntary), or all of the above. One issue that arises is whether a single operation can sell into multiple credit markets by "stacking" credits. Stacking refers to receiving multiple environmental payments to finance the conversion to AD technology. A critical issue with credit stacking is whether it can be done without violating "additionality" criteria (Robertson et al., 2014). Additionality ensures that environmental credits generated by a project represent emission or pollution reduction relative to a business-as-usual scenario. In other words, a reduction that would not have occurred in the absence of said project is said to be *additional* to the status quo. Environmental credit markets typically seek to pay only for additional pollution reductions below some baseline level, making violations of additionality problematic from the perspective of the project's financial viability (Verified Carbon Standard, 2013).

Currently, no public policy addresses environmental credit generation in these farm systems, or in any other system in which multiple credits could be generated. The ambiguities that result from the lack of regulation, rules, or guidance might prevent some operators from adopting an AD system in their operations.

Clearly, multiple payments can increase revenues and thus increase the attractiveness of the AD investment. However, the use of stacked credits also introduces the possibility that some of the stacked credits might be for benefits that are "non-additional" in that they do not produce incremental pollution reductions and thus are suspect for use in offsetting a buyer's pollution. This article informs the development of environmental credit markets by (1) explaining various forms of stacking, such as horizontal, vertical, and temporal, and (2) describing when stacking would be acceptable and when it would be problematic.

This article explains the issues of how the dynamics of environmental credit programs can affect the intended environmental outcomes, which may help address issues stemming from CAFO systems that generate stacked credits. It offers background information on CAFO waste handling systems, types of pollution generated, and types of environmental payment options for CAFOs. It further identifies which types of incentives are and are not needed to induce AD adoption, and how rules for additionality and stacking affect these incentives in these farm systems. This information could be the basis for identifying the roles that government agencies such as the U.S. Department of Agriculture (USDA) may be able to play in establishing market standards or in gathering the data necessary to support standards not imposed by government. Although the focus is on technology, market, and institutional factors affecting environmental crediting from AD adoption at dairies in the United States, the issues addressed are relevant for a wide range of ecosystem service markets that arise in countries throughout the world.

Data Sources and Methods

No federal agency collects consistent and reliable data on CAFOs, which makes it challenging to credibly determine how many there are in the U.S. (Miller & Muren, 2019; U.S. GAO, 2008). An analysis of historical farm trends shows that a reasonable range in the number of operations of dairy CAFOs in the U.S. is somewhere between 2,700 and 4,300 (U.S. GAO, 2008). This number aligns very well with more recent data from the 2012 Census of Agriculture that shows 3,464 dairy operations with more than 500 head of livestock (USDA, 2019). These large dairy CAFO operations represent about 60% of the U.S. animal inventory, or 10.8 million dairy cows (USDA, 2019).

We assessed the environmental impacts of these CAFO operations as a snapshot for 2015 through a literature review focusing on nutrients, GHG emissions, and various manure treatment technologies. We calculated the prevalence of AD technology adoption at operating CAFOs based on U.S. EPA (2014) data and the AgSTAR database, which provides information on anaerobic digester projects on livestock farms in the U.S. The costs of AD installation and operation were based on ICF

(2013), adjusted to the year of analysis, 2015, using the federal Consumer Price Index (U.S. Bureau of Labor Statistics, n.d.).

Current Public Policy on Waste Management in CAFOs

Animal feeding operations (AFOs) are defined by the U.S. EPA (40 C.F.R. § 122.23, 2014) as feeding operations in which animals have been, are, or will be stabled or confined and fed or maintained for a total of 45 or more days in any 12-month period, and in which crops, vegetation, forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility (U.S. EPA, 2008a). A CAFO is defined as an AFO that is large (e.g., 700-plus dairy cows), medium size (e.g., 200–699 dairy cows), or a *significant contributor of pollutants to U.S. waters* (U.S. EPA, 2008a).

U.S. Environmental Regulations Relevant to CAFOs

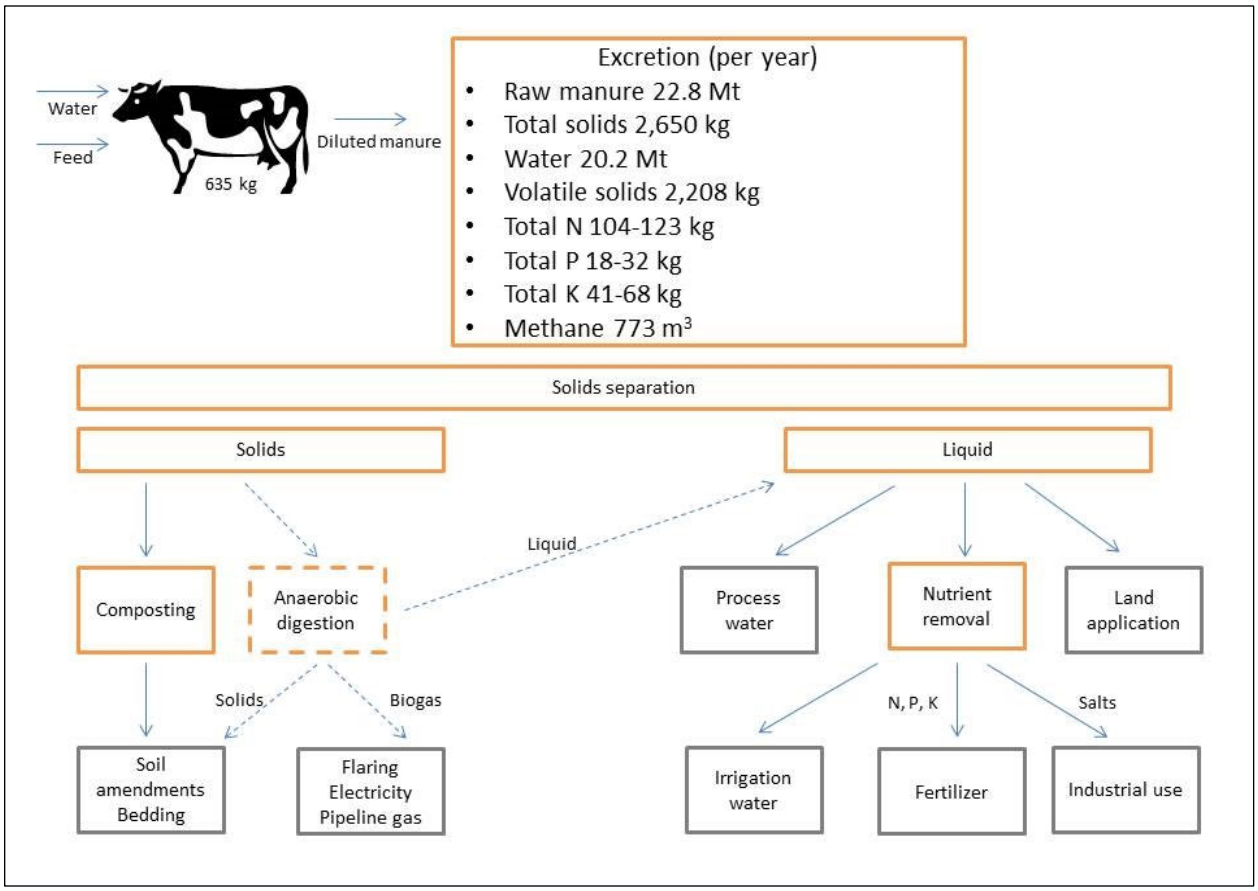
CAFOs were identified as *point sources* of pollution in Section 502 of the CWA. The CWA, through the National Pollutant Discharge Elimination System (NPDES) permit program (CFR Title: 40, 122.23(b)(1), 1990), sets effluent limitation guidelines (ELGs) and standards for certain pollutants from CAFOs. The CWA specifically mentions CAFOs, which are considered point sources under the act. In recent years, the U.S. EPA has increased the regulation of CAFOs, especially those operating anaerobic lagoons for waste management. After a series of changes, the final 2008 CAFO rule requires CAFOs to apply for permits if they discharge waste and nutrients into waterways (U.S. EPA, 2008). Along with the permit application, CAFOs that discharge waste must also develop a nutrient management plan (NMP), which is a tool for managing N and P through best management practices (BMPs) to meet effluent limitations and standards. The CAFO rule states that producers must calculate their nutrient release either in terms of pounds of nutrient per acre (i.e., using the *linear* approach), or the amount of wastewater (i.e., using the *narrative rate* approach). In either case, an annual report must be filed with release estimates. Overall, there is evidence that the enforcement of both water and air quality regulations relevant to CAFOs has been very limited to date (Hoover, 2013; Merkel, 2006; U.S. GAO, 2008).

Wastewater Properties and Management

Livestock waste management operations systems address manure production, environmental residuals, processing, and resource recovery. This article focuses on dairy CAFOs and describes conventional manure management processes and material flows of waste management (Figure 1). The specifics vary by type of livestock, operation size, and geographic location, but waste management processes include some or all of the following: flushing of waste, recycling of wastewater, waste storage, and pumping, digestion of waste, waste spreading, and solids separation and handling. Solids can either be composted or put through the optional anaerobic digestion process, which yields soil amendments and bedding, biogas, and liquids containing nutrients. Liquids gathered either in solids separation or as outflow from the AD can be used for process water, applied to the land, or put through nutrient removal processes that yield irrigation water, fertilizer, or products used for industrial purposes. Conventional methods of storage before land application vary across CAFOs and may include anaerobic lagoons, roofed storage sheds, storage ponds, underfloor pits, or above- or below-ground storage tanks (USDA NRCS, 1992). Of these methods, anaerobic lagoons tend to be the least expensive and, therefore, are often used in the management of wastewater (Pfost & Fulhage, 2000).

Pollutants associated with dairy manure management include the nutrients phosphorus and nitrogen (in the forms of nitrous oxide and nitrate, and ammonia); hydrogen sulfide; particulate matter (PM_x); and the GHGs methane, nitrous oxide, and carbon dioxide. When manure is land applied, its properties affect soils, ground and surface water quality, and air quality from local to global scales. Some nutrients, such as nitrogen, are recyclable through plants, whereas others, like salts (sodium or chlorine), are not and can have adverse effects on soils if applied in excess. From an environmental perspective, nitrogen, phosphorus, potassium, volatile solids (VSs), and salinity are the wastewater properties of most interest.

Figure 1. Process and Material Flow Diagram of Dairy Manure Management



Note: Grey boxes represent process outputs, arrows represent material flows, and dotted lines show material flows that are not part of conventional manure management. Dairy manure characteristics per cow are shown for a typical 635kg (1,400 pound) lactating dairy cow.

Source: Van Horn, Wilkie, Powers, & Nordstedt, 1994.

Anaerobic Digestion

During the AD process, bacteria break down organic material in the absence of oxygen and produce biogas, which contains 55–70% methane, 30–45% carbon dioxide, and other trace gases (Lazarus, 2008). The methane created in the AD process can be captured and either flared to produce carbon dioxide (a less potent GHG) or used as energy that can supplant fossil fuels (Murray, Galik, & Vegh, 2017). ADs thus have received attention for their potential to mitigate GHG emissions. However, with proper design, ADs have been shown to not only capture methane, but also have the potential to assist in odor control, reduce air and water quality degradation, and increase nutrient management flexibility, thereby generating environmental benefits in addition to reduced GHGs (Lazarus, 2008; Yiridoe, Gordon, & Brown, 2009).

Technology and Economics

The components of an AD include the digester vessel, manure handling system, gas handling and use system, and manure storage tank. Several types of ADs exist (Table 1), but the most widely used ADs in dairy systems are plug flow, complete mix, covered lagoon, and fixed film (Lazarus, 2008, Table 1, p. 9). The type of AD used depends on manure qualities (e.g., liquid, slurry). Free-stall dairy operations with daily-scraped alleys work well with ADs because the manure does not get mixed with dirt or stones and is moved into the digester while fresh. However, drylot dairies, beef, sheep, and poultry operations are not compatible with ADs

Table 1. Anaerobic Digester Types and their Prevalence among Dairies with Operating Digesters

	Plug flow	Complete mix	Covered lagoon	Other
Description	A long, narrow concrete tank with a rigid or flexible cover	An enclosed, heated tank with a mechanical, hydraulic, or gas mixing system	An anaerobic lagoon sealed with a flexible cover	Induced blanket reactors (IBRs) develop a blanket of sludge that retains anaerobic bacteria; fixed-film digesters contain plastic media which bacteria attach to and grow
Manure type	Works well for scrape manure management systems for semi-solid manure	Designed to handle slurry manure effectively	Used for flush or dilute manure in warm climates	IBRs works best with highly concentrated waste; fixed-film technology is suitable for diluted waste
Prevalence (%)	53	32	10	5

Sources: North Carolina Cooperative Extension, 2012; U.S. EPA, 2014b; U.S. EPA AgSTAR, 2018.

because the manure may decompose before it is scraped.

In 2009, the U.S. Secretary of Agriculture set a target to reduce GHG emissions from dairy operations by 25% before 2020, using ADs as the primary method for meeting this goal (USDA, 2009). Though costs have been falling steadily over time, AD adoption rates have been low due to the high upfront capital and operating and maintenance (O&M) cost requirements. Of the approximately 3,464 dairy CAFOs with more than 500 animals in the U.S. (USDA, 2019), only 282 (8%) have ADs (U.S. EPA, 2019). A U.S. EPA AgSTAR report has identified 500 dairy cows or 2,000 head of swine as the minimum for which an AD is likely to provide positive financial returns, but this threshold depends on the cost of alternative (fossil) fuel sources for electric power generation, a factor made more relevant by the recent substantial decline in natural gas prices (U.S. EIA, 2016). Based on available data (ICF, 2013), adopting an AD in a 500-animal dairy CAFO requires an upfront capital investment of US$600,000– US$875,000 to construct the digester unit itself and an additional US$110,000–US$160,000 annually for operation and maintenance. For an average size operation (n=2,394, U.S. EPA, 2014), the capital costs of a covered lagoon, complete mix, or plug flow digester are in the range of US$1.6, US$1.8, and US$2.2 million 2014 inflation-adjusted (U.S. BLS, 2014), respectively (ICF, 2013). A report on digester economics in the state of California, the largest dairy producer in the United States, concluded that the costs of building an AD typically outweigh the benefits (revenue) if ecosystem services (ESs) are not priced (Lee & Sumner, 2014). As described above and elaborated on below, these ESs can be priced through a credit program and can include carbon credits, nutrient reduction credits, and—if the AD is producing renewable energy—RECs.

Potential for Pollution Reductions

Methane emissions reductions

According to ICF (2013), methane generation and capture per dairy cow are approximately 582 to 690 m^3/year/animal (384 to 455 kg/year/animal), depending on the type of AD. Different types of digesters allow for varying degrees of substrate breakdown and capture. If the manure of all 10.8 million cows in large CAFOs (USDA, 2019) were treated in an AD, the potential amount of methane emission reductions, depending on AD type, are 3.6 to 4.2 MMt methane/year, assuming an 85% collection efficiency (CAR, 2009). This is equal to 13.6%–16.0% of U.S. methane emissions in 2016—a carbon dioxide equivalent of 90 to 105 MMt carbon dioxide equivalent per year or the subtraction of some 14 million cars off U.S. roads. However, these numbers are not counted against a baseline, which in this case would be an aerobic or anaerobic conventional manure management system with positive emissions.

Nitrogen, Phosphorus, and potassium reductions

Relative to conventional manure management systems, ADs do not change the amount of nutrients in the waste stream and do not significantly reduce manure volume. In fact, anaerobic digestion does not reduce the mass of total nitrogen and phosphorus within the waste stream; it only mineralizes organic nitrogen and phosphorus to inorganic forms, ammonia, and phosphate, respectively. Ammonia can be converted to nitrate for plant uptake and is preferred for minimizing nitrogen leaching losses.

As part of a conventional manure management system, solids separation can remove 10%–20% of nitrogen and 5%–20% of phosphorus (Frear, 2012), and this process can be part of an AD operation. Dedicated nutrient recovery systems and methods such as micro-screens, centrifuges, polymer flocculation, nitrification/denitrification, ammonia stripping, and struvite can help extract additional nitrogen and phosphorus from waste effluent with varying efficiency (Ma, Kennedy, Yorgey, & Frear, 2013). These technologies traditionally are not used at CAFOs but are being developed and tested as post-processors of ADs for the expressed purpose of reducing nutrients from the effluent, typically for land application in lieu of fertilizers. According to one industry source, current nutrient recovery technology can achieve effluent nitrogen recovery rates of 40% and phosphorus recovery rates of 80% (Informa Economics, 2013). These rates are equivalent to 0.1–13 kg nitrogen and 0.04–0.07 kg phosphorus/cow/day. A more recent study claims that current technology is capable of removing 98.3% of nitrogen, 100% of phosphorus, and 99.15% of potassium, from the effluent, which could result in large credit generation potential, depending on these rates compared to regulatory requirements and baseline practices (Douglas, 2012). Whether a nutrient recovery system is installed postdigestion or as a standalone operation in a conventional system depends on various factors, such as whether the nutrient reduction benefits justify the additional costs of adding the nutrient recovery system. The monetization of nutrient reduction benefits will be affected by the dairy operators' ability to sell nutrient reduction credits.

Adoption Economics

Because AD is a costly addition to conventional waste management systems, with or without an additional nutrient recovery system, dairy operators need some economic or regulatory reason to cover an AD's costs and incentivize adoption. The up-front cost of AD adoption has been a large obstacle yet to be overcome at scale, even with the availability of numerous funding mechanisms; it will be a larger obstacle if nutrient recovery systems are added (U.S. EPA, 2012). Funding for the construction of ADs may come from grants, loan guarantees, or similar funding mechanisms. Although these subsidies can be useful in covering up-front costs, the focus of this article is on the potential for AD to generate economic value beyond the core commodity outputs (e.g., milk or meat).

Value Stream from Bioenergy Production

One potential revenue source from AD is from the on-site generation of biogas or electricity that can be sold into energy markets or used to reduce on-site energy costs (Murray et al., 2015). One question producers might face is whether to use the biogas produced on-farm to produce power on-site or to ship off-farm as piped biogas, assuming such a connection to the system is feasible. Broader energy market trends, specifically those in the natural gas market, have a large influence on biogas markets and affect how producers use the biogas captured in ADs. Pipeline biogas, a substitute for natural gas, may be competitive with the on-site generation when natural gas prices are high, which does not describe the current reality (in 2019), but could if prices increased due to restrictions in supply or increases in demand. Another potential source of revenues could come from environmental markets that buy pollution reduction credits, as described below.

Revenue from Credits Sold in Environmental Markets

Other potential revenue sources to finance AD adoption are from environmental markets, particularly those for GHG reduction offset credits, RECs, and nutrient reduction credits. These credits and certificates can be sold to other entities seeking compliance with regulatory mandates (e.g., renewable portfolio standards now in place in approxi-

mately 30 U.S. states [Barbose, 2018]) or to voluntary buyers. These markets are in various stages of development, and several areas of ambiguity remain.

GHG Credits

When the conventional CAFO waste management technology without AD adoption is an anaerobic technology (e.g., lagoon storage of wastes), it generates emissions of methane, a greenhouse gas. As discussed above, ADs can provide a way of reducing methane emissions by decomposing the manure in the digester. Though GHGs have been the subject of regulation in the U.S at the federal level for over a decade, specific regulations to achieve reductions have lagged.[1] Meanwhile, GHGs have been regulated in 10 U.S. states. While agriculture is not likely to be a directly capped source under federal or state programs in the foreseeable future, emissions reductions from AD adoption could, in principle, be used to generate GHG offsets for those facilities that are facing GHG regulation. This is now the case under the current cap-and-trade law controlling GHGs in California. These reductions could also enter into a voluntary market for emissions reductions without a regulatory inducement.

The generation of such GHG reduction credits is typically verified by third-party organizations, registered by a voluntary registry, or used for compliance (e.g., in the California market) after the appropriate conversion of methane credits to carbon credits, based on the higher global warming potential of methane relative to carbon dioxide.

In the U.S., the California compliance carbon market and voluntary carbon markets have published protocols that describe how ADs can generate credits only if an anaerobic system, such as an anaerobic lagoon, was in place prior to the adoption of AD technology. The reason for this is that methane is not generated in aerobic systems, and thus installing an AD on an aerobic system would increase methane production rather than reduce emissions below the status quo.

Other requirements of protocols also affect ADs. For instance, the Regional Greenhouse Gas Initiative (RGGI, 2013), which regulates power plant emissions in nine Northeastern U.S. states, declares that GHG offsets cannot be generated if the offset project has an electric generation component, unless the legal right to credits is transferred from the project sponsor. This caveat would apply to ADs regardless of size.

Renewable Electricity Certificates

RECs represent environmental and other non-power *attributes* of renewable electricity generation, but not the electricity itself (U.S. EPA, 2008b). This definition has been referenced as the conceptual basis for RECs, including GHG benefits (one attribute of renewable electricity), and might by itself suggest that RECs and GHG credits should not be sold separately. There has been an ongoing debate about this issue, however. For example, according to North Carolina's NC Senate Bill 3, GHG effects are not included in RECs (North Carolina General Statutes § 62-133.8(a)(6), [2014]). Specifically, the statute states that "A 'renewable energy certificate' does not include the related emission reductions, including, but not limited to, reductions of sulfur dioxide, oxides of nitrogen, mercury, or carbon dioxide" (para. # 6). Thus it would appear that legislation such as this, which separates GHGs from other environmental attributes inherent in RECs, can override any presumed restriction on the separation of a GHG credit and an REC.

To others, such as the U.S. EPA, a REC represents one megawatt-hour of renewable electricity and the right to claim the attributes (benefits) of the renewable generation source for only one buyer. Specifically, the EPA states that a REC represents the environmental, social and other non-power attributes of renewable electricity generation (U.S. EPA, 2019b). Therefore, the debate over exactly what attributes a REC does and does not include remains unresolved, and no oversight from government or independent parties currently

[1] At the federal level, GHGs are deemed a pollutant to be regulated by the U.S. EPA under the Clean Air Act, but recent federal efforts to regulate GHGs have been tied up in legal and political combat, including a federal cap-and-trade program that failed to clear the U.S. Congress in 2011 and the Trump administration's reversal of GHG caps on the electric power sector in 2017.

exists. It is thus important to pay attention to the governing laws of the system in which RECs are sold.

State renewable portfolio standards (RPSs) require a certain percentage of the electric power to be supplied by renewable sources such as wind, solar, and bioenergy. RECs are generated by renewable electricity producers and are used by power utilities to collectively meet their renewable generation requirements under state RPSs. Renewable power producers thus produce two distinct commodities: undifferentiated electricity (renewable power that has the same physical characteristics as non-renewable power) and RECs. They can sell the power into the grid like any other producer, but they sell RECs into a separate commodity market. The buyers in the REC commodity market are the power companies in states that are obligated to meet the RPS target. A company is compliant if the ratio of RECs to total generation equals the RPS target.[2] In some cases, there are special "carve-outs" for specific types of power. For instance, in North Carolina, the RPS target is 12.5% by 2021 for investor-owned utilities (10% by 2018 for cooperatives and municipalities), but 0.2% of power must be met by bioenergy from swine operations and 900,000 MWh from poultry waste, both of which are tied to AD production methods, illustrating how major agricultural producer states can put in place particular incentives based on their own situation.

Wherever the electricity produced from methane through the AD process qualifies under an RPS, digester operators can sell RECs at the actual market price separately from the actual electricity. Conventional manure management systems typically do not produce electricity or biogas, because methane collection is difficult without an AD. The producer who does produce power using biogas from an AD system typically signs a power purchase agreement with a utility company to sell the generated electricity, which is equal to the total renewable electricity production in the AD. Alternatively, the producer can use the electricity on-farm to run equipment and reduce operating costs.

Nutrient Credits

In 2003, the EPA issued a Water Quality Trading Policy that stipulated the conditions under which water quality trading could be used to meet compliance with total maximum daily load (TMDL) limits for nutrients (N and P) and sediments (U.S. EPA, 2003). Under these provisions, regulated sources of these pollutants, in principle, can engage in nutrient trading to meet the loading requirements more cost-effectively. Nutrient credit trading is defined as the sale of a unit of nutrient credit that was generated by a source as a result of nutrient reduction below that source's permit limit that the buyer can use to compensate for its own exceedance of that limit by a corresponding amount. Agriculture operations are typically considered nonpoint sources (NPSs), which include all sources and means other than direct discharges from point sources (PSs), by which pollutants may end up in water bodies.

In the case of ADs, the regulatory process for credit calculation is conceptually straightforward but can be difficult in practice (Douglas, 2012). CAFOs and ADs are distinct from other agricultural activities in that they are regulated point sources under the CWA and can discharge no more than their waste load allocation (WLA), which is included in their NPDES permit. CAFOs are required to be "zero discharge" for the production area itself per 40 CFR 412, but CAFOs are still assigned a WLA because of possible overflows from the production area. However, by installing an AD to digest manure, and a dedicated nutrient recovery system to remove nutrients, the CAFO may earn PS nutrient credits by reducing nutrient outflows to below that specified on its NPDES permit. Thus, the credit is calculated as the amount of pollution reduction below the CAFO's permit limit, or:

$$Credit = WLA_{\text{without AD}} - Waste\ Load_{\text{with AD}} \quad (1)$$

Nutrient credit trading can take one of three forms: (1) credits generated by PSs available for sale or transfer to other PSs for regulatory compliance; (2) credits generated by PSs and NPSs for

[2] Power producers in states facing an RPS are typically allowed to use RECs that are generated in other states, as long as the credits are verified and have cleared a registry to ensure that they are only used once in any state.

regulatory compliance for PSs; or (3) credits generated by PSs and NPSs sources for regulatory compliance for both PSs and NPSs. ADs regulated as point sources under the CWA can best take advantage of nutrient credit markets in the third scenario because of higher credit prices due to higher demand.

Baselines and Additionality

Two of the environmental credit markets of interest in this article—nutrients and GHGs, but not RECs—generally seek to pay only for *additional* pollution reductions below some baseline level. The fundamental calculation for a pollution reduction (offset) credit can be expressed:

$$Credit = Baseline\ pollution - Pollution\ with\ AD \quad (2)$$

Nutrient Baseline = WLA. "Baseline" pollution refers to the pollution expected from an operation if standard operating practices are followed and, in the case of water pollution, mandated nutrient load allocations are met. For example, the baseline level of nutrient pollution for a CAFO is its WLA specified on its NPDES permit. Because nutrient loads from CAFOs are regulated—although monitoring of nutrient pathways in the effluent for land application, or monitoring of water quality on-site is not required—the only additionality requirement for nutrient crediting is that the waste load with AD be below the WLA, as discussed in the previous section and defined in Equation 1.

GHG Baseline Alternatives. For other pollutants that are not directly regulated at CAFOs, such as GHGs, baseline determination is more complicated. In principle, it is the quantity of that pollutant generated under current conventional management practices, which include practices at similar-size operations in a similar location. If a comparable cohort is not available, or if a new facility is being considered, there are several alternative ways to define a baseline, as described below.

In principle, crediting occurs when emissions are reduced below the baseline, as long as the action is deemed additional to what otherwise would have occurred under business-as-usual circumstances. In practice, the application of baselines and additionality principles can be complicated. In environmental markets, four forms of additionality are typically considered (World Resources Institute [WRI], 2014):

- Regulatory additionality refers to environmental benefits beyond those required by law;
- Temporal additionality refers to new practices implemented after a certain point in time;
- Performance standard (also known as "baseline") additionality establishes a performance standard above which the adopted action is considered a material improvement over business as usual; and
- Financial additionality means that projects would not have occurred without the revenue provided by a crediting market or program.

Using the Climate Action Reserve (CAR) protocols for GHG credits as examples, there are dual additionality requirements: (1) regulatory additionality, using a legal requirement test; and (2) a performance standard. In the case of an AD, the legal requirement test would find that there are no laws, statutes, regulations, or mandates requiring the installation of an AD in livestock operations (CAR, 2013a) or that limit GHGs from CAFOs in any way. The performance standard test would require detailed analysis, including baseline emissions modeling and calculating projected methane emissions, the difference of which is the number of credits calculated.

Temporal additionality is fairly straightforward in that it sets a date certain after which payments would be deemed non-additional. The financial additionality criterion, though not used by CAR, could be used in other future protocols, and we argue is the most relevant criterion to the issue of credit stacking. Financial additionality tests whether or not a project is financially viable when all sources of revenue, excluding revenue from environmental markets, are considered. The underlying question is whether stacking leads to a situation in which some projects would be financially viable with some but not all of the credits being issued.

Therefore, the financial additionality criterion is met for an environmental credit stream in question if, absent that stream (and including all other revenue sources, including other environmental credits), the project is not financially viable.

The stacking of environmental market credits allows producers to receive payments for multiple ecosystem services generated by a new project or practice, such as AD adoption. In the case of a CAFO, stacking can take four forms (WRI, 2014):

- Horizontal: Different environmental credits issued for different projects on the same property.
- Vertical: Different environmental credits issued for one project.
- Temporal: Different environmental credits issued over time.
- Payment: Combining other forms of finance (e.g., government cost-share programs) with environmental credits.

From a financial additionality standpoint, the least concerning for a CAFO is horizontal stacking, because each project, if fully independent, should have its own distinct set of financial and additionality requirements. Consider a large farm that plants trees to sequester carbon for GHG credits, uses best cropland management practices to reduce N runoff, and adopts an AD to manage CAFO wastes and possibly generate GHG credits. Each of these projects stands on its own and should present no additionality problems if all credits on the separate projects go to one landowner.

Vertical stacking and temporal stacking create potential financial additionality issues for CAFOs with ADs. That is because the AD system with dedicated nutrient removal and bioelectricity generation can potentially supply GHG and water quality credits as well as RECs, and it is possible that credits from a subset of those activities would provide sufficient incentives for adoption, leaving the remaining credits unnecessary—and, in principle, non-additional as described above. The environmental value of such non-additional credits is zero since they represent no additional environmental benefits from the project, and attributing positive values to them is equivalent to overestimating the true amount of pollution reduction these credits represent. Similarly, payment stacking of multiple sources of funding for the same *project* is also concerning, because financial additionality in each environmental market or other funding sources may be affected.

Stacking, Baselines, and GHG Additionality under an AD's Joint Production of Pollution Reduction

ADs with nutrient recovery can generate multiple forms of pollution reduction jointly, meaning roughly in fixed proportions at the same time. This reality complicates the notion of a baseline, especially when, by stacking, the AD operation is simultaneously paid for by RECs, GHG credits, and nutrient credits—or two of the three—raising the financial additionality issues just described.

The joint-production-stacking example can be shown by the hypothetical example in Table 2, which shows the profitability of AD adoption under five scenarios, ranging from a single revenue stream from conventional agricultural commodities (e.g., milk and meat from a dairy) to multiple revenue streams from agricultural commodities, bioenergy, RECs, nutrient credits, and GHG credits.

Table 2. Hypothetical Example of the Impact of Credit Stacking on the Profitability of AD Adoption

Revenue Stream	NPV of AD Adoption
Ag commodities only	Negative (unprofitable)
Ag commodities Bioenergy revenues (or cost reductions)	Negative (unprofitable)
Ag commodities Bioenergy revenues (or cost reductions) RECs	Negative (unprofitable)
Ag commodities Bioenergy revenues (or cost reductions) RECs Nutrient credits	Positive (profitable)
Ag commodities Bioenergy revenues (or cost reductions) RECs Nutrient credits GHG credits	Positive (profitable)

Table 2 shows that adoption becomes profitable once the nutrient credits are added to the stack, which alone might suggest that an AD with revenues from agricultural commodities, bioenergy, RECs, and nutrient credits is a viable economic proposition. If so, it could be asserted that the availability of these revenue streams creates a "new baseline" (see equation at the top of this section) against which the generation of GHG credits would be evaluated. This new baseline could, in principle, place some restrictions on the stacking of nutrient credits on top of the other credits. Establishing such a baseline would require coordination among multiple environmental credit markets or at least the development of joint protocols to use for the measurement, reporting, and verification (MRV) of multiple environmental credits. For instance, because nutrient reduction would be presumed to occur under the new baseline for GHG crediting, it could be argued that no GHG credits should be issued given that no additional reductions are being induced by the inclusion of GHG credits. The reasoning is that the buyer of a GHG credit would be given the right to emit a corresponding quantity of GHGs elsewhere. Thus, if the credited action is not associated with a real reduction, the exchange would effectively allow pollution to increase rather than to attain pollution neutrality as intended.

Alternatively, if the AD investment in Table 2 were determined *not* to be profitable with the nutrient credits in place, the additionality of the GHG credit stack would not be as questionable. Presumably, the GHG payments would be necessary to adopt AD and produce the corresponding level of GHG reductions (and nutrient credits, RECs, and electricity).

Stacking over time. Now consider stacking over time. In the Table 2 example, AD adoption might be expected to occur if the first four revenue streams (commodities, energy sales, RECs, and nutrient credits) can be stacked, because the NPV of adoption is positive. However, if GHG crediting becomes available a couple of years after AD adoption at a specific dairy—a possibility given the preexistence of ADs at dairies prior to the establishment of GHG credit markets—the GHG credits might not be considered additional, because no actual change in practice would occur to generate the credits. Because of the path dependence illustrated in Table 2, contemporaneous stacking presents difficulties in determining which credit streams are non-additional; with temporal stacking, it is easier to flag such streams as non-additional.[3]

Fixed versus variable environmental benefits. In the stacking example above, it is assumed that the technology produces environmental benefits in fixed proportions. This may not be the case for nutrient reductions achieved with AD. Substantial nutrient removal may require a process separate from anaerobic digestion to further reduce N loadings, thereby generating incremental nutrient reduction benefits, but at an incremental cost. In this case, the conditions under which stacking is acceptable may include a nutrient credit payment to cover the cost of the separate nutrient production process. If so, allowing full stacking of all credits may present no additionality problem.

Temporal, horizontal, and vertical stacking are not discussed in crediting programs reviewed in this article. The California cap-and-trade regulatory compliance protocol for GHG offsets does not mention stacking. However, the CAR has been trying to tackle the stacking issue since 2011, when it formed its Credit Stacking Subcommittee. Currently, only the CAR Nitrogen Management offset protocol (CAR, 2013b) mentions stacking, but only the credit and payment stacking forms of the issue. The protocol does not comment on the former, but it provides detailed analyses of stacking where government payments are used for financing. Because most environmental payment systems have developed independently of one another, changes in their structures are likely needed to achieve a more streamlined system of environmental markets (WRI, 2014).

[3] However, it is conceivable that the project investor could claim that it is the *expectation* of a GHG credit market materializing that caused them to invest in AD, thereby claiming that the GHG credit should be additional. There is no case law that we know of that addresses this issue.

Discussion

A unique constellation of market opportunities presents itself to CAFOs, particularly dairies, adopting AD. First, in these food production systems, revenues from environmental markets may be treated differently than traditional goods because additionality and stacking need specific consideration only in environmental markets. There are important differences between traditional goods and environmental goods, like GHG reductions. The former arises from purely innate preferences for given products, the associated willingness to pay for those attributes, and the technology and costs to produce them, all of which determine a market price and quantity. The role of government in these markets is primarily limited to ensuring that production occurs safely, dependably, and competitively.

Environmental goods, such as GHG reductions, are public goods, which means that they typically lack "natural" markets to facilitate their exchange (Keohane & Olmstead, 2016). Inherent problems such as lack of excludability and nonrival consumption lead to free-riding, which makes it difficult to create and sell GHG reductions in a private setting. As such, pollution control usually occurs through a regulatory mandate. That is the case here, with one further twist: an environmental credit generated through AD adoption can be sold to another party using the credit as a right to pollute elsewhere (an "offset" [Murray, 2010]). Therefore, if the action underlying the credit does not lead to a real pollution reduction, allowing the credit transfer to occur will lead to an unintended increase in pollution rather than to a net-zero change. Prudent efforts to ensure that reductions are additional to what would have occurred anyway are important to protect the environmental integrity of the exchange.

Second, it may be difficult to determine whether a digester should be given credit for all of the methane and GHGs captured or only the methane and greenhouse gases that would have been emitted if the digester had not been used. The general notion of crediting an action for its level of emissions reduction is that it captures a level of emissions that is lower than if the action had not been taken. But what would have happened otherwise? Under AD adoption, the most reasonable assumption is that the "conventional" forms of waste management would have been undertaken (e.g., solids separation, land application). Therefore, what should be credited is the net difference in methane and other GHG emissions under an AD and an estimate of those emissions under conventional management. Crediting all GHGs captured under an AD would only make sense if all those GHGs would have ended up in the atmosphere if conventional practices were followed.

However, ADs can be accompanied by complicating factors. ADs capture a higher percentage of methane relative to conventional anaerobic non-AD systems, such as anaerobic lagoons, so the reductions are presumably creditable if a conventional anaerobic technology would otherwise have been used. However, if the otherwise-used technology had been an aerobic system, little to no methane would have been generated, so there would be little to no emissions to reduce. In this case, AD is only capturing the methane that the alternative (aerobic) technology would not have generated. As such, no real emissions reduction occurs. Based on the CAR protocol, the baseline emissions equal those from an *anaerobic* system used before AD adoption. Thus, if an *aerobic* system had been used, no methane would have been generated, and no credits would be issued after AD adoption. There are also intermediate cases; for instance, co-digesting manure with solids (e.g., straw) that would not have been broken down anaerobically in a conventional system lowers the amount of emissions reduction attainable by the AD.

A third issue arises around the number of nutrient credits generated. A digester potentially could earn nutrient credits for all of the nutrients captured on-site and not applied to land near an impaired watershed. However, a complication arises when the producer using that digester imports fertilizer to replace the removed nutrients, or if the removed nutrients are just applied to land elsewhere in the watershed. As with the question on the scope of GHG credit, AD—specifically the nutrient removal technology—should in principle earn nutrient credits for the difference in nutrient loadings relative to the WLA without the AD. For

example, if manure is now processed by an AD and nutrients are removed by a separate process rather than land applied, the avoided loadings relative to the WLA from land application, in principle, are creditable. However, a consistent approach would, at a minimum, consider the *net change* in loadings from the whole CAFO system. Thus, if imported fertilizers are now land applied in lieu of manure on the CAFO property, which used to apply manure at agronomic rates (e.g., to grow feed), loadings from those fertilizers should also be included in the credit calculation. It may still be the case that the loadings from fertilizer application are less than those from manure application, making for a net improvement, but the credits should be reduced by any loadings that will occur in the new system.

Matters are more complicated when nutrients from the AD are applied to land outside the boundaries of the CAFO property, leading to concerns of spillover effects (leakage) if pollution is simply displaced. If the nutrients are applied on lands subject to NPDES permitting, the loadings are controlled—or at least are controllable—and spillovers are less of a concern. If nutrients are applied on lands not subject to NPDES permitting, there may be spillover effects to consider. If the land is not subject to NPDES permitting because it is in an unimpaired watershed, spillover concerns may be minimized. However, spillover effects at a scale large enough to transform unimpaired watersheds into impaired watersheds would clearly be a problem. One solution is more careful monitoring of loadings on all watersheds, but that has a cost. Another solution would be to avoid overapplication by requiring nutrient management plans for farms that receive nutrients from an AD. Policymakers should weigh the benefits of nutrient trading against the potential risks to currently unimpaired watersheds and the costs of enhanced monitoring to make a reasoned decision.

Conclusion

Stacking of environmental credits can create problems in an offset crediting system when the technology of interest (here, AD) jointly produces multiple creditable benefits (Robertson et al., 2014). The problem occurs when credits are assigned for some benefits that would be produced anyway—the non-additionality problem—as when AD adoption is profitable only if a subset of the benefits are paid for, thereby generating the extra benefits "for free." Any credits issued for the free benefits are problematic if they allow the credit buyer to pollute more. Solutions to this situation are difficult because the baseline to which actual performance is compared is often a counterfactual—something that did not occur or will not occur, but represents an estimate of what would have occurred if the payments were not made. Moreover, with the multiple credits at issue in stacking, the path dependency and sequencing of payments make the additionality determination of single-credit payments particularly challenging. Because of this difficulty, environmental protocols have largely sidestepped the issue. The main difficulty is the arbitrary assignment of crediting streams for purely joint production technologies; which benefit streams come first? If each type of credit can be generated only with incremental effort and cost, additionality is less of a problem because the revenue from the additional credits can be compared to that cost.

Until ecological trade-offs among ESs are better understood, stacking should be used with caution (Robertson et al., 2014). Currently, no regulations or U.S. federal resource agencies address stacking in these farm systems or any other system. In light of this, Robertson et al. (2014) propose that stacked credits from a given site be sold only within an area having the same environmental regulatory background. One specific solution to the stacking problem in the case of ADs may be to allow stacking of all credits available at the time of AD installation, but to prohibit any further stacking if new credit streams become available after installation. The rationale for this approach is that additional elements cannot be separated from non-additional elements at inception because they are contemporaneous, but that non-additionality can be inferred if new credits are made available in the future for benefits that are being generated from the start. Although some non-additional credits might be allowed in this way, this error of commission must be measured against errors of omission—legitimate AD projects left out if stacking is not allowed (Woodward, 2011). Protocols should

consider discounting (issuing partial credit) as a way to address concerns of overcrediting in these situations without eliminating potentially legitimate projects altogether.

In principle, the additionality challenge with stacking could be addressed through further pilot-testing of AD operations under a wide range of geographic and production system characteristics and subject to an array of environmental payment options. This would require more seed financing for constructing the AD pilot tests and greater availability of environmental market payments for GHGs and nutrient credits. Private investors could provide finance, but only if they had the sense that environmental markets would proliferate to cover their costs and reward their efforts. These markets could be driven by flexible compliance to government mandates for nutrients and GHGs, but these may not be inevitable under the current political circumstances. Alternatively, sustainable food supply-chain standards might be a way to provide further incentives for the adoption of AD and other practices that have multiple benefits for food production and the environment.

References

Arvanitoyannis, I. S., & Giakoundis, A. (2006). Current strategies for dairy waste management: A review. *Critical Reviews in Food Science and Nutrition, 46*(5), 379–390. https://doi.org/10.1080/10408390591000695

Barbose, G. L. (2018). *U.S. renewables portfolio standards: 2018 annual status report.* Berkeley, CA: Lawrence Berkeley National Lab. https://doi.org/10.2172/1393633

Climate Action Reserve [CAR]. (2009). Livestock calculation tool (Beta ver. 2.1.3). Retrieved October 10, 2014, from http://www.climateactionreserve.org

CAR. (2013a). U.S. livestock project protocol (Ver. 4.0). Retrieved November 22, 2014, from http://www.climateactionreserve.org/wp-content/uploads/2009/03/U.S._Livestock_Project_Protocol_V4.0_Package_012114.pdf

CAR. (2013b). Nitrogen management project protocol. Retrieved November 22, 2014, from http://www.climateactionreserve.org/how/protocols/nitrogen-management

Douglas, R. (2012). How to generate tradable nutrient reduction credits. *BioCycle, 53*(6), 48–51. https://www.biocycle.net/2012/06/14/how-to-generate-tradable-nutrient-reduction-credits/

Frear, C., & Dvorak, S. (2012). *Anaerobic digestion and nutrient recovery.* Presentation at AgStar National Conference, Syracuse, NY. http://www.epa.gov/agstar/documents/conf12/10b_Dvorak-Frear.pdf [No longer available online]

Hoover, J. N. (2013). Can't you smell that smell? Clean Air Act fixes for factory farm air pollution. *Stanford Journal of Animal Law and Policy, 6,* 1–29. https://law.stanford.edu/stanford-journal-of-animal-law-and-policy-sjalp/

ICF International [ICF]. (2013). *Greenhouse gas mitigation options and costs for agricultural land and animal production within the United States.* Washington, D.C.: U.S. Department of Agriculture. Retrieved from https://www.usda.gov/oce/climate_change/mitigation_technologies/GHGMitigationProduction_Cost.htm

Informa Economics. (2013, February). National market value of anaerobic digester products [PowerPoint presentation]. Retrieved from https://www.slideshare.net/JerryBingold/national-market-potential-of-anaerobic-digester-products-for-the-dairy-industry-40113-60864699

Keohane, N. O., & Olmstead, S. M. (2016). *Markets and the environment* (2nd Ed). Washington, D.C.: Island Press. https://doi.org/10.5822/978-1-61091-608-0

Lazarus, W. F. (2008). *Farm-based anaerobic digesters as an energy and odor control technology. Background and policy issues* (Agricultural Economic Report No. 843). Washington, D.C.: USDA Office of Energy Policy and New Uses. Retrieved from http://www.usda.gov/oce/reports/energy/AnerobicDigesters0308.pdf

Lee, H., & Sumner, D. A. (2014). *Greenhouse gas mitigation opportunities in California agriculture: Review of the economics* (Report No. NI GGMOCA R7). Durham, N.C.: Nicholas Institute, Duke University. Retrieved from https://aic.ucdavis.edu/publications/california%20economics%20for%20GHG%20dduke%20report.pdf

Ma, J., Kennedy, N., Yorgey, G., & Frear, C. (2013). *Review of emerging nutrient recovery technologies for farm-based anaerobic digesters and other renewable energy systems.* Retrieved from http://csanr.wsu.edu/wp-content/uploads/2014/07/ICUSD-Emerging-NR-Technology-Report-Final.121113B.pdf

Merkel, M. M. (2006). *EPA and state failures to regulate CAFOs under federal environmental laws.* Environmental Integrity Project [EIP]. http://www.environmentalintegrity.org/pdf/publications/EPA_State_Failures_Regulate_CAFO.pdf

Miller, D. L., & Muren, G. (2019). *CAFOs: What we don't know is hurting us* (Report no. R:19-06-A). National Resources Defense Council (NRDC). Retrieved January 15, 2020, from https://www.nrdc.org/sites/default/files/cafos-dont-know-hurting-us-report.pdf

Murray, B. C. (2010). Emissions offsets in a greenhouse gas cap-and-trade policy. In I. W. H. Parry & F. Day (Eds.), *Issues of the Day: 100 Commentaries on Climate, Energy, the Environment, Transportation, and Public Health Policy* (pp. 30–31). Washington, D.C.: RFF Press.

Murray, B. C., Galik, C. S., & Vegh, T. (2017). Biogas in the United States: Estimating future production and learning from international experiences. *Mitigation and Adaptation Strategies for Global Change, 22,* 485–501. https://doi.org/10.1007/s11027-015-9683-7

Myhre, G., Shindell, D., Bréon, F.-M., Collins, W., Fuglestvedt, J., Huang, J., . . . Zhang, H. (2013). Anthropogenic and natural radiative forcing. In T. F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, . . . P. M. Midgley (Eds.), *Climate Change 2013: The Physical Science Basis*: *Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 659–740). Cambridge & New York: Cambridge University Press. Retrieved from https://www.ipcc.ch/report/ar5/wg1/

North Carolina Cooperative Extension. (2012). *Types of anaerobic digesters* [Factsheet]. Accessed 3/13/2015. http://www.extension.org/pages/30307/types-of-anaerobic-digesters/

North Carolina General Statutes § 62-133.8(a)(6). (2014). Retrieved from https://www.ncleg.net/enactedlegislation/statutes/html/bysection/chapter_62/gs_62-133.8.html

Pfost, D. L., & Fulhage, C. D. (2000). *Anaerobic lagoons for storage/treatment of livestock manure.* Columbia: MU Extension, University of Missouri-Columbia. Retrieved from http://extension.missouri.edu/explorepdf/envqual/eq0387.pdf

Regional Greenhouse Gas Initiative [RGGI]. (2013). *Model rule.* https://www.rggi.org/program-overview-and-design/design-archive/mou-model-rule

Robertson, M., BenDor, T. K., Lave, R., Riggsbee, A., Ruhl, J. B., & Doyle, M. (2014). Stacking ecosystem services. *Frontiers in Ecology and Environment, 12*(3), 186–193. https://doi.org/10.1890/110292

Smith, V. H., Tilman, G. D., & Nekola. J. C. (1999). Eutrophication: Impacts of excess nutrient inputs on freshwater, marine, and terrestrial ecosystems. *Environmental Pollution, 100*(1–3), 179–196. https://doi.org/10.1016/S0269-7491(99)00091-3

U.S. Bureau of Labor Statistics [U.S. BLS]. (n.d.). CPI calculator. Retrieved October 15, 2014, from http://www.bls.gov/data/inflation_calculator.htm

U.S. Energy Information Administration [U.S. EIA]. (2016). Henry hub natural gas spot price. Retrieved February 16, 2016, from https://www.eia.gov/dnav/ng/hist/rngwhhdd.htm

U.S. Environmental Protection Agency [U.S. EPA]. (2003). Appendix B: US EPA Office of Water, water quality trading policy. Retrieved November 6, 2014, from http://water.epa.gov/type/watersheds/trading/finalpolicy2003.cfm [No longer available online]

U.S. EPA. (2008a). CAFO final rule 2008. Retrieved July 14, 2014, from http://water.epa.gov/polwaste/npdes/upload/cafo_final_rule2008_comp.pdf [No longer available online]

U.S. EPA. (2008b). Renewable energy certificates. Retrieved September 14, 2014, from http://www.epa.gov/greenpower/documents/gpp_basics-recs.pdf [No longer available online]

U.S. EPA. (2010). U.S. Anaerobic digester status report. Retrieved November 13, 2014, from http://www.epa.gov/agstar/documents/digester_status_report2010.pdf [No longer available online]

U.S. EPA. (2014). *Anaerobic digesters.* Retrieved March 13, 2015, from http://www.epa.gov/agstar/anaerobic/ad101/anaerobic-digesters.html [No longer available online]

U.S. EPA. (2019a). U.S. Livestock anaerobic digester database. Retrieved March 20, 2019, from https://www.epa.gov/agstar/livestock-anaerobic-digester-database

U.S. EPA. (2019b). Renewable energy certificates (RECs). Retrieved January 15, 2020, from https://www.epa.gov/greenpower/renewable-energy-certificates-recs#certificate

U.S. EPA AgSTAR Program. (2012). *Funding on-farm anaerobic digestion.* Retrieved from https://www.epa.gov/agstar/funding-farm-anaerobic-digestion

U.S. EPA AgSTAR Program. (2018). AgSTAR data and trends. Retrieved February 19, 2019, from https://www.epa.gov/agstar/agstar-data-and-trends

U.S. Government Accountability Office [U.S. GAO]. (2008). Concentrated animal feeding operations: EPA needs more information and a clearly defined strategy to protect air and water quality from pollutants of concern (Report No. GAO-08-944). Retrieved from http://www.gao.gov/new.items/d08944.pdf

U.S. Department of Agriculture [USDA]. (2009). News release No. 0613.09. http://www.usda.gov/wps/portal/usda/usdamediafb?contentid=2009/12/0613.xml [No longer available online]

USDA. (2019). *2017 Census of Agriculture: United States summary and state data, Volume 1, Geographic Area Series, Part 51.* Retrieved from https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usv1.pdf

USDA Natural Resources Conservation Service [USDA NRCS]. (1992). *Agricultural waste management handbook.* Retrieved from http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/?&cid=stelprdb1045935

Van Horn, H. H., Wilkie, A. C., Powers, W. J., & Nordstedt, R. A. (1994). Components of dairy manure management systems. *Journal of Dairy Science, 77,* 2008–2030. https://doi.org/10.3168/jds.S0022-0302(94)77147-2

Verified Carbon Standard. (2013). Guidance for standardized methods (8 October 2013, ver. 3.3). Retrieved from http://verra.org/wp-content/uploads/2018/03/VCS-Guidance-Standardized-Methods-v3.3_0.pdf

Woodward, R. T. (2011). Double-dipping in environmental markets. *Journal of Environmental Economics and Management, 61*(2), 153–169. https://doi.org/10.1016/j.jeem.2010.07.004

World Resources Institute [WRI]. (2014). *How can conservation programs effectively interact with environmental markets?* Retrieved from http://www.usda.gov/oce/environmental_markets/files/WRI_Conservation%20Programs%20and%20Env%20%20Markets.pdf

Yiridoe, E. K., Gordon, R., & Brown, B. B. (2009). Nonmarket cobenefits and economic feasibility of on-farm biogas energy production. *Energy Policy, 37*(3), 1170–1179. https://doi.org/10.1016/j.enpol.2008.11.018

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Farm seeker needs versus farm owner offers: A comparison and analysis in the U.S. Midwest and Plains

Julia C. D. Valliant [a] *
Indiana University

Kathryn Z. Ruhf [b]
Land For Good

Stephanie L. Dickinson,[c] Yijia Zhang,[c] Lilian Golzarri-Arroyo,[c] and James R. Farmer [a, d]
Indiana University

Submitted March 4, 2019 / Revised May 28 and July 21, 2019 / Accepted July 21, 2019 / Published online February 6, 2020

Citation: Valliant, J. C. D., Ruhf, K. Z., Dickinson, S. L., Zhang, Y., Golzarri-Arroyo, L., & Farmer, J. R. (2020). Farm seeker needs versus farm owner offers: A comparison and analysis in the U.S. Midwest and Plains. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 141–157. https://doi.org/10.5304/jafscd.2020.092.006

Abstract

Land access for new farmers and ranchers includes transfers from owners without family successors. We compare how farm seekers' needs align with the offerings of farm owners whose farm assets may transfer out of family in the 12-state North Central Region as defined by the U.S. Department of Agriculture.[1] In Phase 1, managers of farm link services, which connect farm owners without a successor in their family to farm seekers, estimated the patterns demonstrated by their program's seeker and owner participants through a questionnaire. In Phase 2, managers of these and select other agricultural and rural programs circulated to

[a] * *Corresponding author:* Julia C. D. Valliant, Sustainable Food Systems Science, The Ostrom Workshop, Indiana University; 515 North Park Avenue; Bloomington, Indiana 47408 USA; +1-812-856-5029; jdv@indiana.edu

[b] Land For Good; P.O. Box 625; Keene, New Hampshire 03431 USA; +1-603-357-1600; kathy@landforgood.org

[c] Department of Epidemiology and Biostatistics, School of Public Health, Indiana University; 1025 East Seventh Street, Room C036; Bloomington, IN 47408 USA; sd3@indiana.edu; yz201@iu.edu; lgolzarr@indiana.edu

[d] School of Public and Environmental Affairs, Indiana University; 515 North Park Avenue; Bloomington, IN 47408 USA; +1-812-856-0969; jafarmer@indiana.edu

Funding Disclosure

This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2016-38640-25381, through the North Central Region SARE program under project number LNC16-377. USDA is an equal opportunity employer and service provider. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the view of the U.S. Department of Agriculture.

[1] The North Central Region includes the states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

their networks an online survey whose respondents included 178 farm seekers and 183 farm owners whose assets may transfer out of family. Findings denote similarities and barriers between the two groups. The biggest difference was that few owners offered an on-farm residence, which was a top need of seekers. In terms of similarities, the survey found no statistical differences in the groups' respective locations on a rural-urban continuum, nor in land parcel sizes sought and offered. Half of farm link service providers concurred, observing a match between seeker and owner land needs. However, the other half of service providers reported wide differences, observing two patterns. First, incoming farmers preparing for commodity row crop, hay and fodder, and beef production are well-matched by owners with like type farms to offer, although new entrants often seek bigger parcels than owners offer. Second, seekers preparing for specialty crop, dairy, and hog or poultry (outdoor and indoor) production far exceed the number of owners who offer the infrastructure and scale for these production systems, particularly for parcels under 40 acres.[2] Results suggest opportunities for research and intervention to target barriers and areas of alignment between owner and seeker needs, especially for affordable on-farm housing for new farm operators.

Keywords
Beginning Farmers and Ranchers, Farm Transfer, Farm Succession, Farm Link, Rural Housing, Rural Development, Small and Medium Farms

Introduction and Literature Review

Beginning farmers and ranchers who seek to own or lease a farm contend with many obstacles to starting and succeeding in agriculture. Some obstacles are ingrained in patterns of farm and ranch transfer from one owner to the next. (Hereafter, we use "farmers" and "farms" to encompass ranchers and ranches as well.) Farm transfers cycle continuously across the land, sometimes within a family and other times between unrelated parties, which is the focus of this study. It is estimated that 25% of farm transfers underway at any time are between non-relatives (USDA NASS, 2015), such that the majority of farmland is actually acquired from a non-relative (Ahearn, 2013). Agreement is clear that farm transfers are generally a difficult turning point for both entering and exiting parties. This paper queries one aspect of that difficulty by examining how well farm owner offers appear to align with farm seeker needs, across a 12-state Midwestern and Central Plains region.

Food system innovation and agricultural productivity can benefit from improved farm transfers (Leonard, B., Kinsella, O'Donoghue, Farrell, & Mahon, 2017; Ruhf, 2013). Agricultural programs and policies, known as farm link programs, for over three decades have implemented a range of strategies to assist farm families in transferring their land to farmers of the next generation (Valliant, Ruhf, Gibson, Brooks, & Farmer, 2019). A number of terms refer to these next-generation farm seekers and subgroups among them, including beginning farmers (USDA ERS, 2019), young farmers (e.g., Ackoff, Bahrenburg, & Shute, 2017), next-generation farmers (e.g., Harper, 2015), first-generation farmers and multigenerational farmers (e.g., Inwood, 2013). We use "farm seeker" to refer to a farmer who is not yet established and is seeking a farming opportunity. Encouraging seekers' prospects for entering and succeeding in agriculture is an impetus for programs that assist with farm transfers in some capacity, because agricultural innovation and investment in the farm business are greater on farms where a successor or transferee is identified and preparing to assume leadership (Chiswell, 2014; Inwood & Sharp, 2012; Lobley & Baker, 2012; Lobley, Baker, & Whitehead, 2010). In addition, entering farmers make an outsized contribution to the categories of renewable agriculture that are tracked by the U.S. Census of Agriculture. For example, beginning farmers represent about 16% of operators (USDA NASS, 2012b), but are responsible for 26% of certified organic sales in the U.S. and 22% of direct-to-consumer sales (USDA NASS, 2014). These food system and agriculture outcomes motivate initiatives to help new farming entrants begin and succeed.

[2] 1 acre= 0.4 hectare

A second impetus for farm link services is the recognition that entering agriculture and retiring from agriculture make up two sides of the same coin. As Parsons and his colleagues have observed, "Barriers to both farm entry and farm exit are in play. If older farmers can't easily exit, their land can't become available to entering farmers" (2010, p. 10). Supporting farmers in preparing for farm transfer is one way of helping new farmers, at the other end of the life course, to gain access to farmland, which surveys of new entrants find to be a widespread difficulty (Ackoff et al., 2017; Freedgood & Dempsey, 2014; Paine & Sullivan, 2014). There are many new farmers in the U.S.; one estimate suggests there are 70,000 every year (Katchova & Ahearn, 2017). For context, this is the same number of farms in the entire state of Wisconsin (USDA NASS, 2012a), the ninth top producing state in the nation (USDA ERS, 2017). Since most beginning farmers do not stand to inherit land (Katchova & Ahearn, 2016), accessing a farming opportunity, ideally with adequate tenure security and on-farm housing, is of utmost priority for many entrants.

Correspondingly, because many farm owners have no family successor, they are looking outside the family for the farm's next operator and/or owner. Given this mutual need to make connections beyond family (Grubbström & Eriksson, 2018), some services assist with farm transfers by aiming to "link" or "match" owners and seekers with transfer partners from beyond their personal networks. To assist parties on both ends of the transfer spectrum—farm owners without a family successor and farmers seeking an opportunity—farm link programs aim to connect unrelated farmers to kindle a potential transfer relationship between them. Recent research highlights that deeper understanding is needed about the effectiveness and best practices of the various linking programs (Carolan, 2018; Freedgood & Dempsey, 2014; Hamilton, 2010; Horst & Gwin, 2018; Parsons et al., 2010; Schilling, Esseks, Duke, Gottlieb, & Lynch, 2015).

One critique of services to link or match farmers provides the motivation for this study. Fraas (2015) and others argue that linking services are based on an overly simplistic premise that there is a fit to be found between exiting and entering farmers, when actually the structural needs of the two groups are "incongruent" (Hersey & Adams, 2017, p. 94). Types of incongruity observed to be barriers include that new entrants are likely to seek smaller acreages for producing specialty crops and/or raising and finishing animals outdoors, but that outgoing farmers are likely to offer broadacre, commodity crop farms; thus the farm sizes sought and offered are unlikely to match. Another observed incongruity is that seekers wish to farm close to metropolitan markets and amenities, while owners' farms tend to be too rural for those seekers. In short, there appears to be a mismatch between the needs of farm seekers and the offers of farm owners, such that some analysts have asserted that farm linking services are not very effective (Hersey & Adams, 2017; Ingram & Kirwan, 2011). This paper queries the assertion of a mismatch, with a quantitative comparison of what seekers are looking for to what owners offer. We examine the following research questions, with other relevant characteristics of farm seekers and farm owners whose farm assets may transfer out of family:

1. Land: Do seekers want different acreages than owners offer?
2. Geography: Are owners located in places more rural than those that seekers desire?
3. Home: Do seekers want an on-farm residence, and do owners have one to offer?

Applied Research Methods

Phase 1: Farm link service providers' observations of seeker and owner program participants

This study focused on services, seekers, and owners in the North Central Region (NCR) of the U.S., which includes the 12 states of the Midwest and Central Plains (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin). The purpose was to gather best practice recommendations from the managers of the active and closed farm link services in the region and to learn about service gaps and opportunities from farm owners and seekers themselves (Farmer & Valliant, 2016;

Valliant et al., 2019). A purposeful strategy aimed to select every farm link service that operates in these states, or that did in the past, in order to learn from information-rich cases that are active as well as those that have discontinued services (Patton, 2002). Thirty-eight programs met one or both of two conditions for inclusion. The first was that the program be listed as a farm listing or linking service in the NCR by a major web resource as of October 2016. These sites were the Center for Rural Affairs "Linking Farmers with Land" page[3] and the National Young Farmers Coalition Midwest Regional Listings.[4] The second condition was that the program appear in a search for the term "transfer" in reports of projects funded by North Central Region-Sustainable Agriculture Research and Education (NCR-SARE), a program of the U.S. Department of Agriculture National Institute of Food and Agriculture (USDA-NIFA-SARE, 2018). In January 2017, managers of the 38 programs received an email invitation to an online questionnaire about their programs via the secure survey service Qualtrics.[5] Between then and March 2017, nonrespondents received up to four emailed and/or phoned reminders. Quantitative data from the questionnaire did not undergo statistical analysis due to the low sample size. We instead undertook analysis using Microsoft Excel in the form of tally, proportion, median and mean values in which respondents approximated and compared the prevalence of characteristics among their seeker and owner participants. We take two approaches to analyzing these responses. One approach uses the program as the unit of analysis. The second incorporates the numbers of seekers and owners who participate in the programs. In both cases, the analysis weights service provider observations of prevalence by assigning a value of zero to the response "none of them"; one to "less than half of them"; two to "more than half of them"; and three to "nearly all of them." The second approach then factors in the number of program participants to depict prevalence across seekers and owners who participate in the NCR farm link services.

Phase 2: Online survey of farm owners and farm seekers

Farm owners and farm seekers who responded to an online survey formed an availability, or convenience, sample (Schutt, 2006). The survey targeted "farm/ranch owners and farm/ranch seekers in the Plains and Midwest states," and was distributed by programs that focus on agriculture and/or rural communities across the NCR. Between March and June 2017, the 22 programs from Phase 1 that were still active and 10 other programs were invited to send the survey to their networks. The 10 additional programs were purposefully selected to represent states in the NCR that have no farm link services, to attempt to learn from seekers and owners in these states. Of these 32 programs, 26 confirmed having sent the survey on to their networks (17 farm link programs and nine others). Programs distributed the survey via social media, electronic newsletter, and/or direct email. The survey was closed to responses on June 17, 2017.

Data were organized and analyzed using Statistical Analysis Software (SAS) 9.4 (SAS Institute Inc., Raleigh, NC). The Pearson Chi-square test was used to compare the characteristics between the seekers and owners. The analysis involved creating the following variables:

- Residence on a rural-urban continuum according to Rural-Urban Commuting Area (RUCA) codes. (USDA ERS, 2016). Since RUCA values are assigned to census tracts, we used the most recent zip code approximations (University of North Dakota Center for Rural Health, 2014), and categorization C to achieve two output levels, and categorization 4E to achieve four output levels (University of Washington Rural Health Research Center, 2005).
- Age: Continuous data were grouped into four categories: 18–29, 30–49, 50–69, 70–85.
- Bachelor's degree: We grouped five response options on educational attainment

[3] https://www.cfra.org/resources/beginning_farmer/linking_programs
[4] https://www.youngfarmers.org/land-and-jobs/#Midwest
[5] https://www.qualtrics.com

into two levels to ensure an ample sample size for comparison.
- Couple archetypes: Respondents indicated employment category for themselves and their spouses using USDA Agricultural Resource Management Survey (ARMS) categories ("At which occupation do you/ spouse spend the majority of your work time?") (USDA NASS, 2016). We grouped these responses to depict their occupational status as a couple: both spouses farm, one spouse farms, neither spouse farms, single farmer, and single non-farmer.

Results

Phase 1: Farm Link Service Provider Observations of Seeker and Owner Participants

Of the 38 programs that received the online questionnaire, 24 managers filled out one or more paired items about their seeker and owner participants, a response rate of 63% to these items. Respondents spent a median time of 24 minutes filling out the questionnaire. Compared to nonrespondents, the respondents' programs are more current and directly focus on farm transfers. For example, every respondent program was listed on active websites, whereas all the nonrespondents represented closed programs. Nonrespondents also shared only an ancillary focus on farm transfers, according to our correspondence with the original program managers, their successors, and/or the projects' final reports in the SARE database. According to the survey responses, these 24 programs serve a total of 6,100 owners and seekers, reflecting 3,800 seekers and 2,300 owners. Respondents represented five projects funded by NCR SARE (US$490,000 invested) and eight by the USDA Beginning Farmer and Rancher Development Program (US$2.8 million invested, including leads and subcontractors).

Acreage

Service providers are evenly split as to whether they observe differences between the farm sizes that seekers desire and the sizes of farms that owners offer. While 45% of programs report no differences, 55% do observe differences between what their seekers want and what their owners have. Six of the eleven programs (55%) that observe differences find that many seekers need smaller tracts than many owners offer. Two other programs report a mixed pattern. The remaining three programs find that many seekers need larger tracts than owners offer. All three programs in this last group primarily serve farmers preparing for commodity crop production. Turning to the amounts of land service providers observe being sought and offered, a caveat to these numbers is that they reflect the variation among the programs, which reflect differences of scale, place, and product mix; this set of programs assists farms at all scales of production, from very small to very large. Together, they report that seeker interest in the smallest and largest tracts (less than 40 and 500+ acres) is greater than owner offerings, while owners offer more land in the 100-499 acre range than seekers need. Seekers and owners are well-matched in the 40–99 acre range, which programs report as the category most frequently both sought and offered.

When we factor in the number of seekers and owners who participate in the programs, which also condenses information from a range of program models and settings, programs report a similar divergent pattern. Seeker demand exceeds supply of the smallest (less than 40) and some of the largest acreages (100–299 and 500–999). Some of these differences are very large (Table 1). Service providers report seeing six to seven times more seekers looking for tracts under 40 acres than owners make available. In the 500–999 acre range, service providers see 100 times more seekers looking for this size range than owners make available. This approach agrees with the first approach, that demand and supply are well-matched in the 40-99 acre range whereas owners actually offer more than is sought in the 300-499 and 1,000+ acre ranges.

Agricultural Products

Twenty of the 21 programs that responded to these items observe differences between what their owner participants produce and what seekers aim to produce. The one program that observes no differences serves commodity producers. We

Table 1. Phase 1 Comparison of Seeker Needs and Owner Offers, Weighted by the Prevalence of Interest Farm Link Service Providers Observe among Their Participants (in Order of Descending Seeker Interest)

Analysis 1 — According to the number of programs reporting

	Owners	Seekers	% difference
Product seekers aspiring to produce versus those produced on owners' farms			
Specialty crops	21	38	81%
Hay/fodder crops	42	33	–21%
Row crops	44	32	–27%
Beef	34	31	–9%
Pastured hogs/poultry	18	22	22%
Dairy	20	21	5%
Indoor hogs/poultry	13	16	23%
Timber	10	6	–40%
Farm asset types: prevalence of seekers and owners who aim to transfer			
Farm business	36	44	22%
Cropland	36	40	11%
Pasture/range	32	40	25%
Home	27	39	44%
Infrastructure	35	38	9%
Water	22	28	27%
Woods/forest	20	10	–50%

Analysis 2 — According to program participation numbers

	Owners	Seekers	Total owners + seekers	% difference
Products seekers aspire to produce versus those produced on owners' farms				
Row crop	1,679	1,595	3,274	–5%
Specialty crops	427	1,418	1,845	232%
Hay/fodder crops	1,245	1,325	2,570	6%
Beef	1,022	1,068	2,090	5%
Pastured hogs/poultry	534	983	1,517	84%
Dairy	544	886	1,430	63%
Indoor hogs/poultry	483	841	1,324	74%
Farm asset types				
Home	1,068	2,946	4,014	176%
Cropland	1,234	2,742	3,976	122%
Infrastructure	1,008	2,629	3,637	161%
Business	1,386	2,293	3,679	65%
Pasture/range	893	2,253	3,146	152%
Water	791	1,694	2,485	114%
Woods/forest	443	274	717	–38%
Acreage				
Under 10 acres	76	553	629	630%
11–39 acres	81	479	560	493%
40–99 acres	553	581	1,134	5%
100–299 acres	107	354	461	230%
300–499 acres	566	156	722	–72%
500–999 acres	11	1,140	1,151	10,540%
1,000+ acres	516	260	776	–50%

1 acre=0.4 hectare

analyze the reported differences in two ways, first by using the program as the unit of analysis, and second by taking program participation numbers into consideration. Both strategies agree that interest in row crops, hay and fodder crops, and beef is high among both groups, and that interest in specialty crops is much higher among seekers than owners. When we take their participation numbers into consideration, the programs report seeing 230% more seekers who wish to produce specialty crops than owners who presently do so. Other areas of substantially higher seeker interest than owner capacity include pastured hog/poultry production (84% more seekers), indoor hog/poultry production (74% more seekers), and dairy production (63% more seekers).

Assets to Transfer

The questionnaire asked service providers to compare how common it is for owners and seekers to aim to transfer seven types of farm resources. These resources included (1) a farm business, (2) a home, (3) cropland, (4) pasture/range, (5) woods/forest, (6) water (stream, pond, well), and (7) buildings, infrastructure, and/or facilities. All 21 programs that responded to this item reported differences between seekers and owners. Service providers observe differences across multiple types of resources (between two and seven types per program, with a mean of 4.2). Weighted values to reflect the magnitude of difference in their responses suggest that the largest difference is in housing. Service providers observe that many seekers are looking for on-farm housing, 2.8 times the number of owners who offer a farm home. The other highest priorities for seekers are cropland, infrastructure, a farm business, pasture or range, and water, in order of descending rank. In each of these categories, other than a business, the programs observe more than twice the need that participating owners make available.

Phase 2: Online survey of farm seekers and farm owners

Description of Respondents

A total of 516 responses represented 178 farm seekers and 338 farm owners. Median response times were three minutes for seekers and six minutes for owners, who received a longer set of questions. We subdivided farm owners according to their likelihood of transferring "some or all of your farm/ranch [land] one day to a non-relative (someone unrelated to you)." One subset includes those who are unlikely to transfer out of family (n=155, 47%); the other includes those who are likely to transfer out of family, or neutral on the matter (n=183, 53%). We focus on the latter subset of owners to understand how seeker priorities align with those of owners more likely to transfer assets out of family. Among this subgroup of owners, 34% are extremely likely to transfer out of family, 31% are somewhat likely, and 35% are neutral. The locations of the seeker and owner respondents are depicted in Figure 1. Only 13% of the respondents we analyze said they had actually participated in a farm link service; the other 87% subscribed to the mailing lists of the programs that distributed the survey, but are not active in their farm link services.

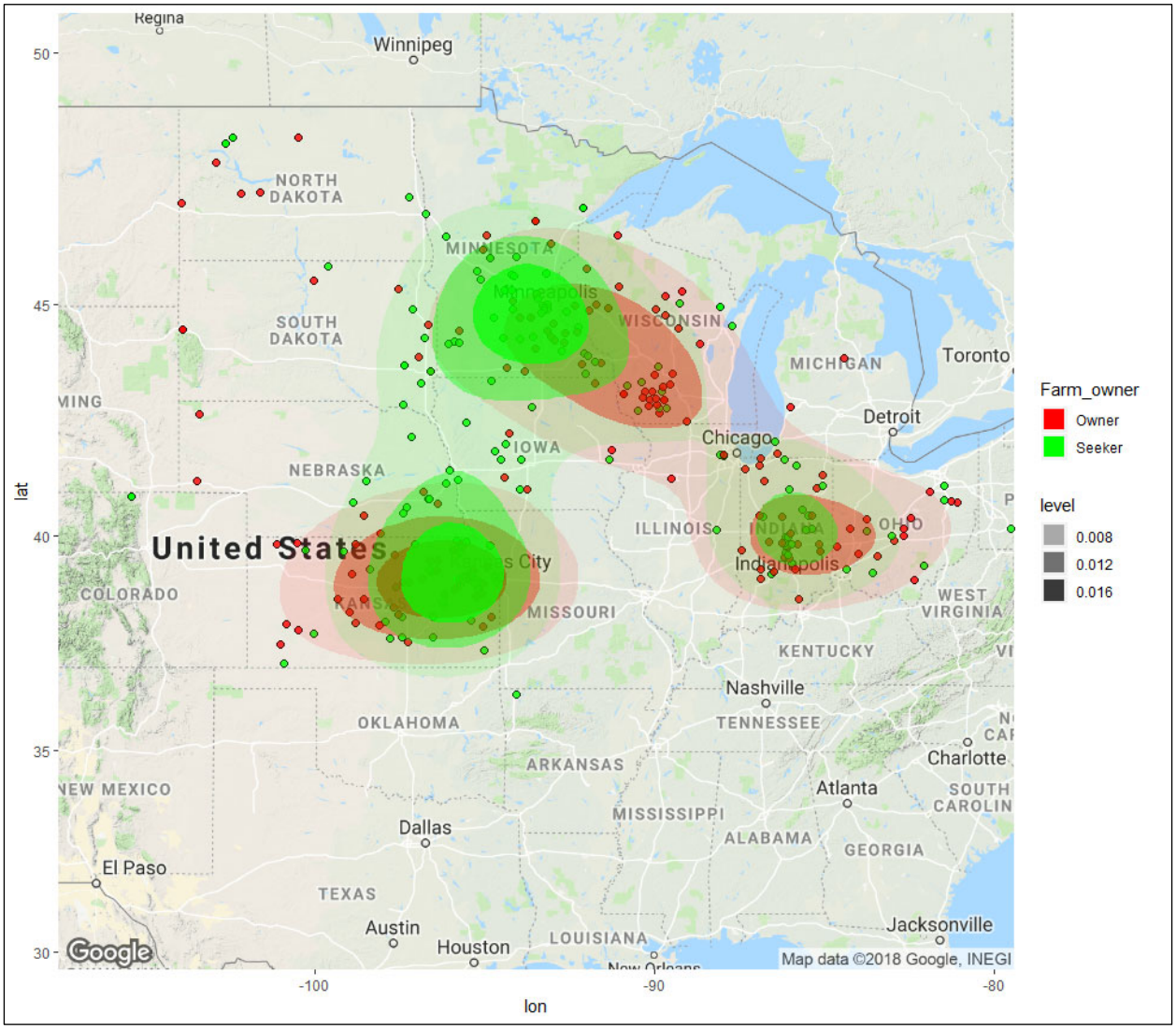
Characteristics of Farm/Ranch Seekers

Among seekers, the median age was 35 years. Many seeker respondents were women, who composed 38% of the group. Seekers were highly educated: 69% hold a bachelor's degree or higher. In terms of where these seekers are presently spending their work time, among 52% of seeker couples, neither person spends the majority of their work time farming. Among 23% of seeker couples, one of the spouses is farming. Only 18% of seeker households presently earn half or more of their income from farming.

Characteristics of the Subset of Farm/Ranch Owners

Farm/ranch owners represent owner-operators more than non-operators. Only 12% of the subset of owners were never the primary operators of their land. The other 88% are the primary operators or were at one time. The median owner age was 56 years and the majority of owner respondents were women (52%). Owners are highly educated, with 77% holding a bachelor's degree and 44% holding a graduate degree. Again, only a minority of households earn most of their income from farming (31%). Most owner households earn

Figure 1. Map of Respondent Locations: Online Seeker/Owner Survey



most of their income off the farm (69%). Owner households are almost evenly divided as to whether someone spends the majority of their work time farming—no in the case of 48% of households. Table 2 shows the descriptive characteristics of the two respondent groups and the results of the Chi-squared tests.

Similarities between Seekers and the Subset of Owners

Owner and seeker respondents to the online survey exhibit no statistical differences in the amounts of land they offer and seek (p=.222). Respondents selected one of eight options for acreage sought or offered, from less than 10 to more than 1,000. While the owner and seeker median and most prevalent categories differ, response spread is distributed rather evenly across categories (owner median 40–80, seeker median 81–160). For higher acreages, seekers express greater demand for the largest tracts than owner respondents make available. Only 14% of owners offer land over 321 acres, while 23% of seekers are looking for this amount of land. Notably, in the smaller acreages, more owners proportionally are offering 11–80 acres than seekers need.

In terms of location, these respondents demonstrate no statistically significant differences on a standard rural-urban continuum, neither when

Table 2. Online Survey Responses: Seeker and Owner Characteristics and Results of Chi-Squared Tests

Characteristic	Owners neutral-to-likely to transfer out of family (*n*=183)	Seekers (*n*=178)	*p*-value
Rural-Urban binary (RUCA categorization C)			0.187
Rural	74 (42.3%)	59 (35.3%)	
Urban	101 (57.7%)	108 (64.7%)	
Rural-Urban 4-level (RUCA categorization E)			0.153
Isolated small rural town	12 (6.9%)	4 (2.4%)	
Small rural town	28 (16.0%)	21 (12.6%)	
Large rural city/town	36 (20.6%)	34 (20.4%)	
Urban	99 (56.6%)	108 (64.7%)	
House			0.076
Any house	145 (88.4%)	131 (81.4%)	
No house	19 (11.6%)	30 (18.6%)	
Type of Housing			
Primary only	121 (73. 8%)	-	-
Any Secondary house	24 (14.6%)	-	
No residence	19 (11.6%)	-	
Land available to transfer/sought			0.222
10 acres or fewer	26 (18.4%)	29 (17.7%)	
11–39 acres	36 (25.5%)	32 (19.5%)	
40–80 acres	20 (14.2%)	16 (9.8%)	
81–160 acres	22 (15.6%)	30 (18.3%)	
161–320 acres	18 (12.8%)	19 (11.6%)	
321–640 acres	11 (7.8%)	17 (10.4%)	
641–1000 acres	2 (1.4%)	12 (7.3%)	
1000+ acres	6 (4.3%)	9 (5.5%)	
Age group			<0.001
18–29	1 (0.7%)	39 (25.2%)	
30–49	49 (34.3%)	89 (57.4%)	
50–69	81 (56.6%)	26 (16.8%)	
70–85	12 (8.4%)	1 (0.7%)	
Gender			0.014
Female	79 (52.3%)	61 (38.4%)	
Male	72 (47.7%)	98 (61.6%)	
Four-year degree			0.083
Yes	119 (77.3%)	109 (68.6%)	
No	35 (22.7%)	50 (31.4%)	
Couple archetypes			<0.001
Both spouses farm	23 (14.4%)	5 (3.1%)	
One spouse farms	47 (29.4%)	37 (22.7%)	
Neither spouse farms	54 (33.8%)	84 (51.5%)	
Single farmer	13 (8.1%)	10 (6.1%)	
Single non-farmer	23 (14.4%)	27 (16.6%)	
Household earns half or more of income from farming, ranching, or livestock production			0.007
Yes	47 (30.7%)	28 (17.7%)	
No	106 (69.3%)	130 (82.3%)	
Off-farm household income received in 2016 (US$)			0.006
$0–29,999	52 (36.1%)	39 (24.8%)	
$30,000–79,999	48 (33.3%)	77 (49.0%)	
$80,000–149,999	29 (20.1%)	35 (22.3%)	
$150,000+	15 (10.4%)	6 (3.8%)	

using a four-level categorization (p=.153) nor with a two-level rural-urban dichotomy (p=.187).

Notable Differences between Seekers and the Subset of Owners

Housing is an area of divergence. Most seekers (81%) are looking for a farm that comes with housing. However, among owners, 74% have only their primary residence on the farm, and 12% of owners have no residence at all on their farm. Only 15% of owners have a secondary residence on their property. Although our tests were not able to further explore any disconnect between seekers desiring affordable on-farm housing and whether owners may prefer on-farm housing in retirement, it is one discord in the puzzle of farm transfers that we explore in the discussion.

In terms of gender, more than half of owner respondents were women (52%). Seeker respondents were 62% male, and therefore statistically more likely than owners to be men (p=.014).

Farming factors into household livelihoods differently for these owners and seekers, to a statistically significant extent. Owner households are more likely than seeker households to have someone spending most of their work time farming (52% of owner households versus 32% of seeker households). In terms of levels of off-farm income, owners are more likely to report the lowest and highest income categories (less than US$30,000 and US$150,000+), whereas seekers are more prevalent in the middle categories (US$30,000–US$79,999 and US$80,000–US$149,999), p=.006.

Discussion

In exploring compatibilities between farm seekers and farm owners whose assets may transfer out of family, the data suggest some congruencies, some barriers, and some clear areas for continuing investment and research. The strongest area of agreement in this study is on the role of the farm home as a potentially severe obstacle to farm transference. A large majority of seekers desire an on-farm residence, but few owners offer on-farm residences. Findings diverge around the farmland tract sizes sought by seekers and offered by owners, which we explore below. The expectation was tested that desiring locations closer to urban centers would predominate among seekers, and found seeker and owner geographic locations to be comparable. Turning to owners' products and seekers' desired agricultural products, we explore below how seeker demand matches owner capacity for some product areas and far surpasses it for others. An expected dissimilarity is that service providers would report high interest in specialty crop production among seekers.

Unexpected Similarity: Seeker and Owner Locations are Compatible on a Rural-Urban Continuum

This analysis finds no statistically significant difference between seeker and owner survey respondents' locations on a rural-to-urban continuum. Thus, one expected barrier between them was not present according to the mechanism used here, the zip code approximation for USDA ERS-RUCA values. RUCA measures the commuting patterns of a place in order to indicate its relation to neighboring employment centers (National Academies of Sciences, Engineering, and Medicine, 2016). Useful follow-up analyses will nevertheless continue to examine seeker and owner locations according to other county and zip code indicators, as well as at more granular levels, to further consider how geography factors into prospective matches for farm transfers. For example, some analyses have looked specifically at how prospects for agricultural entrepreneurship and farm transfer are evolving at the edges of cities, where food system networks are potentially most dense, but where competition for land uses raises land prices (Carolan, 2018; Clark, Inwood, & Sharp, 2012; Lange, Piorr, Siebert, & Zasada, 2013). Farms located at this rural-urban interface face a distinctive set of opportunities and challenges in persisting in agriculture and transferring to a new farmer.

Mixed Findings: Acreages and Agricultural Products

Comparing amounts and sizes of land parcels sought and offered, the seeker/owner survey demonstrated no differences between groups, suggesting a potential fit for attempts to match seekers and owners. Similarly, managers of half the programs in the assessment observed no differences in the land parcels sought and offered by their seeker and owner participants.

Differences, however, are sizeable among the half of programs that did report seekers needing different land parcels, and more land in total, than owners have to offer. Factoring in program participation numbers, the programs that reported differences present the greatest discordance in the 500–999 acre range. They observed 100 times the demand for 500–999 acreages from seekers than what is available. These respondent programs are located in the western part of the region and share a focus on preparing commodity feed grain producers and linking them to resources. A greater number of programs agreed that seeker demand for the smallest tracts (under 40 acres) is six to seven times what is available. Since these are the land sizes most wanted by seekers, future research and investment could prioritize owners of tracts of these sizes for potential linking and transfer initiatives.

Service providers reported as to how owner participants' agricultural products compare with what seekers aim to produce. The managers' observations indicate high interest among seekers in growing specialty crops, at a level that greatly surpasses owners' experience. Service providers also indicated high interest among seekers in products that see equally high experience among owners: row crops, hay/fodder crops, and beef. It bears noting that this pattern of high participation in farm link programs by commodity broadacre farmers is likely specific to certain distinctive programs of the region. A few of the NCR states invest much more than the rest of the country in linking farm owners to seekers by providing comprehensive farm matching services and beginning farmer tax credits (Hamilton, 2010; Meuleners, 2013; Slack, 2013; Valliant & Freedgood, in press; Williamson & Girardi, 2016). These mechanisms and services attract the participation of hundreds to thousands of farm owners per year, most of them commodity feed grain producers (Beck, Carter & Circo, 2018; Girardi, 2015). These are longstanding formal attempts to connect farm seekers to land access (Valliant et al., 2019), some of which provide a financial incentive to owners who choose a qualifying beginning farmer as their farm's next operator or owner. Since these are much higher owner participation numbers than what is seen by any other type of initiative, in the region or nationally, these programs may provide exceptional insight into patterns of high demand for, and supply of, some types of commodity production resources.

Fewer seekers wish to produce dairy, hogs, or poultry (whether indoors or outdoors), although, again, programs observed much more interest in these products among seekers than owners with experience in these areas. These patterns vary somewhat according to whether the unit of analysis is the individual program or the number of participants in a program. Incorporating participation numbers into the analysis shifts patterns toward the results involving programs whose participation numbers are higher. In general, these are programs that primarily serve commodity growers, but nevertheless, the entire group of programs reported three times the number of entering specialty crop farmers than the number of outgoing. The consistent pattern across analytical approaches is that interest in specialty crop production among seekers is far greater than what owners offer. The product areas of specialty crops, hogs, poultry, and dairy, therefore, demand continued and even greater focused support from program initiatives, while row crop, beef, and hay/fodder infrastructure appear to be well-matched with incoming demand to produce these commodities.

Notable Barrier: Housing

Housing is the area of least alignment between farm owners and farm seekers. Among owner and seeker respondents, the majority of owner farms only have one dwelling, and 12% of owner farms have no dwelling. Only 15% of owners have a secondary house on their property. In contrast, 81% of seekers are looking for a house. Service providers also observe an imbalance. When we consider program participation numbers, farm housing surfaces as the most prevalent need that seekers have, such that the demand for housing is nearly three times higher than what is offered by owners. We did not test, but do assume, that owners prefer to continue living at the farm in retirement (Gill, 2008; Leonard, S. H., & Gutmann, 2006). Some research suggests, however, that this desire may be felt more strongly by farm

men than farm women (Downey, Threlkeld, & Warburton, 2017; Riley, 2012).

Given that the farm is the family home (Katchova & Ahearn, 2016) and that "movement away from the farm…[is] an often inconceivable act" for older farmers (Riley, 2016, p. 110), then where will an entering farm family reside? This is a tension in the transfer formula that the literature often states is central (Hersey & Adams, 2017; Lobley et al., 2010; Riley, 2016; Ruhf, 2013), but then generally stops short of analyzing the gap. Our findings spotlight the need for much more research and policy innovation to support adequate options for incoming farmers who wish to reside on the farm. Recent assessments describe the extent to which accessing on-farm housing is part of the difficulty of land access. When the National Young Farmers Coalition surveyed current, former, and aspiring farmers under 40 years of age (*N*=3,517), access to affordable housing ranked in the top five most common challenges (Ackoff et al., 2017). This pattern represented obstacles from the perspective of each subgroup, including reasons that past farmers stopped farming and that aspiring farmers are not yet farming. American Farmland Trust also found housing to be part of "the most conspicuous gap" faced by beginning farmers (Freedgood & Dempsey, 2014, p. 1).

These and other reports suggest points for advocacy in federal, state, and local policies (Ackoff et al., 2017). Calls for state action include incorporating housing considerations into farmland preservation initiatives and replicating and expanding existing incentives for farm owners to build and improve farm laborer housing (Parsons et al., 2010). State and county zoning conventions are another focus (Brandt-Sargent, 2010) because their well-intentioned efforts to prevent agricultural land from fractionating for residential development can restrict housing from being built on lots smaller than a certain acreage (20 or even 80 acres, for example) in agricultural areas (Horst & Gwin, 2018). Specific policy recommendations should aim to make existing on-farm housing more accessible and affordable for incoming farmers. At the federal level, analyses support the effort of USDA Rural Development programs to reinforce rural housing, such as through the Rural Housing Service and expansion of the Community Facilities Direct Loan and Grant Program to include purchases of on-farm housing infrastructure (Calo & Petersen-Rockney, 2018). Innovations at the local level include deed riders to link residential and agricultural parcels to ensure affordable housing adjacent to agricultural activities (Parsons et al., 2010). These advocacy specifics fall under a wider call for rural development policies that are dedicated to more effectively and holistically consider agricultural livelihoods, market infrastructure, and the place of farm transfer in rural community creation going forward (Inwood, 2013).

Limitations

This analysis highlights a segment of entering farmers who are seeking non-family land. New farmers with other prospects for accessing land do not show up here, so we do not generalize beyond this subpopulation. Topically, this analysis leaves out the financial and relational factors that play a large role in any farm transfer and instead focuses on the parties' structural priorities. We did this by surveying farm/ranch owners who expect to transfer out of family and farm seekers, as well as experts whose work caters to these two parties. The survey of seekers and owners reflects an availability, or convenience, sample of respondents whose motivations led them to respond to this online survey. We are unable to compare these seekers and owners to nonrespondents. A specific limitation relative to our finding on seeker and owner geographical locations is that while we asked respondents to provide a zip code, we failed to direct owners to provide a zip code for their farm specifically. Farm owners may have reported their residential zip code or post office box. Specific to the section on housing, we did not ask owners about the possibility of new construction on their farms.

Conclusions and Recommendations

One goal of farm link services is to foster intergenerational farm transfers as an opportunity for incoming farmers to transfer into a farm that has no family member to take it over. We examine a criticism of farm link services (Fraas, 2015; Hersey & Adams, 2017) that they are based on an erroneous assumption that potential matches exist be-

tween incoming and outgoing farmers based on similar structural needs and offers. Our findings offer a nuanced view of this criticism through a focus on farm link services, farm seekers, and farm owners likely to transfer out of family in the U.S. North Central Region. Table 3 summarizes the findings. We find seekers and owners to be compatible in their locations on a rural-urban spectrum. Turning to land parcel sizes, both research phases agree that the 40–99 acre range is particularly where owners and seekers are well-matched, as supply and demand are both high in this range. However, in the less-than-40-acre-parcel range, service providers report that seeker demand is much higher than owners' offers. They also observe that, in the larger acreages, incoming commodity farmers need more 500–999 acre tracts than owners make available.

To explore these supply and demand dynamics relative to farm scale, we incorporate a focus on product mix. Service providers report that the number of aspiring commodity row crop, beef, and hay/fodder crop farmers aligns well with the number of commodity broadacre farms offered. On the other hand, owners appear to offer many fewer resources than what is needed to meet seeker ambitions to produce specialty crops, dairy, and hogs/poultry (outdoor and indoor). Therefore, our recommendations cast light on these latter sectors and smaller scales of agriculture. Our findings indicate that priority for research and policy and programmatic innovation, especially in this region, needs to be placed on unlocking opportunities for owners of parcels under 100 acres, and especially under 40 acres, to transfer to incoming seekers. Dedicating additional farm transfer support to existing specialty crop, dairy, and hog/poultry operations would also be well justified. As an example, the Dairy Grazing Apprenticeship provides one such model (Franzluebbers et al., 2012; Valliant et al., 2019) because it provides a two-year training program through which new grazing-based dairy farmers prepare to lead existing dairies, with master graziers serving as mentors. It creates a mechanism for transferring established dairy operations into the future.

Last, our most salient finding is that a top need for all aspiring farmers, regardless of the agricultural sector, is an affordable on-farm residence. We urge both research practitioners and interventionist

Table 3. Summary of Findings by Study Phase, Analytical Approach, and Area of Comparison

Area of Comparison	Phase 1: Program Assessment		Phase 2: Seeker/Owner Survey
	Programs	Participation Numbers	
Home	Seeker interest in transferring a home is greater than owners'	A home is the top-ranked need of seekers. Seekers' need for a home is three times greater than what owners are offering.	81% of seekers need a home, but only 15% of owners have a secondary home on their farm
Acreage	• Seekers' demand for parcels less than 40 acres is higher than owners' supply • 40–99 acre parcels are highly sought and demanded; here, seekers and owners are closely matched • Beginning commodity producers need larger tracts than owners offer		No statistically significant differences across parcels sought by seekers and offered by owners
Rural/urban location	N/A		No differences between seeker and owner locations
Product alignment	• Seeker interest in growing specialty crops is high, much higher than owner experience • Seeker interest is also high in row crop, hay/fodder, and beef production, at a level that matches owner experience • Fewer seekers are interested in dairy and hog/poultry production (indoor or outdoor), but interest is still higher than owner experience		N/A

stakeholders to dedicate attention to supporting new farmers' transitions with a stock of affordable on-farm housing, as a central component of farmland access. Policy, programmatic, and research recommendations are presented in the above discussion of housing. These inquiries will need to examine how housing access aligns with policy strategies to preserve farmland and agricultural landscapes. Rural on-farm housing deserves particular consideration in the effort to cycle new generations into agriculture.

Acknowledgments

The authors wish to acknowledge the leaders of programs who participated in this assessment for generously sharing their experience and insight. A team of national advisors helped to guide this research; particular thanks are extended to Mary Fund, Wyatt Fraas, Kevin Gibson, and Maria Marshall. Many thanks as well go to Dave Welsch, J. R. Brooks, and Sage Danch for reviewing the data collection instruments in draft form.

References

Ackoff, S., Bahrenburg, A., & Shute, L. L. (2017). *Building a future with farmers II: Results and recommendations from the national young farmer survey*. Hudson, NY: National Young Farmers Coalition. Retrieved from https://www.youngfarmers.org/wp-content/uploads/2018/02/NYFC-Report-2017.pdf

Ahearn, M. C. (2013). *Beginning farmers and ranchers at a glance*. Washington, DC: U. S. Department of Agriculture, Economic Research Service. Retrieved from https://www.usda.gov/media/blog/2013/01/30/beginning-farmers-and-ranchers-glance

Beck, C., Carter, M., & Circo, A. (2018). *The Beginning Farmer Tax Credit Act: Performance on selected metrics*. Lincoln, NE: State Capitol, Legislative Performance Audit Committee. Retrieved from https://nebraskalegislature.gov/pdf/reports/audit/begfarm_2018.pdf

Brandt-Sargent, B. (2010). *Accessory dwelling units to support farm transitions*. Minnesota: Renewing the Countryside & Center for Urban and Regional Affairs. Retrieved from http://d3n8a8pro7vhmx.cloudfront.net/renewingthecountryside/pages/129/attachments/original/1401393367/RTC_ADUs_to_support_farm_transitions.pdf?1401393367

Calo, A., & Petersen-Rockney, M. (2018). *What beginning farmers need most in the next farm bill: Land* (Policy brief). Berkeley: University of California, Berkeley, Berkeley Food Institute. Retrieved from https://food.berkeley.edu/wp-content/uploads/2018/08/BFI-Beginning-Farmers-Policy-Brief.pdf

Carolan, M. (2018). Land changing hands: Experiences of succession and farm (knowledge) acquisition among first-generation, multigenerational, and aspiring farmers. *Land Use Policy, 79*, 179–189. https://doi.org/10.1016/j.landusepol.2018.08.011

Chiswell, H. M. (2014). The importance of next generation farmers: A conceptal framework to bring the potential successor into focus. *Geography Compass, 8*(5), 300–312. https://doi.org/10.1111/gec3.12131

Clark, J. K., Inwood, S., & Sharp, J. S. (2012). Local food systems: The birth of new farmers and the demise of the family farm? In J. D. Gatrell, P. S. Ross, & N. Reid (Eds.), *Local food systems in old industrial regions: Concepts, spatial context, and local practices* (pp. 131–146). Abingdon, Oxon, UK: Routledge.

Downey, H., Threlkeld, G., & Warburton, J. (2017). What is the role of place identity in older farming couples' retirement considerations? *Journal of Rural Studies, 50,* 1–11. https://doi.org/10.1016/j.jrurstud.2016.12.006

Farmer, J. R., & Valliant, J. C. D. (2016). *Transitioning farm and ranch land from one family to another: Evaluating new strategies for profitable transfers and sustainable agriculture partnerships* [Project report]. College Park, MD: USDA National Institute of Food and Agriculture (NIFA) Sustainable Agriculture Research & Education (SARE). Retrieved from https://projects.sare.org/sare_project/lnc16-377/

Fraas, W. (2015). *Land access support for beginning farmers and ranchers: Center for Rural Affairs Strategy & Services*. Lyons, NE: Center for Rural Affairs.

Franzluebbers, A. J., Paine, L. K., Winsten, J. R., Krome, M., Sanderson, M. A., Ogles, K., & Thompson, D. (2012). Well-managed grazing systems: A forgotten hero of conservation. *Journal of Soil and Water Conservation, 67*(4), 100A–104A. https://doi.org/10.2489/jswc.67.4.100A

Freedgood, J., & Dempsey, J. (2014). *Cultivating the next generation: Resources and policies to help beginning farmers succeed in agriculture*. Washington, D.C.: American Farmland Trust. Retrieved from https://4aa2dc132bb150caf1aa-7bb737f4349b47aa42dce777a72d5264.ssl.cf5.rackcdn.com/AFT_BF_06-2014-lo.pdf

Gill, F. (2008). Moving to the 'big' house: Power and accommodation in inter-generational farming families. *Rural Society, 18*(2), 83–94. https://doi.org/10.5172/rsj.351.18.2.83

Girardi, A. G. (2015). *Beginning Farmer Tax Credit Program: Tax credit program evaluation study*. Des Moines: Iowa Department of Revenue.

Grubbström, A., & Eriksson, C. (2018). Retired farmers and new land users: How relations to land and people influence farmers' land transfer decisions. *Sociologia Ruralis*, *58*(4), 707–725. https://doi.org/10.1111/soru.12209

Hamilton, N. D. (2010). America's new agrarians: Policy opportunities and legal innovations to support new farmers. *Fordham Environmental Law Review, 22*(3), 523–562. Retrieved from https://www.vabeginningfarmer.alce.vt.edu/content/dam/vabeginningfarmer_alce_vt_edu/resources/AMERICASNEWAGRARIANS.pdf

Harper, D. (2015). *Partnering with next-generation farmers*. Washington, D.C.: Land Trust Alliance. Retrieved from https://www.landtrustalliance.org/news/partnering-next-generation-farmers

Hersey, A., & Adams, M. (2017). Using contribution analysis to assess the influence of farm link programs in the U.S. *Journal of Agriculture, Food Systems, and Community Development, 7*(3), 83–103. https://doi.org/10.5304/jafscd.2017.073.006

Horst, M., & Gwin, L. (2018). Land access for direct market food farmers in Oregon, USA. *Land Use Policy, 75*, 594–611. https://doi.org/10.1016/j.landusepol.2018.01.018

Ingram, J., & Kirwan, J. (2011). Matching new entrants and retiring farmers through joint farm ventures: Insights from the Fresh Start Initiative in Cornwall, UK. *Land Use Policy, 28*(4), 917–927. https://doi.org/10.1016/j.landusepol.2011.04.001

Inwood, S. M. (2013). Social forces and cultural factors influencing farm transition. *Choices, 28*(2), 1–5. Retrieved from http://www.choicesmagazine.org/UserFiles/file/cmsarticle_309.pdf

Inwood, S. M., & Sharp, J. S. (2012). Farm persistence and adaptation at the rural-urban interface: Succession and farm adjustment. *Journal of Rural Studies, 28*(1), 107–117. https://doi.org/10.1016/j.jrurstud.2011.07.005

Katchova, A. L., & Ahearn, M. C. (2016). Dynamics of farmland ownership and leasing: Implications for young and beginning farmers. *Applied Economic Perspectives and Policy, 38*(2), 334–350. https://doi.org/10.1093/aepp/ppv024

Katchova, A. L., & Ahearn, M. C. (2017). Farm entry and exit from US agriculture. *Agricultural Finance Review, 77*(1), 50–63. https://doi.org/10.1108/AFR-03-2016-0021

Lange, A., Piorr, A., Siebert, R., & Zasada, I. (2013). Spatial differentiation of farm diversification: How rural attractiveness and vicinity to cities determine farm households' response to the CAP. *Land Use Policy, 31,* 136–144. https://doi.org/10.1016/j.landusepol.2012.02.010

Leonard, B., Kinsella, A., O'Donoghue, C., Farrell, M., & Mahon, M. (2017). Policy drivers of farm succession and inheritance. *Land Use Policy*, *61*, 147–159. https://doi.org/10.1016/j.landusepol.2016.09.006

Leonard, S. H., & Gutmann, M. P. (2006). Land use and transfer plans in the U. S. Great Plains. *Great Plains Research, 16*, 181–193. Retrieved from https://www.unl.edu/plains/publications/GPR/gpr.shtml

Lobley, M., & Baker, J. R. (2012). Succession and retirement in family farm businesses. In M. Lobley, J. R. Baker, & I. Whitehead (Eds.), *Keeping it in the family: International perspectives on succession and retirement on family farms* (pp. 1–20). Farnham, Surrey, UK: Ashgate.

Lobley, M., Baker, J. R., & Whitehead, I. (2010). Farm succession and retirement: Some international comparisons. *Journal of Agriculture, Food Systems, and Community Development, 1*(1), 49–64. https://doi.org/10.5304/jafscd.2010.011.009

Meuleners, A. (2013). Finding fields: Opportunities to facilitate and incentivize the transfer of agricultural property to new and beginning farmers. *Drake Journal of Agricultural Law, 18*(1), 211–238. Retrieved from http://aglawjournal.wp.drake.edu/wp-content/uploads/sites/66/2016/09/agVol18No1-Meuleners.pdf

National Academies of Sciences, Engineering, and Medicine. (2016). *Rationalizing rural area classifications for the Economic Research Service: A workshop summary*. Washington, D.C.: The National Academies Press. https://doi.org/10.17226/21843

Paine, L., & Sullivan, A. (2014). *Beginning Farmers in Wisconsin: 2014 Survey Summary*. Madison: Wisconsin Department of Agriculture.

Parsons, R., Ruhf, K. Z., Stevenson, G. W., Baker, J., Bell, M., Epley, E., . . . Keller, J. (2010). *Research report and recommendations from the FarmLASTS Project*. Washington, D.C.: USDA, National Institute of Food and Agriculture. Retrieved from http://www.uvm.edu/farmlasts/FarmLASTSResearchReport.pdf

Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.

Riley, M. (2012). 'Moving on'? Exploring the geographies of retirement adjustment amongst farming couples. *Social & Cultural Geography, 13*(7), 759–781. https://doi.org/10.1080/14649365.2012.725136

Riley, M. (2016). Still being the 'good farmer': (Non-)retirement and the preservation of farming identities in older age. *Sociologia Ruralis, 56*(1), 96–115. https://doi.org/10.1111/soru.12063

Ruhf, K. Z. (2013). Access to farmland: A systems change perspective. *Journal of Agriculture, Food Systems, and Community Development*, *4*(1), 51–60. https://doi.org/10.5304/jafscd.2013.041.006

Schilling, B. J., Esseks, J. D., Duke, J. M., Gottlieb, P. D., & Lynch, L. (2015). The future of preserved farmland: Ownership succession in three Mid-Atlantic states. *Journal of Agriculture, Food Systems, and Community Development, 5*(2), 129–153. https://doi.org/10.5304/jafscd.2015.052.008

Schutt, R. K. (2006). *Investigating the social world* (5th ed.). Thousand Oaks, CA: Sage.

Slack, T. (2013). Challenges facing elder farmers and the need for a nationwide Farm-On program. *Elder Law Journal, 20*(2), 485–520. Retrieved from https://theelderlawjournal.com/archives/

U.S. Department of Agriculture, Economic Research Service [USDA ERS]. (2016). Rural-urban commuting area codes. Washington, D.C.: USDA ERS. Retrieved from https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/

USDA ERS. (2017). *Cash receipts by commodity state ranking*. Washington, D.C.: USDA ERS. Retrieved from https://data.ers.usda.gov/reports.aspx?ID=17844

USDA ERS. (2019). *Beginning, limited resource, socially disadvantaged and female farmers*. Washington, D.C.: USDA ERS. Retrieved from https://www.ers.usda.gov/topics/farm-economy/beginning-limited-resource-socially-disadvantaged-and-female-farmers/

USDA National Agricultural Statistics Service [USDA NASS]. (2012a). *Table 8. Farms, land in farms, value of land and buildings, and land use: 2012 and 2007*. Washington, D.C.: USDA NASS, Census of Agriculture. Retrieved from https://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_US_State_Level/st99_2_008_008.pdf

USDA NASS. (2012b). *Table 55. Selected operator characteristics for principal, second, and third operator: 2012*. Washington, D.C.: USDA NASS, Census of Agriculture. Retrieved from https://www.nass.usda.gov/Publications/AgCensus/2012/Full_Report/Volume_1,_Chapter_1_US/st99_1_055_055.pdf

USDA NASS. (2014). *Beginning farmers—Characteristics of farmers by years on current farm* (ACH12-5). Washington, D.C.: USDA NASS. Retrieved from https://www.nass.usda.gov/Publications/Highlights/2014/Beginning_Farmers/index.php

USDA NASS. (2015). *Farmland ownership and tenure*. Washington, D.C.: USDA NASS. Retrieved from https://www.nass.usda.gov/Publications/Highlights/2015/TOTAL_Highlights.pdf

USDA NASS. (2016). *2016 Agricultural Resource Management Survey, costs and returns report—Version 1*. Washington, D.C.: USDA NASS. Retrieved from https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Ag_Resource_Management/

USDA, National Institute of Food and Agriculture, Sustainable Agriculture Research & Education [USDA NIFA SARE]. (2018). *SARE projects database*. College Park, MD: USDA NIFA SARE. Retrieved from https://projects.sare.org/search-projects/

University of North Dakota Center for Rural Health. (2014). *Temporary zip RUCA 3.10 file access page*. Grand Forks: UND Center for Rural Health. Retrieved from https://ruralhealth.und.edu/ruca

University of Washington Rural Health Research Center. (2005). *RUCA data: Using RUCA data*. Seattle, WA: WWAMI Rural Health Research Center. Retrieved from http://depts.washington.edu/uwruca/ruca-uses.php

Valliant, J. C. D., & Freedgood, J. (in press). Land access policy incentives: Emerging approaches to transitioning farmland to a new generation. *Journal of Agriculture, Food Systems, and Community Development.*

Valliant, J. C. D., Ruhf, K. Z., Gibson, K. D., Brooks, J. R., & Farmer, J. R. (2019). Fostering farm transfers from farm owners to unrelated, new farmers: A qualitative assessment of farm link services. *Land Use Policy, 86*, 438–447. https://doi.org/10.1016/j.landusepol.2019.05.004

Williamson, J. M., & Girardi, A. (2016, May). *Income tax credits to assist beginning farmers and ranchers: A look at state-level policies*. Paper presented at the annual meeting of the Agricultural and Applied Economics Association, Boston, MA. Retrieved from https://ageconsearch.umn.edu/record/235810/files/Williamson_AAEA%202016%20BFTC%20manuscript%20FINAL.pdf

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

The state of sustainable agriculture and agroecology research and impacts: A survey of U.S. scientists

Marcia DeLonge [a] * and Tali Robbins [b]
Union of Concerned Scientists

Andrea D. Basche [c]
University of Nebraska–Lincoln

Lindsey Haynes-Maslow [d]
North Carolina State University

Submitted April 19, 2019 / Revised June 26 and August 11, 2019 / Accepted August 22, 2019 / Published online February 18, 2020

Citation: DeLonge, M., Robbins, T., Basche, A. D., & Haynes-Maslow, L. (2020). The state of sustainable agriculture and agroecology research and impacts: A survey of U.S. scientists. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 159–184. https://doi.org/10.5304/jafscd.2020.092.009

Abstract

A growing body of research suggests that although sustainable agriculture, particularly agroecology, can address challenges such as those related to climate change, ecosystem services, food insecurity, and farmer livelihoods, the transition to such systems remains limited. To gain insight into the state of U.S. sustainable agriculture and agroecology, we developed a 28-question mixed-method survey that was administered to scientists in these fields. Respondents (N=168) represented diverse locations, institutions, and career stages. They offered varied definitions of sustainable agriculture, with 40% considering economic and social well-being to be core components. Respondents identified the amount and duration of public research funding as

[a] * *Corresponding author:* Marcia DeLonge, Food & Environment Program, Union of Concerned Scientists, Washington, D.C. 20006 USA; +1-510-809-1582; mdelonge@ucsusa.org

[b] Tali Robbins, Food & Environment Program, Union of Concerned Scientists.
Robbins is now at the Friedman School of Nutrition Science and Policy, Tufts University; Boston, MA 02111 USA; avital.robbins@tufts.edu

[c] Andrea D. Basche, Department of Agronomy and Horticulture, University of Nebraska-Lincoln, Lincoln, NE 68583 USA; abasche2@unl.edu

[d] Lindsey Haynes-Maslow, Department of Agricultural and Human Sciences, North Carolina State University, Raleigh, NC 27695 USA; lhmaslow@ncsu.edu

Funding Disclosure
The research was conducted while M.D., T.R., and A.B. were employed by the Union of Concerned Scientists, a nonprofit organization. Funding was provided in part through the generous support of the Grantham Foundation for the Protection of the Environment, the TomKat Foundation, and The New York Community Trust. The funders had no role in the design of the study; in the collection, analyses, and interpretation of data; in the writing of the manuscript; and in the decision to publish the results.

important obstacles to conducting research on sustainable agriculture (85% and 61%, respectively). Further, most expressed challenges in communicating findings beyond academia, including to the media and policymakers, potentially limiting the impacts of such research. However, respondents expressed satisfaction in several areas, including relationships with community members (81%) and local producers (81%), and interest from students (80%) and research communities (73%), suggesting positive momentum in this field. Earlier versus later career scientists rated research on "human dimensions" as more important, expressed greater concerns over career stability, and were less satisfied with opportunities for policy engagement. Results imply that greater public investments, particularly fostering human dimensions, could support a transition to agroecology and its associated benefits.

Keywords
Agroecosystem, Policy Engagement, Research Funding, Systems Science, Media, Outreach

Introduction

Additional sustainable agriculture research and adoption is needed in the U.S. to address persistent challenges that threaten farms, farmers, rural communities, and public health and ecosystem services, including air quality, water supply, and biodiversity (Foley et al., 2011; Nelson et al., 2018). The urgency to transition to a system with greater sustainability has accelerated, as evidence shows that climate change, particularly shifts to more extreme and more variable rainfall, is already exacerbating consequences of practices that lead to soil erosion, water pollution, and risks of flooding and drought (U.S. Global Change Research Program, 2018). Sustainable agriculture, as defined by the U.S. Department of Agriculture (USDA), should reduce such undesirable outcomes through a system that will broadly "satisfy human food and fiber needs; enhance environmental quality and the natural resource base upon which the agriculture economy depends; make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole" (National Agricultural Research, Extension, and Technical Policy Act, 1997, p. 9).

The field of agroecology has recently been attracting growing attention for its valuable approaches toward developing more sustainable agriculture (High Level Panel of Experts on Food Security and Nutrition [HLPE], 2019). While agroecology has in some contexts been understood to be most relevant to crop production and practices at the farm scale, it has increasingly been interpreted as also encompassing environmental, social, economic, ethical, and community development issues (Wezel et al., 2009). As this field has evolved and varied, it has been interpreted as referring to a scientific discipline, an agricultural practice, and/or a social movement (Montenegro de Wit & Iles, 2016; Wezel et al., 2009). In this study, we focus on the scientific discipline of agroecology, asserting that it entails a systems-based integration of ecological concepts with agricultural practices, while also recognizing that it can be understood as drawing on both the biophysical and social sciences (DeLonge & Basche, 2017; Gliessman, 2015).

As a scientific discipline, agroecology has recently shown that practices such as diversifying farms and rotating crops can deliver positive environmental outcomes at a variety of scales and levels, building soil health locally and protecting water resources more broadly, while maintaining profitable and resilient farms (DeLonge & Basche, 2017; Gliessman, 2015). For example, a growing body of research has demonstrated measurable improvements in ecosystem services across a range of climates, geographic regions, and agricultural conditions (Altieri, Nicholls, Henao, & Lana, 2015; Hunt, Hill, & Liebman, 2017; Isbell et al., 2017; Ponisio et al., 2014; Schulte et al., 2017). Furthermore, agroecology's status not only as a science but also as practice and a movement may uniquely position it to transform food and farming systems (Montenegro de Wit & Iles, 2016; Cacho et al., 2018; Duru, Therond, & Fares, 2015). Agroecology could play a significant role in ensuring that agricultural and food systems can meet both production and broader sustainability goals (HLPE, 2019; Hunter, Smith, Schipanski, Atwood, &

Mortensen, 2017). It has been proposed that a supportive policy environment, informed by agroecological research from field to ecosystem scales, could accelerate a transition to a more sustainable agricultural landscape (DeLonge, Miles, & Carlisle, 2016; Miles, DeLonge, & Carlisle, 2017).

As evidence of the potential benefits of agroecology has emerged, more international organizations and institutions have expressed interest in advancing the field, such as the United Nations (Food and Agriculture Organization of the United Nations [FAO], 2018), the International Panel of Experts on Sustainable Food Systems (Frison, 2016), and the government of France (Gonzalez, Thomas, & Chang, 2018). In the U.S., organizations that include leading scientific societies, public university coalitions, and nonprofit organizations have also begun to acknowledge the interest in agroecology and its potential to solve interconnected food system challenges (American Society of Agronomy [ASA], Crop Science Society of America [CSSA], & Soil Science Society of America [ASSA], 2016; Association of Public and Land-grant Universities [APLU], 2017; Schonbeck, Jerkins, & Ory, 2015; USDA National Institute of Food and Agriculture [USDA NIFA], 2018; Union of Concerned Scientists [UCS], 2016). Interest in agroecology and related disciplines has expanded beyond agricultural sciences to entities such as the National Academies of Sciences, Engineering, and Medicine (2019), which have recognized that systems science, transdisciplinary research, and community partnerships are critical to the future of agriculture and the sustainability of our environment.

Research and practice in these disciplines remain relatively rare, however, possibly due to numerous obstacles. The historic underinvestment in agroecology as compared to conventional agriculture may explain a slower pace of research and development improvements (DeLonge et al., 2016; Pimbert & Moeller, 2018), initiating a feedback cycle in which limited investment leads to slower improvements, contributing to less likelihood of attracting future investment, and so on (Miles et al., 2017). In the U.S., shortage of funding for agroecology has been exacerbated by reduced rates of public investment in agricultural research and development overall at both the federal and state levels, particularly relative to private investment (Pardey, Chan-Kang, Beddow, & Dehmer, 2015).

In addition to difficulties associated with funding, identified obstacles to agroecology research and development include insufficient supporting infrastructure and related cultural obstacles such as siloed departments, programs, and institutions; lack of suitable equipment and technology across the supply chain; and inadequate incentives for complex, collaborative research (Basche et al., 2014; DeLonge & Basche, 2017; Duru et al., 2015). Agroecology research requires training in interdisciplinary, systems-science approaches, which are relatively rare and difficult to pursue at U.S. research institutions (DeLonge & Basche, 2017). Other obstacles for advancing agroecology may include institutional practices and norms that fail to support independent science, such as discouraging scientists from communicating their findings to policymakers and shifting resources from work viewed as politically contentious. Recent studies have provided some evidence that such institutional constraints may exist at the USDA (Carter, Goldman, & Johnson, 2018; USDA Office of Inspector General [USDA OIG], 2018), the primary source for public agricultural research funding in the U.S. However, little attention has been paid to whether such constraints exist at other institutions, such as colleges and universities. Based on the responses in our survey, we found that, collectively, obstacles that are financial, institutional, and cultural threaten to limit the expansion of agroecological science and practices.

Considering the expanding interest in but limited adoption of sustainable agriculture and agroecology research and practice, the goal of this study was to gain a better understanding of opportunities and barriers surrounding these fields in the U.S. We focused on the scientific community, because research, education, and extension critically affect the array of practices and tools available for farmers and ranchers (Miles et al., 2017). Obstacles within the research community may signify, aggravate, or even produce additional obstacles for agricultural operations and development. Alternatively, investment in the research community could lead to new tools, techniques, and trainings, with benefits for farmers, ranchers, and the public.

Applied Research Methods

Survey Development and Distribution

To gain a better understanding of potential opportunities and obstacles for sustainable agriculture and agroecology, we distributed an online survey to researchers and other professionals with advanced degrees (master or doctorate) who have academic or professional experience in fields related to sustainable agriculture (Appendix). The survey was administered through the SurveyMonkey platform (SurveyMonkey, 2018), using a private password-protected account. Incomplete responses were collected and saved by SurveyMonkey after the completion of each survey section, but no personally identifying information (including IP addresses) was collected; thus, the study authors could not resend the link to encourage respondents to complete the survey. Responses were stored on SurveyMonkey before being downloaded to a password-protected server.

The 28-question survey contained both multiple-choice and open-ended questions regarding respondent experiences with sustainable agriculture and agroecology, including issues related to funding, institutional support, and collegial support and collaboration opportunities. Further demographic questions assessed career stage, geographic region, and institutional affiliation. Most multiple-choice questions were based on a 5-point Likert scale. All responses were voluntary.

The survey was peer-reviewed by four experts as part of the internal development process. The survey was then submitted to Western IRB, an independent company accredited to perform institutional review board (IRB) services and was approved for an exemption from IRB review (WIRB Work Order #1-1000684-1). The study team circulated the survey broadly, using active email listservs with interests pertaining to sustainable agriculture and agroecology,[1] as well as to the Union of Concerned Scientists Science Network members with relevant expertise in agricultural or environmental science. (The Science Network is a network of more than 20,000 individuals with advanced degrees in a diverse range of scientific fields.) We used a snowball recruiting method in which respondents were encouraged to share the survey with other interested and qualified individuals in their professional networks (Heckathorn, 2011). Recruiting emails were first distributed in March 2017. Follow-up requests were sent once to each listserv in mid-April 2017. The survey was closed at the end of April 2017.

Data Analysis

The original data were downloaded from the SurveyMonkey platform and exported to Microsoft Excel. The data were analyzed using Microsoft Excel and the R software platform (R Core Team, 2014). We evaluated survey results overall, as well as in subgroups for earlier and later career stages. Respondents varied widely in the number of years they have been working in the field, with several respondents identifying in each of the ranges provided in the survey. We analyzed data in this paper using two large groups derived from these ranges: 0 to 10 years (earlier career stage) and 11 or more years (later career stage). These groups capture earlier- and later-career stages, while also representing a relatively balanced number of respondents. We also explored evaluating differences among other subgroups, including region and institution types. However, sample sizes for such groups were not large enough to adequately measure statistical significance.

For questions that included a 5-point Likert scale, 5 represented for respondents the most agreement, satisfaction, or importance, and 1 represented the least agreement, satisfaction, or importance. From these values, we calculated the mean and standard errors of responses. We tested for statistical differences between groups using paired two-sided t-tests in R statistical software.

Responses to open-ended questions were evaluated qualitatively by a content analysis approach, which involves an analysis of written statements to help identify themes pertaining to a specific topic. For the analysis, we developed a list of key themes and evaluated written responses for the presence or

[1] The listservs were susag-community@iastate.edu, divfarmingsystems@lists.berkeley.edu, agroecommunity@googlegroups.com, comfood@elist.tufts.edu, NWAEGInternational@umich.edu, nsac-research-extensioneducationcommittee@googlegroups.com

absence of each theme. Content analysis was considered an appropriate approach to open-ended responses because it allows researchers to also code themes that may not have already been established as key themes (Guest, MacQueen, & Namey, 2011). Relevant codes were identified and defined by two coders. One coder analyzed the full dataset, and a subset of the open-ended content was analyzed independently by two coders to ensure consistency; codes were compared to reconcile discrepancies.

Results

Survey Respondents

A total of 168 qualified experts participated in the survey, of whom 165 provided answers to at least one open-ended question, and 104 provided answers to at least one quantitative question. Respondents represented a wide geographic range in the U.S.; diverse positions at academic, nonprofit, private, governmental, and other institutions; and both earlier and later career stages (Table 1).

Respondents who identified their geographic region were relatively dispersed throughout the six U.S. regions. Given the relatively balanced regional distribution as well as the limited number of respondents per region, we did not explore the influence of region on responses in this study. Only 72 respondents specified their job title. We categorized these into two groups: research positions, including doctoral students, post-doctoral fellows, adjunct professors, assistant professors, associate professors, and full professors; and administrative, project coordination and/or management positions. Among the 72 respondents, 62 self-identified as researcher and 10 self-identified as administrative, project coordination and/or management position. The majority of respondents who identified their employer were from a land-grant university ("the term used to identify a public university in each state that was originally established as a land grant college of agriculture pursuant to the Morrill Act of 1862" [Womach, 2005, p. 151]). Thus, these represent a network of U.S. educational institutions that receive federal support and work in collaboration with the USDA to advance agricultural science. Given the lack of respondents within other major employer categories, we did not explore differences between employer subgroups in this paper.

Defining Sustainable Agriculture

Respondents provided varied definitions of sustainable agriculture. The most common themes identified were related to social viability and well-being (included in 40% of responses), economics (40%), and the enhancement of natural resources (26%). Other themes appearing in a relatively large percentage of responses included biological diver-

Table 1. Characteristics of Survey Participants: Career Stage and Employer Type

		Participants	
Category	**Subgroup**	(*n*)	(%)
Years in career, *n*=73	<1	6	8.2
	1 to 3	4	5.5
	4 to 5	12	16.4
	6 to 10	12	16.4
	11 to 20	18	22.7
	>20	21	28.8
Employer, *n*=62	Land Grant University	40	66.7
	Other College or University	5	8.3
	Non-profit organization	5	8.3
	Private industry	6	10.0
	Local, state, or federal government agency	4	6.7
Job type, *n*=72	Research	62	86.1
	Administrative, Project Coordination and/or Management	10	13.8

sity (19%), equity and justice (15%), ecology (13%), reducing environmental damage (15%), and local considerations (12%). Other less common themes, mentioned by less than 10% of respondents, included regeneration, improving efficiency, connecting consumers and producers, climate adaptation or mitigation, alternative markets, organic practices, and population growth. Theme frequencies were similar between the full group (165 respondents) and the smaller subset that included only respondents who replied to quantitative questions (104 respondents).

Topics of Importance within Sustainable Agriculture

Respondents indicated that they consider a range of topics to be important to include in USDA Requests for Applications (RFAs) for research grant proposals (Table 2). Agroecology was ranked as very important (mean score of at least 4 out of a possible 5) by the largest percentage of respondents (44%). The majority of proposed areas received an average score of at least 3.3.

Overall perception of obstacles to sustainable agriculture research and their broader impacts

A large majority of respondents considered several obstacles to be important (Likert scale=4) or very important (Likert scale=5) in attempting to perform sustainable agriculture research (Figure 1). The obstacles substantially consisted of ingrained financial interests and a lack of research funding. Overall, fewer respondents considered obstacles such as conflicts of interest related to the private sector, lack of career stability, and lack of institutional support to be important.

Experiences with sustainable agriculture research

Respondents cited high levels of satisfaction in many areas of their work in sustainable agriculture (Figure 2). Relationships were a major area of satisfaction, with most respondents indicating positive relationships with local producers (the area with the highest level of satisfaction), interest from students and others seeking mentorship (ranked second), as well as interest from local or regional community members (ranked third).

Respondents were less satisfied with other aspects of their work, including the lesser amount of interdisciplinary, farmer-driven, and community-based research that they were able to conduct. While the reasons for this could not be gleaned from the quantitative data, the open-ended question indicated that difficulties with building relationships, institutional support, and having enough time were factors experienced as barriers, especially for community-based research. Other areas of low satisfaction were related to the lack of opportunities to engage with policymakers, the media, and

Table 2. Importance for Requests for Applications to Reference Range of Topics in Sustainable Agriculture

Topic in USDA research grant RFAs	*n*	% 1	2	3	4	5	Mean	Standard Error
Broader public impacts (e.g. ecosystem services)	91	1	7	19	33	41	4.1	0.1
Agroecology	89	3	7	16	30	44	4.0	0.1
Interdisciplinary	90	3	8	17	30	42	4.0	0.1
Human dimensions/decision making	88	6	7	22	27	39	3.9	0.1
Pollinator health	89	3	10	24	29	34	3.8	0.1
Social justice	86	6	14	14	29	37	3.8	0.1
Integrated pest management	89	5	15	21	33	27	3.6	0.1
Economics	91	2	14	30	28	26	3.6	0.1
Racial equity	87	8	14	21	26	31	3.6	0.1
Organic production systems	90	8	16	22	29	26	3.5	0.1
Perennial crops	86	7	14	28	27	24	3.5	0.1
Crop rotation	90	4	26	20	30	20	3.4	0.1
Improved grazing systems	88	11	13	27	28	21	3.3	0.1
Agroforestry	87	8	21	24	26	21	3.3	0.1

the wider public. The only area where dissatisfaction was greater than satisfaction was in respondent perceived opportunities to engage with policymakers.

Experiences with obstacles in sustainable agriculture research

Respondents did not agree that a variety of hypothesized potential obstacles to sustainable agriculture research affected their work (Figure 3). For 10 of 12 statements suggesting potential obstacles, few respondents agreed that they reflected actual barriers to their work. The statement that received the lowest level of agreement was, "I have experienced pressure to modify research results." However, 58% of respondents agreed (including 15% who strongly agreed) with the statement, "Sustainable agriculture

Figure 1. Perceptions of Obstacles to Sustainable Agriculture Research (*N*=71)

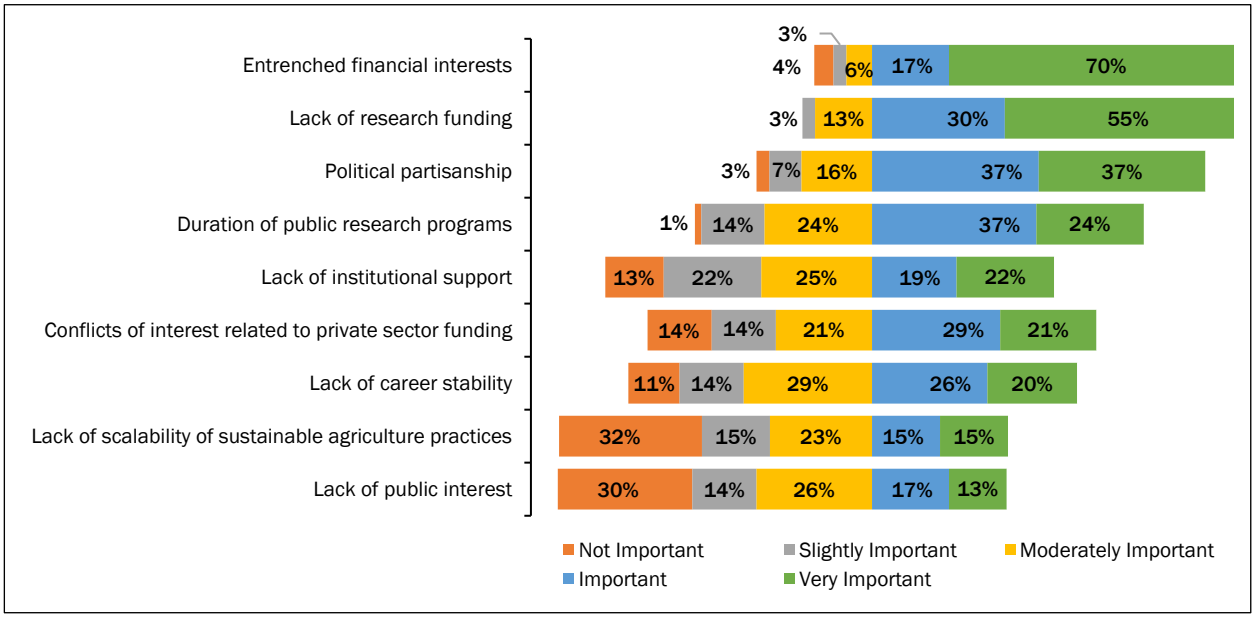
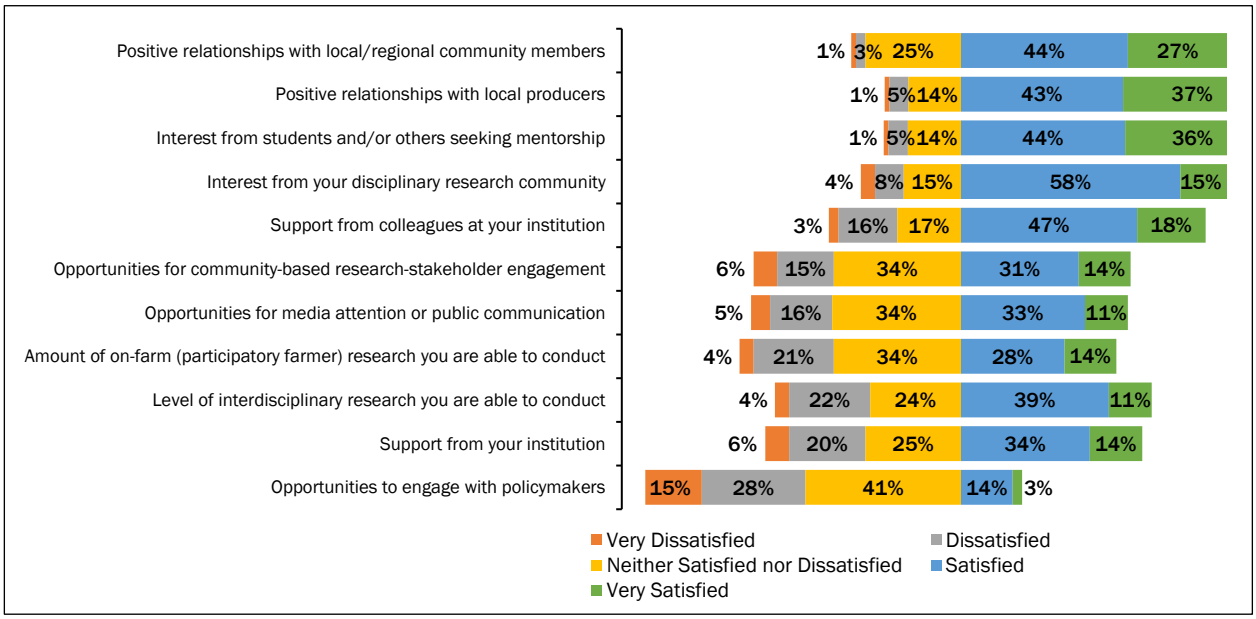


Figure 2. Level of Satisfaction in Areas of Sustainable Agriculture Research (N=87)



research entails challenging relationships with agricultural stakeholders." Open-ended responses in this section of the survey reinforced concerns regarding lack of institutional support, challenges with funding, and external pressure to change their research agenda.

Experiences with policy engagement and the media: A closer look

To gain a better understanding of respondent experiences specifically related to policy engagement, the survey asked them to indicate the degree to which policy engagement was part of their job, and whether it was important or should be avoided. To this question, 73% of respondents considered policy engagement to be important, whereas just 26% stated that policy engagement is part of their job (*n*=70).

Respondents were also asked to state their degree of satisfaction with various aspects of policy engagement in their work (Figure 4). Results indicated that a large portion of respondents was satisfied with the number of students interested in policy engagement. Many respondents were also satisfied or very satisfied with the number of colleagues interested in policy engagement and the support they receive from colleagues. Just 17% of respondents were satisfied with the amount of training they had received for policy engagement, and no respondents were very satisfied in this area. While not specified within the survey, satisfaction in terms of rewards and recognition could be interpreted in a variety of ways, including financial, acknowledgment, or career advancement. None of the respondents were very satisfied with the amount of time they had for policy engagement.

Influence of Career Stage

Our results show that career stage may influence perceptions of obstacles and opportunities involving sustainable agriculture research (Table 3). First, earlier-career scientists (defined as those working between 0 and 10 years in the field) were more

Figure 3. Experience with Obstacles in Sustainable Agriculture Research (*N*=71)

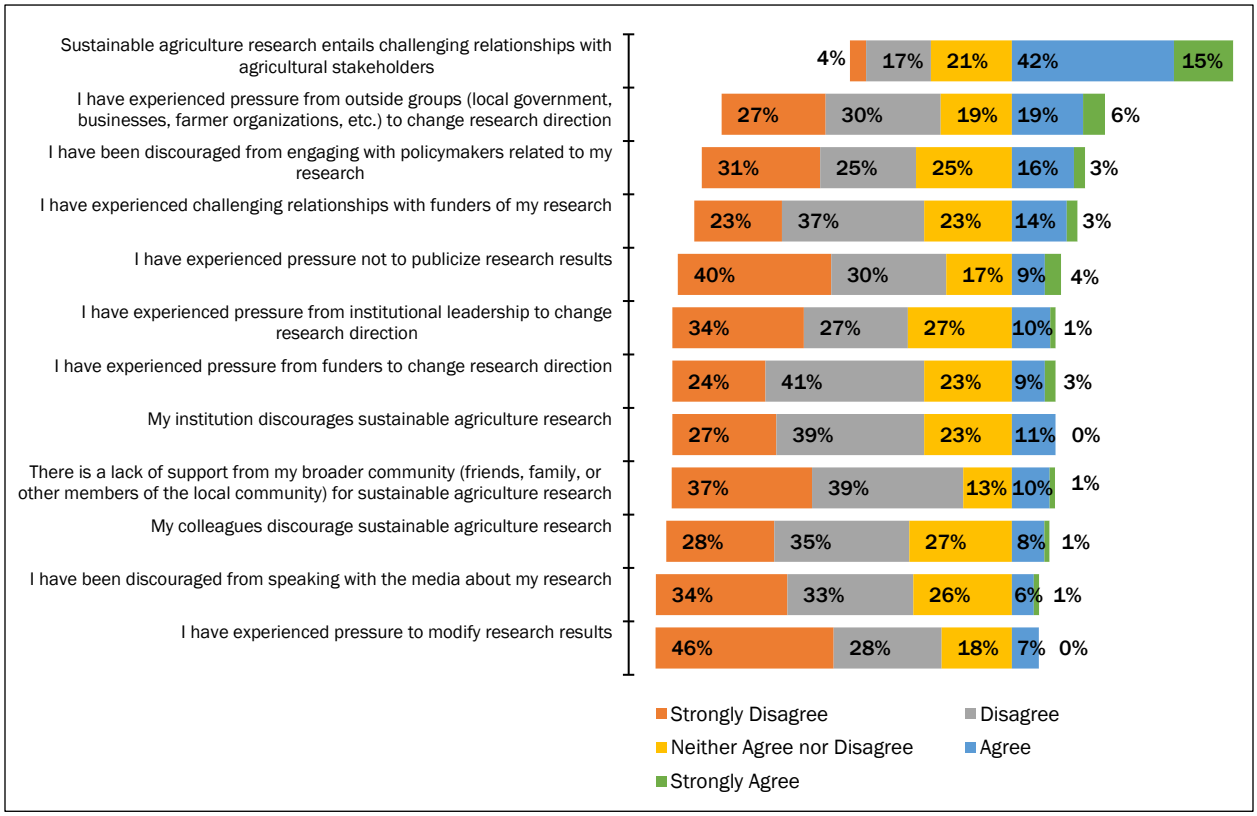


Figure 4. Satisfaction with Policy Engagement on the Topic of Sustainable Agriculture (*N*=61)

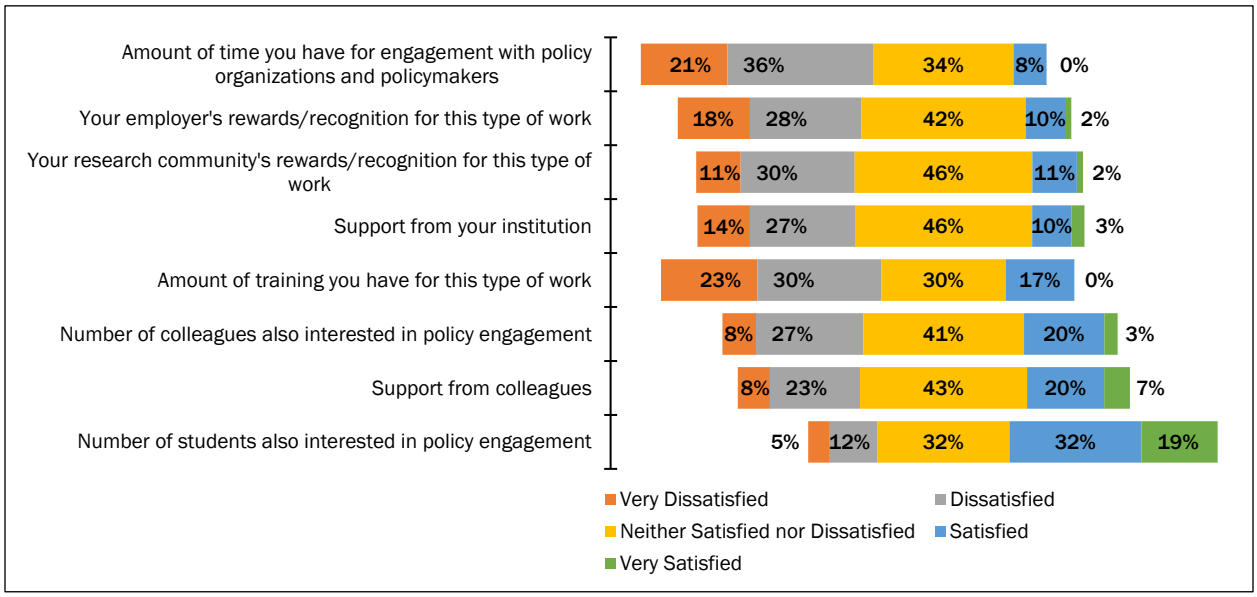


Table 3. Areas of Select Survey Questions Where Career Stage Influenced Responses

Topic/Question	Earlier Career (0–10 years)	Later Career (> 10 years)	*p*-value
RFA: Agroforestry (Table 2)	2.923	3.500	0.082
RFA: Economics (Table 2)	3.933	3.286	0.016
RFA: Human dimensions/decisionmaking (Table 2)	4.214	3.514	0.024
RFA: Organic production systems (Table 2)	3.138	3.667	0.081
Lack of career stability (Table 3)	3.677	2.921	0.010
Amount of time for engagement with policy organizations and policymakers (Table 6)	2.042	2.485	0.079
Amount of training received for this type of work (policy) (Table 6)	2.125	2.594	0.089

likely to identify human dimensions/decision-making and economics as relatively important topics for research grant RFAs ($p<0.05$). However, later-career scientists identified organic production systems and agroforestry as relatively more important topics ($p<0.10$). Earlier- and later-career scientists also exhibited differences with respect to policy engagement. Earlier-career scientists were less satisfied on average with both the time they had for engagement with policy organizations and the amount of training they received for this type of work ($p<0.10$). In terms of obstacles, earlier-career scientists identified lack of career stability as a relatively more important obstacle as compared to all other respondents ($p=0.01$).

Discussion

Research Investment as a Lever for Transitioning to a More Sustainable Agriculture System

Our results provided further evidence that research in sustainable agriculture, including agroecology, is underfunded, given current needs. In our survey, 85% of respondents cited lack of funding as an important obstacle to sustainable agriculture research. Several comments in open-ended responses made a similar point. These results are consistent with quantitative analyses of funding sources, which have shown limited public investment in agroecology compared with conventional agriculture (DeLonge et al., 2016; Pimbert &

Moeller, 2018). In the U.S., the severity of the disproportional funding is pronounced due to the declining prioritization of public funding for agricultural research in recent decades (Pardey et al., 2015), hindering the ability of sustainable agriculture practitioners to develop and apply their research findings on a wider scale. This survey also highlighted the unique importance of independent public funding, as a large majority (87%) of respondents agreed that financial interests present important or very important obstacles to their work. Despite the need for public and independent agricultural research funding, it has been estimated that nearly one-quarter of funding at land grant universities comes from private industry, potentially discouraging research that is critical of private industries or that prioritizes advancing a broader public benefit (Food & Water Watch, 2012).

Investing in research is a lever for the transition to agroecology, not only through the quantity of funding but also through the scope and structure of funding programs. A majority of survey respondents (61%) indicated that the insufficient duration of long-term financial support is a barrier to the complex, systems-based research required in this field. In addition, respondents largely agreed that USDA RFAs should encourage agroecology directly while also prioritizing several areas that are critical to advancing agroecology, such as research promoting broad public benefits, interdisciplinary approaches, social justice, and racial equity. It is also worth noting that a large fraction of respondents included both social and biophysical elements in their definitions of sustainable agriculture, which emphasizes the importance of transdisciplinary work as a foundation for continuing progress and defining crucial aspects of agroecology. Based on these findings, several programmatic changes could be adopted within grant programs that would better support scientists and other stakeholders working in sustainable agriculture, agroecology, and related fields.

Relationships as a Foundation for Opportunities and as Obstacles in Sustainable Agriculture

Relationships are both a positive factor in and an obstacle to sustainable agriculture research. For example, relationships were an area in which researchers felt the most satisfaction with their work, and our results indicated that there is widespread interest in sustainable agriculture and agroecology, including among students, colleagues, and other stakeholders, particularly for interdisciplinary, farmer-driven, and community-based research. On the other hand, agreement with the statement "Sustainable agriculture research entails challenging relationships with agricultural stakeholders" represented the strongest consensus of any question in our survey. Although the question did not specify further details, such challenges may involve relations with stakeholder groups, including farmers and farm organizations, industry organizations (e.g., suppliers of inputs such as fertilizers and pesticides), and other community groups.

While our study did not ask respondents to go into detail regarding challenging relationships, the survey results may imply difficult dynamics that tend to reinforce existing power structures and circumstances that are challenging to confront or alter. Such institutional dynamics were highlighted as an obstacle to agricultural change in a recent policy analysis from the United Kingdom and France (Gonzalez et al., 2018). Similar research has noted how universities and industry have become intertwined, leading to complex relationships that often focus more on revenue generation than on pursuing research in the public interest (Glenna, Lacy, Welsh, & Biscotti, 2007; Welsh. Glenna, Lacy, & Biscotti, 2008). More transparency and equity may help to resolve such relationship challenges (Chiles, 2018).

Fostering Science Communication and Broader Impacts

Given the relative scarcity of public research funding as well as the presence of tenuous relationships in sustainable agriculture research, it is important that funded research is widely communicated both within and beyond academia. However, our results suggest that although many experts are interested in applying their research to inform agricultural policy and public dialogue, they report difficulties in doing so. Difficulties include lack of training and support from their institutions, indicating possible tension between scientists and their employers concerning the freedom to engage in policy. The time available to do such work was also a theme that

emerged in responses to open-ended and multiple-choice questions in our survey, suggesting that incentives could be shifted such that researchers prioritize the time needed to do this work. To facilitate scientists engaging in policymaking, universities could adopt measures toward reducing the stigma surrounding policy engagement or even proactively affirm their support for affiliated researchers to engage with the policy process. Likewise, universities, research institutions, and competitive grant programs could further emphasize outreach and extension and improve training and support for media and public outreach. Effective channels of communication could help researchers share their findings to improve transparency and understanding, and to facilitate implementation and success of sustainable agricultural production systems. This is of particular importance for earlier-career researchers, who are both interested in policymaking and dissatisfied with current training opportunities and available time. In addition, earlier-career scientists are more likely to report concern about career stability, and greater training and incentives for policy engagement and communication could particularly support those in less stable career stages.

Concrete affirmations for the importance of broader impacts of sustainable agriculture are especially important in a political environment in which federal government scientists face heightened scrutiny and workloads. In a recent survey of government scientists, more than 90% of USDA scientists had noticed workforce reductions and 92% stated that such reductions made it more difficult for the agency to fulfill its science-based mission (Carter et al., 2018). Moreover, more than one-third of USDA scientists had noticed that resources had been allocated away from work viewed as politically contentious (Carter et al., 2018). When political interference may constrain the ability of federal scientists from communicating with policymakers, it is all the more important for researchers at universities and other independent institutions to maintain the freedom to do so.

Study Limitations

It is important to note that our study had some limitations. For example, the survey was designed to target a relatively narrow population of interest (U.S. scientists engaged in sustainable agriculture and agroecology research), and this limited the potential sample size. In terms of sampling, we used a snowball recruitment method to target this narrow population without strictly limiting the survey's reach (as an invite-only approach would have done). This approach enabled us to collect a sample of interest, but not an ideal representative random sample.

Furthermore, as with all voluntary surveys, the results of this survey are based on the responses from individuals who were both most likely to receive the survey and motivated to invest the time to complete the survey. Thus the results are subject to associated response and nonresponse errors; that is, those that chose not to complete the survey might have different perceptions than those that did complete it.

Another limitation was that our survey questions were voluntary. We chose to allow survey respondents to decide which questions to answer in an effort to encourage completion of as many questions as respondents were comfortable with. The consequence of this design was that it reduced our sample size for many of the questions, thereby limiting the scope of our analysis, particularly with respect to statistical testing for differences between groups.

Conclusions

Our survey of scientists working in the field of sustainable agriculture indicated that there is great interest and support for related topics, including agroecology. However, the survey also revealed numerous obstacles that may be limiting the advancement of research, extension, and education. These include not only the amount and scope of available research funding, but also lack of training, time, support for communicating findings outside of academic circles, as well as challenging relationships with agricultural interests holding power. Thus, encouraging and preparing researchers to share the results of their work, including through media and policy engagement, may be an important lever to enhancing the transition to a more sustainable agriculture system. Given respondents' understanding of

agroecology as a transdisciplinary practice that encompasses both biophysical and social sciences, stronger support for agroecology research could enable researchers and other stakeholders to address real-world problems related to human well-being and persistent inequities in the food system.

Acknowledgments

For their thoughtful reviews and feedback during the development of the survey, the authors would like to thank four anonymous reviewers. We would also like to thank three anonymous JAFSCD reviewers for their helpful suggestions that substantially improved this article.

References

Altieri, M. A., Nicholls, C. I., Henao, A., & Lana, M. A. (2015). Agroecology and the design of climate change-resilient farming systems. *Agronomy for Sustainable Development*, *35*, 869–890. https://doi.org/10.1007/s13593-015-0285-2

American Society of Agronomy [ASA], Crop Science Society of America [CSSA], & Soil Science Society of America [ASSA]. (2016). *The food-energy-water nexus in agronomy, crop and soil sciences*. Madison, WI: Authors. Retrieved from https://www.crops.org/files/science-policy/letters/2016-02-04-infews-summary.pdf

Association of Public and Land-grant Universities. (2017). *The challenge of change: Harnessing university discovery, engagement, and learning to achieve food and nutrition security*. Washington, D.C.: Author. Retrieved from https://www.aplu.org/members/councils/presidents/presidentsdocuments/6-2017/challenge-of-change-material.pdf

Basche, A. D., Roesch-McNally, G. E., Pease, L. A., Eidson, C. D., Lahdou, G. B., Dunbar, M. W., … Wilke, A. K. (2014). Challenges and opportunities in transdisciplinary science: The experience of next generation scientists in an agriculture and climate research collaboration. *Journal of Soil and Water Conservation*, *69*(6), 176A–179A. https://doi.org/10.2489/jswc.69.6.176A

Cacho, M. M. y. T. G., Giraldo, O. F., Aldasoro, M., Morales, H., Ferguson, B. G., Rosset, P., …& Campos, C. (2018). Bringing agroecology to scale: Key drivers and emblematic cases. *Agroecology and Sustainable Food Systems*, *42*(6), 637–665. https://doi.org/10.1080/21683565.2018.1443313

Carter, J., Goldman, G., & Johnson, C. (2018). *Science under President Trump: Voices of scientists across 16 federal agencies*. Cambridge, MA: Union of Concerned Scientists. Retrieved from https://www.ucsusa.org/sites/default/files/attach/2018/08/science-under-trump-report.pdf

Chiles, R. M., Glenna, L., Sharma, A., Catchmark, J., Azzara, C. D., & Maretzki, A. (2018). Agri-food firms, universities, and corporate social responsibility: What's in the public interest? *Renewable Agriculture and Food Systems*. Advance online publication. https://doi.org/10.1017/S1742170518000376

DeLonge, M., & Basche, A. (2017). Leveraging agroecology for solutions in food, energy, and water. *Elementa, Science of the Anthropocene*, *5*, 6. https://doi.org/10.1525/elementa.211

DeLonge, M. S., Miles, A., & Carlisle, L. (2016). Investing in the transition to sustainable agriculture. *Environmental Science & Policy*, *55*(Part 1), 266–273. https://doi.org/10.1016/j.envsci.2015.09.013

Duru, M., Therond, O., & Fares, M. (2015). Designing agroecological transitions: A review. *Agronomy for Sustainable Development, 35*, 1237–1257. https://doi.org/10.1007/s13593-015-0318-x

Foley, J. A., Ramankutty, N., Brauman, K. A., Cassidy, E. S., Gerber, J. S., Johnston, M., … & Zaks, D. P. M. (2011). Solutions for a cultivated planet. *Nature*, *478*, 337–342. https://doi.org/10.1038/nature10452

Food and Agriculture Organization of the United Nations [FAO]. (2018). *Agroecology can help change the world's food production for the better: Calls for transformative change at 2nd International Agroecology Symposium in Rome*. Rome: Author. Retrieved from http://www.fao.org/news/story/en/item/1113475/icode/

Food & Water Watch. (2012). *Public research, private gain: Corporate influence over university agriculture*. Washington, D.C.: Author. Retrieved from https://www.foodandwaterwatch.org/insight/public-research-private-gain

Frison, E. (2016). From uniformity to diversity: A paradigm shift from industrial agriculture to diversified agroecological systems. *Indian Journal of Plant Genetic Resources, 29*(3), 237–240. https://doi.org/10.5958/0976-1926.2016.00033.4

Glenna, L. L., Lacy, W. B., Welsh, R., & Biscotti, D. (2007). University administrators, agricultural biotechnology, and academic capitalism: Defining the public good to promote university-industry relationships. *The Sociological Quarterly, 48*(1), 141–163. https://doi.org/10.1111/j.1533-8525.2007.00074.x

Gliessman, S. (2016). Transforming food systems with agroecology. *Agroecology and Sustainable Food Systems, 40*(3), 187–189. https://doi.org/10.1080/21683565.2015.1130765

Gonzalez, R. A., Thomas, J., & Chang, M. (2018). Translating agroecology into policy: The case of France and the United Kingdom. *Sustainability, 10*(8), 2930. https://doi.org/10.3390/su10082930

Guest, G., MacQueen, K. M., & Namey, E. E. (2011). *Applied thematic analysis*. Thousand Oaks, CA: Sage.

Heckathorn, D. D. (2011). Comment: Snowball versus respondent-driven sampling. *Sociological Methodology, 41*(1), 355–366. https://doi.org/10.1111/j.1467-9531.2011.01244.x

High Level Panel of Experts on Food Security and Nutrition [HLPE]. (2019). *Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition* (HLPE Report 14). Rome: FAO, Committee on World Food Security. Retrieved from http://www.fao.org/agroecology/database/detail/en/c/1242141/

Hunt, N. D., Hill, J. D., & Liebman, M. (2017). Reducing freshwater toxicity while maintaining weed control, profits, and productivity: Effects of increased crop rotation diversity and reduced herbicide usage. *Environmental Science & Technology, 51*(3), 1707–1717. https://doi.org/10.1021/acs.est.6b04086

Hunter, M. C., Smith, R. G., Schipanski, M. E., Atwood, L. W., & Mortensen, D. A. (2017). Agriculture in 2050: Recalibrating targets for sustainable intensification. *BioScience, 67*(4), 386–391. https://doi.org/10.1093/biosci/bix010

Isbell, F., Adler, P. R., Eisenhauer, N., Fornara, D., Kimmel, K., Kremen, C., … & Scherer-Lorenzen, M. (2017). Benefits of increasing plant diversity in sustainable agroecosystems. *Journal of Ecology, 105*(4), 871–879. https://doi.org/10.1111/1365-2745.12789

Miles, A., DeLonge, M. S., & Carlisle, L. (2017). Triggering a positive research and policy feedback cycle to support a transition to agroecology and sustainable food systems. *Agroecology and Sustainable Food Systems, 41*(7), 855–879. https://doi.org/10.1080/21683565.2017.1331179

Montenegro de Wit, M., & Iles, A. (2016). Toward thick legitimacy: Creating a web of legitimacy for agroecology. *Elementa: Science of the Anthropocene, 4,* 000115. https://doi.org/10.12952/journal.elementa.000115

National Academies of Sciences, Engineering, and Medicine. (2019). *Science breakthroughs to advance food and agricultural research by 2030*. Washington, D.C.: National Academies Press. https://doi.org/10.17226/25059

National Agricultural Research, Extension, and Teaching Policy Act (NARETPA). (1977). Pub L. No. 95–1137, Ti. XIV Subti. A§ 1404(17). Retrieved from https://nifa.usda.gov/sites/default/files/resource/nar77.pdf

Nelson, G., Bogard, J., Lividini, K., Arsenault, J., Riley, M., Sulser, T. B., … & Rosegrant, M. (2018). Income growth and climate change effects on global nutrition security to mid-century. *Nature Sustainability, 1*, 773–781. https://doi.org/10.1038/s41893-018-0192-z

Pardey, P. G., Chan-Kang, C., Beddow, J. M., & Dehmer, S. P. (2015). Long-run and global R&D funding trajectories: The U.S. Farm Bill in a changing context. *American Journal of Agricultural Economics, 97*(5), 1312–1323. https://doi.org/10.1093/ajae/aav035

Pimbert, M. P., & Moeller, N. I. (2018). Absent agroecology aid: On UK agricultural development assistance since 2010. *Sustainability, 10*(2), 505. https://doi.org/10.3390/su10020505

Ponisio, L. C., M'Gonigle, L. K., Mace, K. C., Palomino, J., de Valpine, P., & Kremen, C. (2014). Diversification practices reduce organic to conventional yield gap. *Proceedings of the Royal Society B: Biological Sciences, 282*(1799), 20141396. https://doi.org/10.1098/rspb.2014.1396

R Core Team. (2014). *R: A language and environment for statistical computing*. Vienna: R Foundation for Statistical Computing. http://www.R-project.org/

Schonbeck, M., Jerkins, D., & Ory, J. (2016). *Taking stock: Analyzing and reporting organic research investments, 2002–2014*. Santa Cruz, CA: Organic Farming Research Association. Retrieved from https://ofrf.org/wp-content/uploads/2019/11/WholeTakingStockReport_V3.pdf

Schulte, L. A., Niemi, J., Helmers, M. J., Liebman, M., Arbuckle, J. G., James, D. E … & Witte, C. (2017). Prairie strips improve biodiversity and the delivery of multiple ecosystem services from corn–soybean croplands. *Proceedings of the National Academy of Sciences, 114*(42), 11247–11252. https://doi.org/10.1073/pnas.1620229114

SurveyMonkey. (2018). San Mateo, CA: SVMK Inc. https://www.surveymonkey.com/

Union of Concerned Scientists [UCS]. (2016). Scientists call for public investment in agroecological research. Cambridge, MA: Author. Retrieved from https://www.ucsusa.org/our-work/food-agriculture/solutions/advance-sustainable-agriculture/scientists-call-public-investment-agroecology

U.S. Department of Agriculture [USDA] National Institute of Food and Agriculture [NIFA]. (2018). *NIFA listens: Investing in science to transform lives. What we heard in 2017*. Washington, D.C.: USDA NIFA. Retrieved from https://nifa.usda.gov/nifalistens2017

USDA Office of Inspector General [USDA OIG]. (2018). *Survey of USDA scientists regarding scientific integrity: Methodology, analysis, and results* (Product No. 16-010-01). Washington, D.C.: Author. https://www.usda.gov/oig/webdocs/16-010-01.pdf

U.S. Global Change Research Program. (2018). *Fourth national climate assessment. Volume II: Impacts, risks, and adaptation in the United States*. Washington, D.C.: Author. https://nca2018.globalchange.gov

Welsh, R., Glenna, L. L., Lacy, W. B., & Biscotti, D. (2008). Close enough but not too far: Assessing the effects of university-industry research relationships and the rise of academic capitalism. *Research Policy, 37*(10), 1854–1864. https://doi.org/10.1016/j.respol.2008.07.010

Wezel, A., Bellon, S., Doré, T., Francis, C., Vallod, D., & David, C. (2009). Agroecology as a science, a movement and a practice. A review. *Agronomy for Sustainable Development, 29*(4), 503–515. https://doi.org/10.1051/agro/2009004

Womach, J. (2005). *Agriculture: A glossary of terms, programs, and laws, 2005 edition*. Washington, D.C.: Library of Congress, Congressional Research Service. Retrieved from https://www.everycrsreport.com/reports/97-905.html

Appendix. Original Survey Circulated Among Agroecology Experts

Thank you for participating in our anonymous survey! The survey will take about 15–20 minutes to complete. Please answer all questions as honestly and completely as possible. Answers will be kept completely anonymous and confidential.

This survey is intended for researchers or other professionals with an advanced degree (Master's or Ph.D.) and with academic or professional experience that is relevant to sustainable agricultural systems.

The goal of this survey is to collect information from researchers on their experiences securing funding and conducting research broadly related to a more sustainable agricultural system. The survey contains three sets of questions, related to:

1) securing funding for this type of work
2) researchers' satisfaction with different aspects of sustainable agriculture research and outreach; and
3) institutional challenges to sustainable agriculture research and outreach

If you have questions about the survey or its use, please contact Tali Robbins at trobbins@ucsusa.org.

1. **How do you define sustainable agriculture?** Your answer may be brief -- a few sentences, phrases, or less. We will use your definition to better understand how definitions of sustainable agriculture vary and to provide greater context for your responses in the following sections. _____

_____

_____

_____

PART 1 OF 3: FUNDING

Questions are not mandatory, so if a question does not apply to your experience, please feel free to leave it blank. Answers will be saved after the completion of each section.

2. **In your current position, on average, how many sustainable agriculture research funding proposals do you write per year?** If you have been in your position for more than five years, please just focus on the previous five years.
   - o 1-3
   - o 4-7
   - o 8-10
   - o > 10

3. **In your current position, please estimate what percentage of your working time is spent writing research proposals for sustainable agriculture.** If you have been in your position for more than five years, please focus just on the previous five years.
   - o < 10%
   - o 10-25%
   - o 25-50%
   - o 50-75%
   - o > 75%

4. For each agency listed below, **please indicate whether you have submitted at least one research proposal related to sustainable agriculture** (relevant to your current position, as either Principal or Co-Investigator) and whether it was fully funded, partially funded, and/or did not receive funding, within the last five years.

	Principal Investigator			Co-Principal Investigator		
	Fully funded	Partially funded	Submitted, Not funded	Fully funded	Partially funded	Submitted, Not funded
National Science Foundation						
U.S. Department of Agriculture – SARE						
USDA – AFRI						
USDA - other						
U.S. Environmental Protection Agency						
U.S. Department of Energy						
Industry - private companies						
Industry - commodity organizations						
Foundations						
Non-profits						
State Department of Agriculture						
State Department of Natural Resources						
Other (please specify).						

5. Are there any funding programs that you have applied to in the past but have abandoned due to the low funding rates or apparent research direction of the funding program?
   - o Yes
   - o Unsure
   - o No

   If applicable, please add examples.

6. Over the course of your career, acquiring funding for sustainable agriculture research has become:
    - o Much easier
    - o Easier
    - o About the same
    - o Harder
    - o Much harder
7. **Regarding USDA research grants, how important is it for Requests for Applications (RFAs) to explicitly reference the following topics related to the broader field of sustainable agriculture?** Please consider both existing and potential future RFAs.

	1- not important	2- slightly important	3-fairly important	4- important	5- very important
Agroecology					
Agroforestry					
Broader public impacts (i.e. ecosystem services)					
Crop rotations					
Economics					
Human dimensions/ decisionmaking					
Improved grazing systems					
Integrated pest management					
Interdisciplinary					
Organic production systems					
Perennial crops					
Pollinator health					
Racial equity					
Social justice					
Other (please specify).					

8. Aside from changing Request for Applications (RFA) language, how important are the following changes to **USDA research grant programs** to better support sustainable agriculture research?

	1- not important	2- slightly important	3-fairly important	4- important	5- very important
Increasing the duration of research grants					
Increasing maximum funding amounts per grant					
Other (please specify)					

9. **Regarding non-USDA research grants,** how important is it for Requests for Applications (RFAs) to explicitly reference the following topics related to the broader field of sustainable agriculture?

	1- not important	2- slightly important	3-fairly important	4-important	5- very important
Agroecology					
Agroforestry					
Broader public impacts (i.e. ecosystem services)					
Crop rotations					
Economics					
Human dimensions/ decisionmaking					
Improved grazing systems					
Integrated pest management					
Interdisciplinary					
Organic production systems					
Perennial crops					
Pollinator health					
Racial equity					
Social justice					
Other (please specify)					

10. Aside from changing Request for Application (RFA) language, how important are the following changes to **non-USDA research grants?**

	1- not important	2- slightly important	3-fairly important	4-important	5- very important
Increasing the duration of research grants					
Increasing maximum funding amount per grant					
Other (please specify)					

PART 2 OF 3: RESEARCH & OUTREACH

Questions are not mandatory, so if a question does not apply to your experience, please feel free to leave it blank. Answers will be saved after the completion of each section.

11. In your overall research experience working on sustainable agriculture research, please rate your level of satisfaction with each of the following areas:

	1- very dissatisfied	2- dissatisfied	3-neither satisfied nor dissatisfied	4-satisfied	5- very satisfied
Support from your institution					
Support from colleagues at your institution					
Interest from your disciplinary research community					
Interest from students and/or others seeking mentorship					
Positive relationships with local producers					
Positive relationships with local/regional community members					
Level of interdisciplinary research you are able to do					
The amount of on-farm (participatory farmer) research you are able to do					
Opportunities for community-based research-stakeholder engagement					
Opportunities for media attention or public communication					
Opportunities to engage with policymakers					

12. Regarding your experience with **interdisciplinary research,** please rate your satisfaction with the following elements of your work and the work of your institution**:**

	1- very dissatisfied	2- dissatisfied	3-neither satisfied nor dissatisfied	4- satisfied	5- very satisfied
Number of colleagues willing to participate					
Number of students willing to participate					
Support from your institution					
Institutional commitment to hiring interdisciplinary scientists					
Amount of funding available					
Ease of managing funds between collaborators					
Amount of time investment required to win grants for this type of research, as compared to your other research					
Amount of time you have for this type of research					
The amount of training you have for this type of research					
Institutional rewards/ promotion/recognition for this type of research					

13. Please add any comments regarding the **amount of interdisciplinary research** that you conduct.

14. Please add any comments regarding your satisfaction with your **institution's commitment** to interdisciplinary research.

15. Regarding your experience with **on-farm or farmer-participatory research**, please rate your level of satisfaction with the following elements of your work and the work of your institution:

	1- very dissatisfied	2- dissatisfied	3-neither satisfied nor dissatisfied	4-satisfied	5- very satisfied
The number of colleagues willing to participate					
The number of students willing to participate					
Support from your institution					
The amount of funding available					
Ease of managing funds between collaborators					
The amount of time to write grants for this type of research					
The amount of time you have for this type of research					
The amount of training you have for this type of research					
Institutional rewards/ promotion/recognition for this type of research					

16. Please add any additional comments regarding your satisfaction with your experience with **on-farm or farmer-participatory research.**

17. Regarding your experience with **community-based research** (i.e., research topics developed with stakeholders in the community), please rate your level of satisfaction with:

	1- very dissatisfied	2- dissatisfied	3-neither satisfied nor dissatisfied	4- satisfied	5- very satisfied
The number of colleagues willing to participate					
The number of students willing to participate					
Support from your institution					
The amount of funding available					
Ease of managing funds between collaborators					
The amount of time to write grants for this type of research					
The amount of time you have for this type of research					
The amount of training you have for this type of research					
Institutional rewards/promotion/ recognition for this type of research					

18. Please add any additional comments regarding your level of satisfaction with your experiences with **community-based research.**

19. In your experience with **media and public outreach**, please rate your level of satisfaction with:

	1- very dissatisfied	2- dissatisfied	3-neither satisfied nor dissatisfied	4-satisfied	5- very satisfied
Support/encouragement from colleagues					
Support from your institution					
The amount of time you have for these activities					
The amount of training you have for these activities					
Institutional rewards/ promotion/ recognition for this type of research					
Your research community's rewards/ recognition for these activities					

20. Please add any additional comments regarding your level of satisfaction with **media and public outreach opportunities.**

21. Please indicate the degree to which **policy engagement** is a part of your job.
    - o Policy engagement is not part of your job, and should be avoided
    - o Policy engagement is not part of your job, but can be appropriate
    - o Policy engagement is not technically part of your job, but is important
    - o Policy engagement is part of your job, but you prefer avoid it
    - o Policy engagement is part of your job, and is important

22. In your experience with **policy engagement** on the topic of sustainable agriculture, please rate your level of satisfaction with:

	1- very dissatisfied	2- dissatisfied	3-neither satisfied nor dissatisfied	4- satisfied	5- very satisfied
The number of colleagues also interested in policy engagement opportunities					
The number of students also interested in policy engagement opportunities					
Support/encouragement from colleagues					
Support from your institution					
The amount of time you have for engagement with policy organizations and policy makers					
The amount of training you have for this type of work					
Your employer's rewards/ recognition for this type of work					
Your research community's rewards/recognition for these activities					

23. Please add any additional comments you have regarding your level of satisfaction with your **policy engagement** experience.

PART 3 OF 3: OBSTACLES TO RESEARCH

Questions are not mandatory, so if a question does not apply to your experience, please feel free to leave it blank. Answers will be saved after the completion of each section.

24. Please rate your level of agreement with the following statements regarding obstacles you may have faced through your sustainable agriculture research

	1-strongly disagree	2- disagree	3-neither agree nor disagree	4-agree	5-strongly agree
My institution discourages sustainable agriculture research					
My colleagues discourage sustainable agriculture research					
There is a lack of support from my broader community (friends, family, or other members of local community) for sustainable agriculture research					
Sustainable agriculture research entails challenging relationships with agricultural					

stakeholders					
I have experienced pressure to modify research results					
I have experienced pressure to not publicize research results					
I have been discouraged from speaking with the media about my research					
I have been discouraged from engaging with policymakers related to my research					
I have experienced pressure from institutional leadership to change research direction					
I have experienced pressure from funders to change research direction					
I have experienced challenging relationships with funders of my research					
I have experience pressure from outside groups to change research direction (local government, businesses, farmer organizations, etc.)					

25. Please add any additional comments you may have regarding these challenges.

26. In your opinion, how important are the following obstacles to sustainable agriculture research?

	1-not important	2- slightly important	3- moderately important	4-important	5-very important
Political partisanship					
Entrenched financial interests					
Lack of research funding					
Lack of career stability					
Conflicts of interest related to private sector funding					
Direction of public research programs					
Lack of public interest					
Lack of institutional support					
Lack of scalability of sustainable agriculture practices					
Other (please specify)					

27. If you could share a story with decision makers (i.e. policy makers or agency leadership) on the need for more funding for sustainable agriculture, what would you say?

28. Do you have any other comments regarding sustainable agriculture funding or other obstacles to sustainable agriculture research that you would like to share?

CONCLUSION: BACKGROUND INFORMATION

Questions are not mandatory, so if a question does not apply to your experience, please feel free to leave it blank. Answers will be saved after the completion of each section.

29. Which best describes your title? Check all that apply.
    - ☐ Assistant Professor
    - ☐ Associate Professor
    - ☐ Professor
    - ☐ Adjunct Professor
    - ☐ Department Chair
    - ☐ Dean or other administrative role
    - ☐ Extension Appointment
    - ☐ Researcher/Research Associate
    - ☐ Post-doctoral Fellow/Researcher
    - ☐ Program/Project Manager
    - ☐ Policy Coordinator
    - ☐ Development Coordinator
    - ☐ Outreach Coordinator
    - ☐ Other (please specify)

30. What is the highest education level you have completed?
    - ○ Bachelor's degree
    - ○ Master's degree
    - ○ Ph.D.
    - ○ Non-U.S. degree/ other (please specify)

31. At which type of institution do you currently work? Check all that apply.
    - ☐ Land Grant University
    - ☐ Other (Non-Land Grant) Public University
    - ☐ Private University
    - ☐ Community College
    - ☐ Federal government
    - ☐ State or local government
    - ☐ Non-profit organization
    - ☐ Private Industry
    - ☐ Other (please specify)

32. What is your area of expertise (i.e. current department or graduate major)?
    - ☐ Primary field of expertise: _____
    - ☐ Secondary field of expertise: _____

33. For how many years have you been working in your current position?
    - o < 1
    - o 1-3
    - o 4-5
    - o 6-10
    - o 11-20
    - o > 20

34. For how many years have you been working in your current field of study (excluding graduate school)?
    - o < 1
    - o 1-3
    - o 4-5
    - o 6-10
    - o 11-20
    - o > 20

35. In what region of the United States are you currently based?
    - o N/A- outside of the United States
    - o Southwest (including CA)
    - o Pacific Northwest (including AK)
    - o Northern Plains
    - o Southern Plains
    - o Midwest
    - o Southeast
    - o Northeast

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Making a market for on-farm food loss: Exploring food banks as a market for Southeastern produce

Rebecca Dunning,[a] * J. Dara Bloom,[b] Emma Brinkmeyer [b]
North Carolina State University

Submitted May 30, 2019 / Revised September 6, 2019 / Accepted September 8, 2019 /
Published online February 18, 2020

Citation: Dunning, R., Bloom, J. D., & Brinkmeyer, E. (2020). Making a market for on-farm food loss: Exploring food banks as a market for Southeastern produce. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 185–195. https://doi.org/10.5304/jafscd.2020.092.014

Abstract

Reducing food waste across the supply chain is one means to more efficiently utilize natural resources and potentially divert unutilized food to the food-insecure. Food banks are the primary institution by which this transfer occurs in the U.S. Over the past 20 years, growth in the number of pounds distributed annually by food banks has been accompanied by a focus on the nutritional quality of the food distributed. This shift has included an increase in sourcing of fresh produce directly from growers, with anecdotal evidence that some food banks have market-based relationships in which food banks pay growers and even forward contract for product. The current study sought to examine the prevalence of these relationships for the purpose of evaluating food banks as a market channel for farmers' surplus and cosmetically imperfect produce. The authors collected data on market relationships between food banks and produce farmers through interviews with food bank operators in 13 southeastern U.S. states. Based on interviews with 24 individuals representing 16 food banks, food bank associations, and regional nonprofit produce distributors serving food banks, we find payments from food banks to farms to be a widespread practice. Eleven of the 13 states (and 14 of the 16 food banks) reported paying growers either directly or via Feeding America's online Produce Matchmaker system. Interviews also revealed sourcing manag-

[a] * *Corresponding author:* Rebecca Dunning, Department of Horticultural Sciences, North Carolina State University; 2721 Founders Drive; Raleigh, NC 27607 USA; rebecca_dunning@ncsu.edu

[b] J. Dara Bloom and Emma Brinkmeyer, Department of Agricultural and Human Sciences, North Carolina State University.

Funding Disclosure

This material is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 571385-02452 through the Southern Sustainable Agriculture Research and Education program.

ers' expectations that compensating growers could be a "win-win" strategy for both food banks and growers. Such practices are supported by infrastructure commitments from Feeding America, a network of food banks and pantries which includes 80% of food banks in the U.S.

Keywords
Farms, Food Banks, Food Waste, Surplus, Produce

Introduction

News accounts of the hardships experienced by families during the five-week U.S. federal government shutdown in early 2019 was a reminder both of the tenuousness of American families' ability to weather missed paychecks and the capacity of the food bank system to respond to these hardships (Elejalde-Ruiz, 2019; Simon, 2019). Food banks aggregate and distribute mainly donated foodstuffs to an estimated 60,000+ community partner organizations, serving one in seven Americans in any given year, and often for extended periods of time (Campbell, Webb, Ross, Crawford, Hudson, & Hecht, 2015; Poppendieck, 1999). Along with the growth in food banks' distributional capacity, there has been an increased emphasis on leveraging their connections to communities and families to enhance individual health (Campbell et al., 2015). One outcome is an increased distribution of fresh fruits and vegetables. Fresh produce comprised 43% of the total pounds of rescued food distributed in 2017 by Feeding America, the largest network of food banks and pantries in the U.S. (Feeding America, 2018).

The current study was motivated by this food bank sourcing trend and the authors' work to minimize on-farm produce loss in ways that economically benefit growers (Dunning, Johnson, & Boys, 2019; Johnson et al., 2019; Johnson, Dunning, Bloom et al., 2018; Johnson, Dunning, Gunter et al., 2018), and by anecdotal and published evidence that food banks are compensating growers for produce (Vitiello, Grisso, Whiteside, & Fischman, 2015). Farmers have long had the option of donating product to food banks, and occasional compensation to farmers for transportation costs is not unusual. However, the possibility that compensation is occurring on a consistent basis across numerous food banks could indicate the creation of a reliable market channel for farmers' surplus and cosmetically imperfect products.

Goals of this exploratory study were two-fold: (1) to gauge the prevalence of payments by food banks to produce growers across the southern region of the U.S, including the sources of funding used for these payments, and (2) to gain an understanding of food bank staff experiences and perceptions with regard to current and future direct-sourcing from farmers. Researchers sought to understand how, why, and to what extent food banks are shifting to include cash purchase of, and forward contracting for, produce purchased directly from farmers, and to collect estimates of the per-pound costs paid by food banks. The motivation for the study was to identify potential "win-win" strategies that could reduce on-farm produce loss and enhance farmers' profitability while providing food banks and their clients healthy, fresh food.

Background

Food Banks

The emergency food system arose from the desire to rescue wasted food and distribute it to people not adequately supported by publicly funded social programs (Poppendiek, 1999). The system originated in the 1960s under the mantel of Second Harvest, which was later largely absorbed into Feeding America. Since that time, a network of food banks has developed around the country with sophisticated warehouses and distribution systems, institutionalizing a system that was originally envisioned to serve people on only an "emergency" basis (Poppendieck, 1999). Food pantries and charitable feeding organizations experienced particularly rapid growth in the 1980s in response to cuts in federal social spending (Campbell et al., 2015; Poppendieck, 1999).

"Food banks," understood as entities that aggregate and distribute food to partnering entities, most often local "food pantries" managed by community-based organizations that distribute food directly to community members, exist in various sizes and are connected in various ways across the U.S. Feeding America, a network whose members

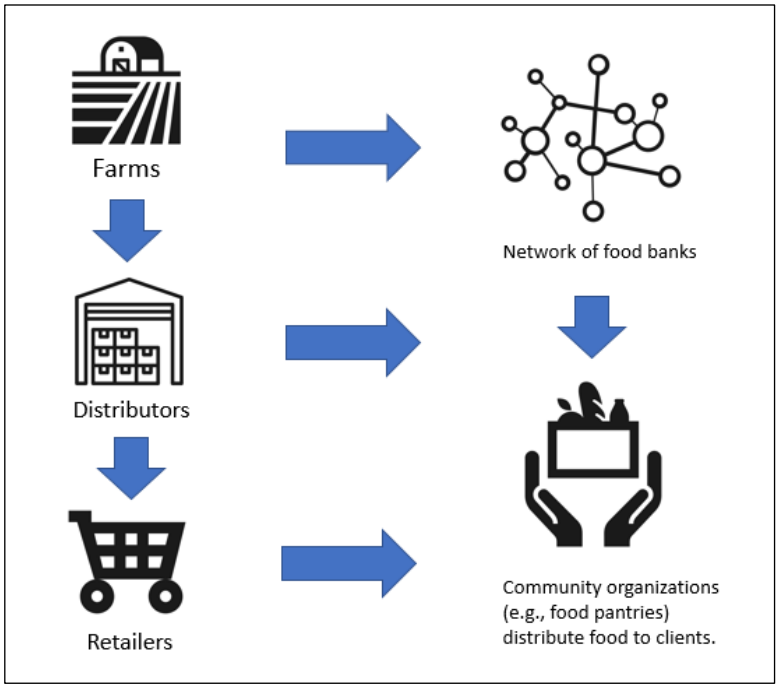
make up 80% of U.S. food banks, negotiates arrangements with large retailers, manufacturers, and growers. Member food banks access these donations through the online Feeding America Choice System. This software platform is used by food banks to order donated food, which is apportioned to food banks based on the pounds of inventory they distribute annually and the prevalence of poverty in their geographic service area (Campbell et al., 2015). The Feeding America system is also the primary distributor of the U.S. Department of Agriculture's (USDA) Emergency Food Assistance Program (TEFAP) and Commodity Supplemental Food Programs. Individual food banks can also accept donations from local donors, purchase products, or work with other providers.

The types of food sourced and distributed by food banks have changed over time. An increase in food banks' sourcing and distribution of fresh produce reflects current public interest in and policies attending to the importance of fresh fruit and vegetables for dietary health, as well as the developing capacity of food banks and their client agencies (e.g., local food pantries) to store perishable products (Bazerghi, McKay & Dunn, 2016; Campbell, Ross, & Webb, 2013; Campbell et al., 2015; Shimada, Ross, Campbell & Webb, 2013). Combined with declines in donations from grocery retailers, food banks are reportedly sourcing larger volumes and a greater variety of fresh produce directly from growers, with some reports of reimbursements to growers to cover their costs of harvest (Vitiello et al., 2015). A schematic of the sources and destinations for fresh produce in the food bank system is illustrated in Figure 1.

Feeding America's leadership and investment in infrastructural capacity are further supporting the move to more fresh produce. Produce Matchmaker, an online platform paralleling the Choice System, is designed specifically for fresh produce and allows food banks to work directly with growers to arrange shipments across the country according to their needs. The platform lists costs and shipping fees and includes anticipated product availability. For example, an apple grower or wholesaler can indicate loads of surplus product anticipated for the coming season.

Figure 1. Sources of Fresh Produce for Food Banks and Clients

Farms, aggregator/distributors, and retailers can donate or sell produce directly to community organizations for distribution to clients. More often, these donations are managed by regional food banks with the capacity to receive, hold, and distribute perishable items.



In 2015, Feeding America took the major step of establishing six regional produce aggregation and distribution hubs (Feeding America, 2017). Two of these are located in the study region: The Southeast Regional Cooperative in Atlanta sources and distributes across seven states to 32 food bank members, and the Collaborative for Fresh Produce in Texas distributes across five states.

Food Loss on Produce Farms

Produce farmers can leave large amounts of product unharvested in the field for a number of reasons, including low market demand, harvest costs that outstrip estimated returns, and harvest labor needed elsewhere on the farm. Recent loss measurements for eight commonly grown southeastern crops find that a volume

equal to 42% of sold produce remains in the field after the final harvest (Johnson, Dunning, Gunter et al., 2018). Of this in-field loss, half of the product met the same market standards for which the marketable portion had been sold, with the remaining half considered as good condition and edible but not meeting marketing specifications.

Farmers may donate to food banks, and legislation encourages donations using limited tax deductions and liability protection. While published research is not available to link the tax deduction benefit to farmers' likelihood of donation, a set of interviews with 17 midscale (median size of 1,027 acres [416 hectares] in production) produce growers in North Carolina found that growers did not view tax deductions as a benefit significant enough to justify going back into a field for an additional harvest (L. Johnson, personal communication, December 15, 2018). Growers indicated that their most likely reason for donation would be a rejected load and that the donation would take place at the point of the rejection, such as at a regional grocery distribution warehouse.

The majority of costs on a produce farm are associated not with production, but rather with the labor and packaging costs needed to transform product in the field into a saleable item. Food banks may cover "pick and pack-out costs" (PPO), payments to growers that offset the costs of harvesting and preparing product for transport to food banks. This can make it worthwhile for growers to return their own skilled harvest crews to the field for an additional harvest. Economic analysis using the volumes reported in the Johnson, Dunning, Gunter et al. study (2018) calculated that an estimated US$0.10/pound PPO rate (based on PPO reports from North Carolina) for some crops could justify the costs of returning to conduct an additional harvest (Dunning et al., 2019).

Growers may not need to make a profit over and above covering their PPO cost in order to justify returning to the field. If growers have contracted labor with hourly requirements for each week, growers may harvest a field, even with the expectation of low yield, if the harvest crew is not needed elsewhere (Johnson & Dunning, 2020). Even for growers who pay per unit harvested (e.g., pound, bucket), a grower may continue a low-yielding harvest to keep workers from seeking employment elsewhere (Johnson & Dunning, 2020).

The current study sought to understand whether anecdotal reports of food banks reimbursing growers for PPO costs is a widespread practice. Prior findings on the sheer volume of produce that remains in farmers' fields, and the economic value of this loss, support the conjecture that the practice could simultaneously benefit growers, reduce farm-level loss, and increase the availability of nutritionally dense foods for food banks and their clients. Common use of the practice would indicate its acceptance as a purchasing channel for the emergency food system and as a steady market for farmers' surplus product. "Steady" is the operative word. If farmers know that a reliable channel exists, it becomes something around which they can plan and establish an ongoing business relationship. The current study of food bank PPO practices in the southeast informs this potential win-win strategy for food banks, their clients, and farmers.

Methods

A 13-state area (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia) was selected based on the regional focus of the study's funder and resource constraints. The members of the research team created a list of interview questions based on their experiences researching issues of on-farm food losses. These questions were designed to gain a better understanding of food banks' motivation to pay for produce, funding sources, and amount paid to farmers. We piloted the interview guide with one food resource manager at a North Carolina food bank in order to determine whether the questions, as worded, elicited responses that helped us answer our research questions. We also asked this interviewee for feedback on the types of questions asked as well as terminology used, and we made suggested edits. This revised interview guide and research plan underwent institutional review board (IRB) review and received an exempted status.

Researchers used web searches to identify any food bank networks or large food banks in each of

the target states. This identification began with Feeding America's online food bank member directory, subsequent web searches, and snowball sampling, whereby interviewees were asked to identify other large food banks in their state. As an exploratory study, the goal was to understand the existence and extent of purchasing by the largest food banks in the state, rather than an exhaustive accounting of all food banks within and outside of the Feeding America network. In most cases, states were identified as having one large Feeding America network food bank that serviced numerous community organizations, and so we focused our efforts on contacting these food banks. Identified food banks were contacted by email and telephone to request an interview with the staff member most familiar with the practice of sourcing fresh produce directly from growers. In nearly all cases, the interviewees held a title indicating that they were the director of sourcing or a sourcing specialist. All the food bank staff members contacted agreed to be interviewed.

A total of 24 interviews were conducted. The final sample included 20 food bank staff from 16 food banks, one state-level director of produce recovery, and the executive directors and sourcing staff at two of Feeding America's regional aggregators (Table 1). Interviews were conducted by one of the authors over the telephone. Of those interviewed, 15 agreed to be recorded, and these recordings were transcribed verbatim. Detailed notes were taken for those who selected not to be recorded.

Table 1. List of Interviewees at Food Banks in the Target States [a]

State	No. of Food Banks Contacted for Interview	No. of Staff Interviewed
Alabama	1	1
Arkansas	1	2
Florida	1	1
Georgia	2	3
Kentucky	1	1
Louisiana	1	3
Mississippi	1	1
North Carolina	2	2
Oklahoma	1	1
South Carolina	1	1
Tennessee	1	1
Texas	2	2
Virginia	1	1
Total	**16 food banks**	**20 food bank staff**

[a] Four additional interviews were conducted, as described in the text, for a total of 24 participants.

Food bank staff were asked to estimate the total pounds of food distributed by their food bank, total pounds of fresh produce distributed, and total pounds of distributed fresh produce that originated at a farm (as opposed to donations from a grocery retailer or produce wholesaler). They were also asked to explain their methods for sourcing from farmers; whether farmers were ever paid and if so, the average price per pound paid; and to reflect on past experiences and future plans for sourcing directly from farmers. Two of the co-authors developed a codebook representing key themes identified to address the research questions, as well as to reflect emergent issues identified by participants (Coffey & Atkinson, 1996). Codes included, for example, total pounds of produce distributed, types of produce purchased, state funding to purchase produce, health/nutrition, and grower incentives. Once the codebook was developed, two co-authors separately coded one interview and then met to compare their coding and make any needed clarifications to the codebook. One co-author then coded the rest of the interviews using the adjusted codebook. Coding was done manually using Microsoft Word, with separate documents for each code. The co-author also went through each interview to extract the quantifiable data about amounts of produce sourced and amount paid in order to develop the subsequent tables.

Quantitative Findings: How Much and for How Much

State-specific data is not given in this publication because of IRB specifications that only aggregated or anonymized information would be shared. Specific states are mentioned if the information is available from other public sources. Anonymized estimates per state are given in Table 2.

Across the 13 states, food banks distributed

1.6 billion pounds[1] of food, of which 265,630 million were fresh produce. Per-state pounds of fresh produce as a percentage of total pounds of distributed food ranged from 7.6% to 31%, with an average of 16%. Interviewees reported sourcing fresh produce directly from growers, directly from food banks in other regions, and through the Feeding America Produce Matchmaker program. Respondents were unable to consistently provide a breakdown of pounds from each source.

Fourteen of the 16 food banks in the region reported compensating growers for PPO costs. These 14 were in 11 of the 13 states. In eight of the 11 states, PPO prices were decided from direct conversations with growers during the season, with reported PPO payments ranging from US$0.08/lb. to US$0.15/lb., and averaging US$0.10/lb. Three food banks noted that they used prices that had been determined by other entities. One noted that per-pound benchmark prices were determined with the assistance of university-based economists. The second state stipulates that food banks that receive state funds to support farm-to–food bank transactions should pay growers 95% of the state's wholesale auction price. The third state (state #10 in Table 2) has a fund to support farm-to-food bank transactions, and payments paid from that fund must be a minimum of US$0.10/lb. Once these funds are expended, food banks use negotiated rates. Three state programs provide funding for food banks to purchase produce from farmers: Kentucky's Farm to Food Bank Program, Texans Feeding Texans, and Farmers Feeding Florida.

Five interviewees reported that they had made arrangements with local growers for product in advance of the harvest. One noted a yearly contract with a grower for 300,000 pounds of produce at US$0.12 per pound, paying the grower at the time of planting. This type of forward contracting was the exception. In all other cases, informal arrange-

Table 2. Summary of Findings from Interviews with Food Banks in 13 Southern U.S. States, Including Pick and Pack-out Cost (PPO) Compensation from Food Banks to Growers

State	Total Pounds Distributed (000)	Pounds of Produce Distributed (000)	% Produce of Total Pounds Distributed	Practice of PPO Compensation	Pricing: Negotiated or Criteria-based [a]	Reported Typical PPO	Has State Program to Subsidize PPO	Ever Done Forward Contracting
1	58,476	9,908	17	No	--	--	No	No
2	54,224	5,422	10	Yes	Negotiated	$0.15	No	No
3	228,494	20,281	9	Yes	Negotiated	$0.08	No	Yes
4	141,942	30,206	21	Yes	Negotiated	$0.12	No	Yes
5	76,647	23,996	31	Yes	Criteria	NA	Yes	No
6	155,403	40,439	26	Yes	Negotiated	$0.17	No	Yes
7	75,955	20,257	27	Yes	Negotiated	$0.10	No	No
8	72,565	NA	NA	Yes	Negotiated	$0.10	No	Yes
9	19,201	1,455	8	No	--	--	No	No
10	450,163	48,613	11	Yes	Criteria & Negotiated	$0.10	Yes	Yes
11	121,000	22,000	18	Yes	Negotiated	NA	No	NA
12	74,682	18,535	25	Yes	Criteria	NA	Yes	No
13	91,315	24,517	27	Yes	Negotiated	NA	No	No
TOTAL	**1,620,070**	**265,630**	**16**					

[a] *Negotiated* pricing refers to prices agreed upon based on discussions between the food bank and the producer. *Criteria-based* pricing is based on benchmark prices from a designated source (e.g., wholesale auction prices).

[1] 1 lb.=0.45 kg

ments were made between food banks and farmers who had either donated or sold to the food bank in the past, with the food bank agreeing to continue the relationship in the coming season.

Qualitative Findings: Reasons Behind the Practice

In addition to questions on volume and PPO reimbursement practices, interviewees were asked to reflect on any changes in sourcing practices over time. Most respondents noted that the primary reason for sourcing more fresh produce was the push from stakeholders for food banks to supply healthier foods. Food bank staff noted the availability of new sources of funding that specifically target the purchase of fresh produce, and the need to purchase produce (rather than rely on donations) in order to increase the variety of produce offerings. A number of food bank staff cited the potential "win-win" if this produce could be purchased from local farmers; the purchase could simultaneously support local farm businesses while reducing on-farm waste. From food bank staff and regional aggregators, we also learned of emerging innovative infrastructure models that have formed to meet the distribution challenges of increased demand for fresh, local produce within the food banking system.

Promoting Health

Food bank staff consistently expressed a commitment to increase the amount and variety of produce that they offer. For example,

> Over the last six and a half years I've been here, we've really transformed that program to have more variety and not just if you want produce, sure, here's your potatoes. But we have some of eight different types of produce available at all times … [We] try to have a variety to really fill the plate of the individual that gets from us. (Interviewee #1, Production Logistics Manager)

Respondents also noted that donors are interested in linking their monetary donations to healthy foods and that this increased interest from donors in supporting healthy food donations has inspired food banks to actively seek out donors holding these priorities. One operations manager noted, "We now have our development team working on getting donors that are interested in getting people fresh produce" (Interviewee #5, Operations Manager). A food resource manager echoed this: "There's obviously donors who want to specify where their money goes and produce is one of those things…healthcare providers like [X] and other hospital companies like nutritious foods to be tied to their donation" (Interviewee #4).

National-level support and local donations for healthy food were cited by most of the respondents as having created a culture within food banks to procure more produce. The demand for healthy food was expressed as top-down from leadership and bottom-up from partner agencies. For example, one director of procurement cited support from the food bank's board:

> It is one of our organizational goals and our strategic goals to distribute fresh, nutritious product, and because that amount of our product just isn't available donated, we do have a budget that's granted by the board to bring in that PPO produce. (Interviewee #8, Director of Procurement)

A food sourcing manager cited the bottom-up demand they've noticed from the food pantries and other organizations that they serve: "Our agencies are also requesting even more variety of produce" (Interviewee #3).

Decline in Produce Donations

A third of the respondents noted that their interest in paying for produce was related in part to a decline in donations from manufacturers and retailers:

> In the past, we've really relied on retail donations. As they've dropped, we've definitely increased our produce purchasing. As that trend continues to evolve of donations kind of dropping and us having to rely more on purchased food, produce has been where we make up the difference, so it's increased. It's become increasingly a larger part of our total distribution. (Interviewee #10, Outreach Coordinator)

Food bank resource managers perceived these declines in donations as part of companies' desire and ability to track and reduce waste in their supply chains.

> Twenty years ago, canning companies wouldn't know their machines made a mistake for two truckloads worth of product or whatever. Now, they can tell when one can is off. There's definitely less canned food donation…fresh produce has a lot of excess, so we're all trying to figure that out. (Interviewee #1, Production Logistics Manager)

Whereas an increased focus on reducing waste on the national level means that retailers and manufacturers have less excess food to donate, participants identified fresh produce as an opportunity area to reduce food waste while meeting the demands from donors and clients.

Win-win Solution: Supporting Local Farmers

While food bank staff noted an increased interest in procuring produce more generally, they also made an explicit connection to supporting local farmers. In part, this can be attributed to the priorities of donors from agricultural sectors that include state farm-to-food bank programs:

> The thing with those donations [from retailers] are they are very close to the end of their shelf life. They need to go out the same day we receive them or the day after. Pretty quickly they need to go out the door. (Interviewee #10, Outreach Coordinator)

In addition to these benefits, about one-third of the respondents identified direct purchasing as a win-win that could support farm economic viability. This reasoning demonstrated interviewees' awareness of the challenges that farmers face. For example, a regional warehouse president states, "We want to make it easy for growers to donate produce and not lose their shirt in doing this—they have thin margins and struggle cash-wise" (Interviewee #12). Another respondent also expressed a desire to support farmers:

> There's obviously donors who want to specify where their money goes and produce is one of those things, like there's some Farm Bureau, Farm Credit and farmer co-ops and folks who are tied to the industry, who like to earmark money that they donate for produce procurement. (Interviewee #4, Sourcing Manager)

Price and quality are also factors that make purchasing fresh produce from farmers appealing, as noted by one director of procurement:

> When it comes down to it, produce is much more economical for us because it really is available with that PPO. So the average cost to purchase grocery items is 65 cents a pound. And our average cost on produce is 21 cents a pound. So we can get a lot more produce for our money. (Interviewee #7, Director of Procurement)

Purchasing, rather than relying on donations, also gives food banks more control over volume and quality. When food banks pay PPO for produce, the product is typically shipped directly from the farm and, therefore, is likely to have a longer shelf life, as one outreach coordinator noted:

> [We want to be] a business solution for farmers [to let] them know that we're here for them and that we can handle large volume and that they shouldn't be afraid to reach out even if they think it's too much or maybe that it's something that we can't use. (Interviewee #4, Food Resource Manager)

At the same time, study participants said that they often used the mission of the food bank as a starting place to recruit growers, appealing to farmers' charitable inclinations and desire to reduce waste, while also helping them see the benefits of selling fresh produce at PPO rates.

Infrastructure Taken to a New Level

Tapping into the excess produce on farms requires appropriate storage and distribution equipment and practices. Individual food banks have added cool-

ers and refrigerated trucks for the storage and delivery of fresh produce for their clients. Food banks with excess produce can post that excess on Feeding America's Produce Matchmaker platform or make direct arrangements with food banks in other states, thus moving produce from areas with a surplus to those in need. As one food bank sourcing manager describes, the Produce Matchmaker platform allows both "real-time and forward planning" for food bank produce needs; growers and others can post planned supplies and the surplus they expect in the coming season, and food banks can lock in those future supplies.

As noted above, Feeding America has also developed six regional distribution centers for the aggregation and distribution of fresh produce. The centers provide a number of efficiency benefits to network members, as one regional warehouse president explains:

> Any single food bank can usually not take that much produce. We are trying, as a nonprofit, to be an aggregator—we are working with 40 different food banks across [X] states. [What] we offer to growers is that when they have an excess amount of produce, they can let us know, and depending on commodity, PPO cost, [we] can commit to moving it for them and get it distributed through our network of different food banks, and thus we can handle large amounts of produce at any given time. (Interviewee #12, Regional Warehouse President)

Study Limitations

This research does not represent an exhaustive study of the food bank landscape in the southeastern U.S. Reliable state-level totals of pounds distributed, pounds of produce, etc., were not available for all states. Additionally, while we sought to determine the proportion of fresh produce sourced directly from growers compared to other sources, most food banks could not separate produce sourced by category. Thus, the quantitative findings presented in this paper reflect an effort to capture the best available estimates. Our findings also do not reflect food banks that operate outside the Feeding America network in these states. In addition, the findings do not reflect produce sourcing and purchasing that occurs directly between individual local pantries and local growers.

Summary and Directions for Future Research

Historically, the food bank system has relied largely on retail and manufacturing donations of shelf-stable products. The system's initial emphasis on calories and volume has more recently given way to a focus on the inclusion of fresh foods, including fresh produce (Campbell et al., 2015). As more food banks shift their priorities and capacity to fresh produce, regional warehouses have emerged to absorb larger quantities and redistribute them across an entire network of food banks. The continuing push for fresh and locally produced foods, combined with declines in retail and manufacturing donations of canned foods (Campbell, Ross, & Webb, 2013), presents a potential opportunity to divert current produce losses that are occurring on-farm in a way that also benefits growers. This study confirms that the practice of paying growers in the form of "pick and pack-out costs" is common across states in the southeastern region of the U.S. Based on informant interviewees and investments by donors and Feeding America, the practice of paying farmers for produce is likely to grow.

Our findings thus suggest that food banks are a potentially reliable sales channel for produce growers. Given that PPO prices are generally much lower than market prices, this channel should be seen as one part of an overall marketing strategy. Sales to food banks are a way for growers to make use of surplus produce or items not meeting market standards because of characteristics such as shape, size, and color. This strategy can reduce waste in terms of the actual product that would otherwise go unharvested, the investment in natural resources (e.g., water, land), and added production inputs invested by the grower. Based on the findings from this study and others (Dunning et al., 2019; Vitiello et al., 2015), food system practitioners should include food banks as a potential market for the farmers with whom they work, and should seek to build relationships between these two parts of the food system.

Interviews with management at two regional

cooperatives highlight the role of regional aggregation, in the form of nonprofits designed specifically to serve food banks, for sourcing of fresh produce. These aggregators can provide key system benefits to the food bank network. They can break down truckloads and pallet loads of produce into mixed loads for delivery to food banks that do not have the capacity to receive and distribute large volumes. The co-ops can also smooth out regional supply and demand by moving surplus products in one area to areas with deficits. By providing a centralized point of aggregation and distribution, the co-ops can also enable food banks to make regular orders of an array of produce items. Food banks can then keep their inventory stocked with more variety and more consistency, thus benefitting their client organizations. The co-op operations are financed by fees charged to food banks per pound of delivered product. Having this infrastructure operating at a large scale takes the system one step further in its ability to capture the excess product that is often lost at the farm level. Logistical, operational, and economic analysis of this system is an important direction for future research (see Foundation for Food and Agriculture Research, 2019).

While this study provides a snapshot of the potential market opportunities for growers in the food banking system, there are several important areas that remain for future research. Longitudinal case studies that include the economic outcomes for growers who have sold to food banks could help confirm the viability of this market from the growers' standpoint. A comparison of the use of the Produce Matchmaker platform as an alternative or supplement to food bank regional distribution centers would also be insightful. Quantitative analysis of the platform as a means to forward contract with growers, as well as a consideration of alternative ways to operate the platform, would be valuable. For example, prices of available produce on the platform do not change over time, and thus do not reflect their shelf life, and the price of a product posted for a future season does not change as the season approaches (and, presumably, the offering grower might be incentivized to lower the price).

Several interviewees also expressed concern that the practice of paying farmers might lead to a decline in grower donations. This led some food bank staff to use the term "compensation" rather than "payments" when referring to PPOs, as well as a stated preference to not openly advertise that the practice was used. While this was not a widely shared sentiment among the interviewees in our study, it points to the potential implications of the shifting practices and missions of food banks, and thus merits attention in future studies. Investigation of the impact of state-level programs that encourage farm-to-food bank relationships could also inform the development of public policy that simultaneously addresses food insecurity, farm viability, and food loss.

References

Bazerghi, C., McKay, F. H., & Dunn, M. (2016). The role of food banks in addressing food insecurity: A systematic review. *Journal of Community Health, 41*(4), 732–740. https://doi.org/10.1007/s10900-015-0147-5

Campbell, E. C., Ross, M., & Webb, K. L. (2013). Improving the nutritional quality of emergency food: A study of food bank organizational culture, capacity, and practices. *Journal of Hunger & Environmental Nutrition, 8*(3), 261–280. https://doi.org/10.1080/19320248.2013.816991

Campbell, E., Webb, K., Ross, M., Crawford, P., Hudson, H., & Hecht, K. (2015). *Nutrition-focused food banking* (*NAM Perspectives* Discussion Paper). Washington, D.C.: National Academy of Medicine. https://doi.org/10.31478/201504a

Coffey, A., & Atkinson, P. (1996). Concepts and coding. In A. Coffey & P. Atkinson, *Making sense of qualitative data: Complementary research strategies* (pp. 26–53). Thousand Oaks, CA: SAGE.

Dunning, R. D., Johnson, L. K., & Boys, K. A. (2019). Putting dollars to waste: Estimating the value of on-farm food loss. *Choices,* Quarter 1. Retrieved from http://www.choicesmagazine.org/choices-magazine/theme-articles/examining-food-loss-and-food-waste-in-the-united-states/putting-dollars-to-waste-estimating-the-value-of-on-farm-food-loss

Elejalde-Ruiz, A. (2019, January 22). Federal employees turn to food pantries during government shutdown: 'After a while you have to let that pride go.' *Chicago Tribune*. Retrieved from https://www.chicagotribune.com/business/ct-biz-government-shutdown-food-pantries-20190122-story.html

Feeding America. (2017, August 28). *Establishment of six regional produce cooperatives* [Press release]. Retrieved from https://www.feedingamerica.org/about-us/press-room/produce-cooperatives

Feeding America. (2018). *2018 annual report*. Retrieved from https://www.feedingamerica.org/sites/default/files/2018-12/2018%20Feeding%20America%20Annual%20Report_0.pdf

Foundation for Food and Agriculture Research. (2019, April 9). *FFAR awards $1 million grant to reduce food insecurity* [Press release]. Retrieved from https://foundationfar.org/2019/04/09/ffar-awards-1-million-grant-to-reduce-food-insecurity/

Johnson, L. K., & Dunning, R. D. (2020). Food loss on the farm: Lessons learned from conversations with produce growers. In T. Minor, S. Thornsbury, & A. K. Mishra, & (Eds.), *The economics of food loss in the produce industry* (pp. 116–130). New York: Routledge.

Johnson, L. K., Bloom, J. D., Dunning, R. D., Gunter, C. C., Boyette, M. D., & Creamer, N. G. (2019). Farmer harvest decisions and vegetable loss in primary production. *Agricultural Systems, 176,* Art. 102672. https://doi.org/10.1016/j.agsy.2019.102672

Johnson, L. K., Dunning, R. D., Bloom, J. D., Gunter, C. C., Boyette, M. D., & Creamer, N. G. (2018). Estimating on-farm food loss at the field level: A methodology and applied case study on a North Carolina farm. *Resources, Conservation & Recycling, 137,* 243–250. https://doi.org/10.1016/j.resconrec.2018.05.017

Johnson, L. K., Dunning, R. D., Gunter, C. C., Bloom, J. D., Boyette, M. D., & Creamer, N. G. (2018). Field measurement in vegetable crops indicates need for reevaluation of on-farm food loss estimates in North America. *Agricultural Systems, 167,* 136–142. https://doi.org/10.1016/j.agsy.2018.09.008

Poppendieck, J. (1999). *Sweet charity?: Emergency food and the end of entitlement*. New York, NY: Penguin.

Shimada, T., Ross, M., Campbell, E. C., & Webb, K. L. (2013). A model to drive research-based policy change: Improving the nutritional quality of emergency food. *Journal of Hunger & Environmental Nutrition, 8*(3), 281–293. https://doi.org/10.1080/19320248.2013.821963

Simon, D. (2019, January 20). Federal employees turn to food banks to feed their families during shutdown. CNN. Retrieved from https://www.cnn.com/2019/01/17/us/government-employees-shutdown-food-banks/index.html

Vitiello, D., Grisso, J. A., Whiteside, K. L., & Fischman, R. (2015). From commodity surplus to food justice: Food banks and local agriculture in the United States. *Agriculture and Human Values, 32*(3), 419–430. https://doi.org/10.1007/s10460-014-9563-x

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Integrating food systems and local food in family and consumer sciences: Perspectives from the pilot Extension Master Food Volunteer program

J. Dara Bloom,[a] * Joanna Massey Lelekacs,[b] and Gretchen L. Hofing [c]
North Carolina State University

Robyn Stout [d]
Center for Environmental Farming Systems, North Carolina State University

Morgan Marshall [e] and Kristin Davis [f]
North Carolina Cooperative Extension

Submitted March 10, 2019 / Revised June 3, July 11, August 20, and August 30, 2019 / Accepted September 4, 2019 / Published online February 19, 2020

Citation: Bloom, J. D., Lelekacs, J. M., Hofing, G. L, Stout, R., Marshall, M., & Davis, K. (2020). Integrating food systems and local food in family and consumer sciences: Perspectives from the pilot Extension Master Food Volunteer program. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 197–220. https://doi.org/10.5304/jafscd.2020.092.013

Abstract

Cooperative Extension programs across the United States are embracing food systems and local food as a new topic area. Previous studies indicate that successful local food programming requires cross-program collaboration. However, research in this area has underrepresented Extension educators from non-agricultural program areas, although understanding their perspectives is key to fostering

[a] * *Corresponding author:* J. Dara Bloom, Assistant Professor and Local Foods Extension Specialist, Department of Agricultural and Human Sciences, North Carolina State University; 512 Brickhaven Drive, Raleigh, NC 27695 USA; +1-919-515-8475; dara_bloom@ncsu.edu

[b] Joanna Massey Lelekacs, Local Food Program Manager, NC State Extension, North Carolina State University.
Lelekacs is now Director of Education, North Carolina Botanical Garden, University of North Carolina at Chapel Hill.

[c] Gretchen L. Hofing, MPH, RD, NBC-HWC, SNAP-Ed Steps to Health Coordinator, Department of Agricultural and Human Sciences, North Carolina State University.
Hofing is now Program Coordinator, Duke Integrative Medicine.

[d] Robyn Stout, NC 10% Campaign State Coordinator, Center for Environmental Farming Systems, North Carolina State University.

[e] Morgan Marshall, Extension Area Agent, Family and Consumer Sciences, North Carolina Cooperative Extension, New Hanover, Brunswick, and Pender County Centers.
Marshall is now Marketing and Event Assistant, Asheville Event Co.

[f] Kristin Davis, Extension Agent, Family and Consumer Sciences, North Carolina Cooperative Extension, Mecklenburg County Center.

Funding Disclosure

The development of the Extension Master Food Volunteer program was made possible through funding from NC Cooperative Extension's FCS Program, the Department of Agricultural and Human Sciences, and a grant from the NC ECA and FCS Foundation.

cross-program collaboration. The case study presented in this paper examines qualitative evaluation data from the pilot year of the NC State Extension Master Food Volunteer (EMFV) program, which provides training in food systems and local food to Family and Consumer Sciences (FCS) educators and their volunteers. Data from semistructured interviews with educators in the pilot program and from focus groups with their volunteers provide the opportunity to explore areas of intersection and divergence between local food and the FCS program area in order to determine how to best integrate FCS and local food. Findings suggest that integrating local food into FCS programming will require special attention to potentially controversial issues that require educators and volunteers to communicate with the public about scientific issues that also invoke personal values, such as pesticide use and genetic engineering. We also found that educators and volunteers felt that promoting local food was not always compatible with an FCS focus on healthy eating. Overall, this case study demonstrates the potential to engage FCS educators and volunteers in cross-program, community-based food system projects, and to provide public education in the growing field of food systems and local food.

Keywords
Local Food, Cooperative Extension, Family and Consumer Sciences, Volunteers, Food Systems Training

Introduction and Literature Review

Introduction: Local Food, Cooperative Extension, and Family and Consumer Sciences

Research has shown that Cooperative Extension educators across the country have become increasingly involved in food systems work, focusing specifically on local foods (Benson, 2014; Bloom, Lelekacs, Dunning, Piner, & Brinkmeyer, 2017; Ingerson, Jayaratne, Wymore, & Creamer, 2014; Lelekacs et al., 2016; McGuirt et al., 2018; Perez & Howard, 2007; Thomson, Radhakrishna, & Bagdonis, 2011; Thomson, Radhakrishna, Maretzki, & Inciong, 2006). This interest mirrors the growing consumer interest and corresponding research in local food systems as vehicles for promoting community economic development, supporting farmers, and increasing access to healthy food (Bauman, Thilmany McFadden, & Jablonski, 2018; Koch et al., 2017; Low et al., 2015). A growing body of literature identifies Cooperative Extension as being ideally situated to take leadership in local food system development (Clark et al., 2017; Colasanti, Wright, & Reau, 2009; Dunning et al., 2012; Morgan & Fitzgerald, 2014; Raison, 2010). This is because Cooperative Extension has traditionally provided training and programs that coincide with the primary areas of local food system development, including (1) working with growers and gardeners; (2) supporting local markets; (3) educating youth about agriculture and food; and (4) providing guidance on home and commercial processing and preservation (Gould, Steele, & Woodrum, 2014). Local food, therefore, crosses Cooperative Extension program areas, which include Agriculture and Natural Resources (ANR; encompassing horticulture and livestock), 4-H youth programming, and Family and Consumer Sciences (FCS). In addition, Cooperative Extension has a large presence across the country; according to the USDA National Institute of Food and Agriculture, Extension operates offices in most of the 3,000 counties nationwide (USDA NIFA, n.d.-a), connecting communities to more than 100 land-grant universities (USDA NIFA, n.d.-b).

Despite the gains that have been made to integrate local food systems into Cooperative Extension, research still indicates that Extension educators consistently express needs for resources and education to help them accomplish these goals (Bloom et al., 2017; Lelekacs et al., 2016; Thomson et al., 2011). Before educators can engage communities to work on local food system projects and programs, they need education and capacity-building related to what defines a food system and how to foster high-performing local food systems (Bloom et al., 2017; Lelekacs et al., 2016).

Noting the complexities of understanding the food system and the nontraditional stakeholders who are interested in the field (such as public health practitioners), researchers suggest that a systems approach that crosses program areas is the best way to engage Cooperative Extension educa-

tors (Bloom et al., 2017; Dunning et al., 2012; Morgan & Fitzgerald, 2014). However, surveys and focus groups conducted to better understand Extension educators' role in local food systems have most often targeted educators who are already explicitly involved in local food work (most often from the ANR program area), resulting in lower response rates from FCS educators (Benson, 2014; Clark et al., 2017; Ingerson et al., 2014).[1] One exception is a study by Thomson et al. (2011), who sent a survey about local food perceptions to the entire population of Extension educators in New York, New Jersey, and Pennsylvania. This study had higher response rates from FCS educators than the studies cited above, although still lower than agriculture educators (28.8% and 45.9%, respectively). Another exception is McGuirt et al. (2018) and Seguin et al. (2018), both of whom targeted nutrition educators. However, the McGuirt et al. study evaluated a specific program that offered cost-offset community supported agriculture (CSA)[2] boxes to participants in nutrition education classes, rather than exploring the larger issues involved in integrating local food projects and issues into the FCS program area within Cooperative Extension. While Seguin et al. were connected to the same CSA project, they asked nutrition educators specific questions about their perceptions of local food and its integration in Cooperative Extension programming. Their study was a first step toward understanding the relationship between local food and non-agricultural Extension program areas. Seguin et al. found that nutrition educators were supportive of local food due to its resonance with their "way of life" and supporting farmers. At the same time, they found that educators identified barriers to integrating local food in their programming due to the seasonality of local food, its potential for spoilage, and perceived price issues. The current study builds on these findings to expand the body of research that explores local food program implementation in non-agricultural program areas in Cooperative Extension. Our study differs from both the McGuirt and Seguin studies by focusing on Family and Consumer Sciences (formerly referred to as Home Economics) educators and their volunteers, rather than nutrition educators. FCS educators conduct nutrition education in the context of overall FCS programming, which also includes food safety, cooking skills, home food preservation, and working with community partners to change community food environments. In addition, we examine FCS educators' and their volunteers' perspectives of local food within the context of a specific program that provides training, resources, and program implementation opportunities on this topic. We contend that effectively promoting a cross-program approach to local food programming in Extension requires understanding the barriers to and opportunities for integrating local food into non-agricultural program areas such as FCS.

While FCS educators are typically underrepresented in research related to local food in Extension, there are many intersections between FCS programming and local food work. Developments in the field of public health and previous research on consumers' and educators' local food perceptions can inform those interested in how local food might align with this program area. Washburn (2017) describes how, beginning in 2015, the federally funded nutrition education programs that have long served as the hallmark of FCS programming, such as the Expanded Food and Nutrition Education Program (EFNEP) and the Supplemental Nutrition Assistance Program Education (SNAP-Ed), began to emphasize the need to go beyond direct education to include policy, systems, and environmental changes (PSE; see also Haynes-Maslow, Osborne, & Jilcott Pitts, 2018). These PSE strategies focus on changing community food environments to make healthy food more available,

[1] Benson (2014) reported a 37.7% response rate for ANR educators, compared to 19% for FCS; Clark et al. (2017) had 33.3% representation from ANR, compared to 19.6% for FCS; and Ingerson et al. (2014) had a 35.9% response rate from Agriculture educators, compared to 12.8% FCS (combined with County Extension directors and program associates).

[2] Community supported agriculture is a marketing arrangement where farmers typically sell customers a "share" of the harvest before the season begins. In return, customers receive a box or share of produce on either a weekly or biweekly basis throughout the season (Woods, Ernst, & Tropp, 2017).

affordable, and accessible to consumers (Committee on Accelerating Progress in Obesity Prevention, Food and Nutrition Board, & Institute of Medicine, 2012). For example, PSE changes might include offering healthier food through school cafeterias, congregate nutrition sites, food pantries, corner stores, faith communities, or other community sites, or working with these sites to build walking trails or other opportunities for physical activity (Haynes-Maslow et al., 2018). Often, direct education in the form of cooking demonstrations or taste tests accompanies PSE changes in community locations to help support consumers as they increase their consumption of healthy food. As a result, many PSE projects include local food, such as working with farmers markets to increase community access, connecting food pantries with sources of local food, or designing nutrition education in school settings to incorporate gardening (Haynes-Maslow et al., 2018; Koch et al., 2017).

Research on consumer and Cooperative Extension perceptions of local food systems also suggests synergy between FCS topic areas and local foods. For example, Perez and Howard (2007) found in their survey of consumers in California that consumers' primary food system concerns were related to food safety and nutrition, both of which are traditional FCS program areas. They also found that consumers were interested in the environmental impacts of how food is produced, an issue that points to a potential new role for FCS educators to address. This finding is consistent with other research findings documenting growing consumer interest in "sustainable diets," or in understanding the social and environmental implications of their dietary choices (Gussow, 1999; Gussow & Clancy, 1986; Merrigan et al., 2015; Reynolds, Buckley, Weinstein, & Boland, 2014). Studies also indicate that FCS educators believe their role intersects with the food system through improving access to healthy food for low-income consumers, including increasing the inclusion of marginalized populations in local food programs (Clark et al., 2017; McGuirt et al., 2018; Seguin et al. 2018; Thomson et al., 2011).

To expand our understanding of the intersection between local food and FCS programming, we ask: How do FCS Extension educators and volunteers in their programs perceive the value of food systems education and its relationship to traditional FCS programming? We address this research question through a case study of the evaluation of a pilot Extension program for FCS educators and their volunteers that includes training in food systems in addition to traditional FCS topic areas.

Applied Research Methods

Study Context

To explore the intersection between FCS programming and local food, we focus on qualitative data from the evaluation of the pilot NC State Extension Master Food Volunteer (EMFV) program. The EMFV program provides FCS educators with a training curriculum to prepare volunteers to support FCS programming in their counties. The EMFV program helps FCS educators strengthen their programming in food and nutrition, learn about food systems and local food, and expand their capacity to serve multiple counties by engaging with volunteers. In 2015–2016, the lead author assembled a team of Extension specialists and FCS educators (including the co-authors) to develop the NC State Extension Master Food Volunteer (EMFV) program and training curriculum. The EMFV curriculum consists of 10 modules: (1) Cooking Skills; (2) Cooking Demonstrations; (3) Food Safety; (4) Nutrition; (5) Food Systems and Local Food; (6) Teaching Strategies; (7) Evidence-based Programming; (8) Changing Health Behaviors; (9) History of Extension and FCS; and (10) Diversity, Inclusion and Equity. The entire curriculum requires 30 hours of training to complete, and the Food Systems and Local Food section of the curriculum[3] takes approximately 6 to 8 hours. The learning objectives for the Food Systems and Local Food module are that participants will:

1. Understand the place-based nature of local food and identify which values of local food systems are relevant in their county or region.

[3] For a summary of the content of Food Systems and Local Food module of the EMFV curriculum, please see Appendix A.

2. Be able to define the sectors of the food system and cite example projects or Cooperative Extension programs that are working to develop local food systems in North Carolina.
3. Be familiar with common definitions of local food and why consumers are interested in local food.
4. Be able to answer consumers' questions about the benefits and impacts of buying local food.
5. Be able to describe the differences between standards, certifications, and labels, and be familiar with some common certifications and labels.

The program was piloted with seven FCS educators in 2016–2017. The seven educators in the pilot program were trained in person in the EMFV curriculum in May 2016 by a team, which included the co-authors, of 13 Extension specialists and one Extension educator who had contributed to the curriculum. An evaluation of the program was conducted in 2017. Revisions were made to the curriculum based on this feedback from educators and volunteers, including the incorporation of new activities developed by educators in the pilot program (discussed more fully in the results section). The curriculum was then sent for external review by seven experts in the fields of local food and FCS. The curriculum was finalized in 2017, and the program was rolled out statewide in 2018. This study focuses on educators' and volunteers' perceptions of the intersection between FCS and local food based on their experiences in the pilot EMFV program.

While many other states offer a similar volunteer program (including Kansas State University and Virginia Polytechnic Institute and State University [Virginia Tech]), NC State Extension's curriculum is unique in including a section on Food Systems and Local Food. Part of the justification for developing a Food Systems and Local Food module for the EMFV training curriculum was due to the strong emphasis on local food within NC Cooperative Extension.[4] Local Food was named a Flagship Program for NC Cooperative Extension in 2012, and every county has a designated local food coordinator (Dunning et al., 2012; Ingerson et al., 2014). Extension specialists have offered local food training and program support for many years, both as part of the Flagship program and preceding this designation. Offerings have included training at in-service events, promotion of the NC 10% Campaign, a graduate-level course for Extension educators, and an online, professional development certificate program about local food systems (Bloom et al., 2017; Dunning et al., 2012; Ingerson et al., 2014; Lelekacs et al., 2016). For these reasons, it was important that a curriculum designed to educate and support FCS educators and their volunteers in North Carolina include information about food systems and local food.

Sample

The seven FCS Extension educators in the pilot worked in 11 different counties with regional variation across North Carolina. However, two educators were excluded from this study because they had not yet trained their volunteers at the time of the evaluation. A total of 25 volunteers participated in the pilot year of the EMFV program. Except for two volunteers in County 2, the FCS educators and their volunteers were all females. All the educators who participated in the evaluation were white except for one Latina, and these educators worked with a total of seven volunteers who were African American, two who were Latina, and 16 who were white. A summary of county demographic and agricultural characteristics is provided in Appendix B to provide context to the subsequent analysis.

As Appendix B shows, all five counties included in the evaluation either had strong agricultural sectors or had experienced large growth in the local food sector between 2007 and 2012. Counties 3 and 5 had the largest mean farm size (431 acres [174 hectares] and 340 acres [138 ha], respectively) and had experienced the largest sales growth in this area (+40% and +25%, respectively). Counties 1 and 5 had the most direct-to-consumer sales

[4] The Food Systems and Local Food section of the EMFV curriculum is available for purchase by other states for inclusion in their programming. Adaptations are needed to include state-specific information about agriculture and food systems.

(US$382,000 and US$482,000, respectively) and had experienced the largest growth in this area between 2007 and 2012 (+96% and +114%, respectively). County 2 experienced the most growth in the number of farms selling direct to consumers from 2007 to 2012 (+76%; data are unavailable about direct consumer sales in 2012 for this county). County 4 had the largest number of farms (638) and the largest number of farms selling direct to consumer (73), and also the smallest average farm size (93 acres or 38 ha). County 4 was the only one that had experienced a decline in direct sales to consumers between 2007 and 2012 (–59%), with County 1 experiencing the greatest increase in this category (+96%). Given that these counties all either had strong agricultural systems (Counties 3, 4, and 5) and/or exhibited growth in local food indicators (Counties 1, 2, and 5), we expected that training and resources focused on food systems and local food would be relevant to Extension educators and volunteers.

Methods

We evaluated the program after educators and volunteers had participated in the pilot for one year to assess their perceptions of the program's curriculum and implementation. The lead author conducted semistructured interviews in the summer of 2017 with the five educators who had trained volunteers. The lead author also conducted five focus groups with 17 participating volunteers who had been trained by these five educators. All interviews and focus groups were audio-recorded and transcribed; on average, they lasted one hour. The questions in both the interviews and focus groups were designed to learn about the educators' and volunteers' perceptions of the curriculum and implementation of the EMFV program. The participants were not asked specifically about the Food Systems and Local Food module of the curriculum, but rather more generally about which parts of the training they liked the best, which they liked the least, and what they would change.[5] We did not ask questions specifically about the Food Systems and Local Food module of the curriculum because the purpose of the evaluation was to gather feedback on the entire training curriculum and program. Instead, we analyzed the interview and focus group transcripts to see where educators and volunteers independently mentioned this area of the training and curriculum. This allowed us to see how educators and volunteers reacted to the inclusion of these topics in a program designed to provide training in FCS topic areas and how they perceived the value of these topics. The extent to which the Food Systems and Local Food module was referred to by educators and volunteers, therefore, can be seen as an indicator of the salience of the topic to the participants. The lead author developed a codebook, and two independent coders analyzed the transcripts using NVivo 11 software.[6] The lead author then reconciled the codes and analyzed emerging themes in terms of educators' and volunteers' reactions and responses to the Food Systems and Local Food module, and perceptions more generally about food systems issues as related to traditional FCS programming. This evaluation was reviewed and approved by the NC State University Institutional Review Board, #6078.

Results

Although neither Extension educators nor volunteers were asked directly about food systems and local food, the responses that they offered to questions about their satisfaction with the curriculum and training implementation shed light on many of the themes that were identified in the review of the literature. These include (1) the need for training in food systems and local food; (2) interest in cross-program collaboration; (3) controversial issues in the food system; and (4) the intersection of local food programming and food insecurity.

Need for Food Systems Training

Three of the five educators reported that their favorite part of the curriculum was the Food Systems and Local Food module. This included an educator who was already interested in and familiar with local food in County 2, as well as two educators who were less familiar with the topic. For

[5] For more information, please see the Interview Guide (Appendix C) and the Focus Group Guide (Appendix D).
[6] To see the codebook, please see Appendix E.

example, the educator from County 3 responded to a question about what stood out for her from the training by saying,

> The thing that I still really think about is the food system stuff, just because I had never really addressed it prior to that time. . . . Definitely something that our participants want to know or that are very interested in, so I'm glad I got that experience, and it just seems like it was the first time I've been exposed to that information.

This sentiment was echoed by a third educator in County 4, who said,

> Well, for me, it was my first experience with learning about food systems. I mean I kind of had a general idea about it, but I didn't know enough to be able to teach it to someone else… It really made me feel a lot more comfortable with talking to other people about local food.

These educators clearly valued learning about food systems and local food more generally, especially for those who recognized interest and demand in their county and now felt more prepared to address that interest.

Volunteers in two focus groups also directly mentioned the Food Systems and Local Food module when asked about their favorite parts of the curriculum. For example, one volunteer in County 4 said of this module, "You know I did not know the local thing. That was very interesting to me. The processing, the food banks, and what was the wheel thing? You know I never really thought about that. . . . I mean every farmer doesn't go to the local farmers markets, so how does their product get different places?" The "wheel thing" this volunteer refers to is a diagram of the food system that is used to teach about the different sectors. In this quote, the volunteer demonstrates an appreciation for learning not just about local food, but about the bigger picture of how the food system works. While one volunteer in County 2 expressed disappointment that the curriculum seemed more focused on "knowing where the food came from," rather than on cooking, other volunteers expressed increased knowledge in this area and correspondent behavior changes. These behavior changes often overlapped with other areas of the curriculum. For example, one volunteer in County 3 mentioned increasing her fruit and vegetable consumption in response to the Nutrition module of the curriculum, but she also reported that she had begun to frequent a local farm stand more often and to try new foods, in this case, spaghetti squash. This volunteer and one in County 4 both reported that because of the training, they now asked the farmers at their local stands which products were local and which were coming from other regions.

Interest in Cross-Program Collaboration

While both educators and volunteers appreciated the Food Systems and Local Food module of the curriculum, it was a new area for many of them. As a result, they either requested additional training or implied that they were not ready to teach it on their own. The educator in County 3 expressed that while she felt she learned a lot, she also felt that she learned just enough to be able to communicate better with the agriculture educator in her county. When asked if she found the food systems training useful, she responded,

> Definitely, because … I can have intelligent conversations with the ag educators about what I need. Because I have that little bit of knowledge, and I'm like, 'This is what I need from you. It's something along this topic, I know you are better equipped for this,' but then I have the direction for them to go.

This quote illustrates how this training also helped to promote another goal in local food Extension work, cross-program collaboration. The County 3 FCS educator relied on the agriculture educator to provide resources about local food in their county that she could share with her volunteers. A volunteer from this county also mentioned directing program participants to the horticulture educator when they asked her questions about growing or planting gardens. The fact that participants in FCS programs also ask about growing food indicates that consumers are increasingly

interested in food systems issues and do not always recognize the boundaries that Extension program areas put in place. The County 5 educator expressed her interest in the potential for cross-program collaboration by sharing her vision for having Extension Master Food Volunteers pair with Extension Master Gardeners, saying,

> If I have a volunteer, like one volunteer from the Master Gardeners and one volunteer from the Extension Master Food Volunteer [program] to teach a class at preschool, it would be so awesome to see this person talking about an eggplant from the plant side and then this person showing about the nutrition and how to cook it, and let's do a food [taste] test, but together.

In this way, this educator hoped that the volunteers would see each other as partners, rather than competitors, something that she also mentioned in reference to collaborating with 4-H educators. In these ways, we can begin to see how the EMFV program spurred educators to think about how food systems could lead them to work more with their colleagues and form bridges to other program areas to meet consumers' and program participants' interests.

Controversial Issues in the Food System

The Food Systems and Local Food section of the EMFV training curriculum provided some introductory information about potentially controversial issues in the food system. This included organic agriculture and genetically modified organisms (GMOs), which are described briefly in a section about standards, certifications, and labels. The way that educators and volunteers talked about these issues in interviews and focus groups raised the question about volunteers' ability to put aside their personal opinions on controversial topics. To this end, there is a module in the EMFV curriculum called Programs that Work that explains what it means that Extension uses evidence and research-based strategies and information. Every FCS educator who was interviewed as part of this evaluation brought up the issue of volunteers adhering to evidence and research-based information, and volunteers in all counties except County 1 mentioned it as well. However, most educators and volunteers brought this up as an issue more generally, or specifically in the context of sharing information related to nutrition, food safety, or home food preservation. Only the educators from Counties 2 and 4 and volunteers in Counties 3 and 4 mentioned this specifically as it related to food system issues. For example, the educator in County 2 said,

> I still get a little nervous thinking about sending them out and then getting questions about more opinion-based things, because … it makes me nervous, but it's like, if someone asks you about organic versus conventional or something like that, like you can't tell them … [they should buy] one or the other.

The educator in County 4 expressed similar sentiments, and gave a specific example,

> We were doing a grocery store tour, I had one of the EMFV volunteers helping. And they were talking about produce and how to find product of origin, and she pipes up and says so just go by the Clean 15 and the Dirty Dozen, or something like that. And while yes, that is one of the strategies that people can use, I didn't really think it was appropriate for the grocery store tour… it's really hard to get volunteers to stick to that best practices or best recommendations when they have a personal bias in a particular area.

In both of these cases, the educator expressed concern that volunteers had a hard time putting aside their personal opinions, especially when it came to questions related to pesticide use and organic agriculture.

Interestingly, while FCS educators expressed these concerns about their volunteers, the EMFV volunteers who participated in the focus groups consistently reinforced the idea that they should refer any questions they did not feel prepared to answer back to the educator with whom they worked. Volunteers mentioned taking this approach generally and specifically with food systems issues. For example, when asked if she

ever gets questions during FCS programs about GMOs, a volunteer in County 3 responded, "No GMO. I haven't gotten any like that. If I get any like that, I direct them to [the FCS educator]." Volunteers in County 4 were the most vocal about these controversial issues, especially GMOs, as well as the question of personal opinion. For example, one volunteer made the statement,

> I want to avoid the health fairs, because I don't like to dispute people on GMOs and stuff. I think that's a personal opinion. I don't think that it's a question where I would be comfortable sharing either way the research base, it's just because I don't know enough about it for one thing.

This volunteer made the statement that the issue was too "political" and was thus better avoided. However, another volunteer in the focus group in County 4 responded, "I mean you know there's just certain things that you mess with, and certain things that you don't, and our food is one of them," expressing her disapproval of GMO technologies. Despite the fact that this was an issue that volunteers did not seem to agree on in this county, they still made the point that questions on controversial issues should be referred back to FCS educators. As one said, "You'd better be darn tooting you know everything, or be knowledgeable. If you don't know, it's okay, just tell them… go talk to [the FCS educator]."

In addition to the issues identified here, volunteers' comments during the focus groups suggest that they may have unacknowledged biases that would keep them from being able to identify situations when they need to avoid offering personal opinions and should refer questions back to FCS educators. For example, in talking about issues of food insecurity, a volunteer in County 1 made the comment, "And now the kids these days, the moms don't want to cook, they're eating out fast food, they're huge, they're growing big because of hormones or whatever they're getting." This volunteer's reference to how children are "growing big because of hormones," may be referring to a controversial issue in agriculture, the use of hormones in livestock production, but without any reflection as to the research in this area that may or may not support this claim. The volunteer's comment also indicates stereotyping and bias against consumers' health circumstances, which could be influenced by socioeconomic status and other factors. This example indicates the possibility that volunteers have opinions and biases in topics related to agriculture and the food system that they do not necessarily recognize, and which they may share with program participants.

In response to these issues, the FCS educator in County 2 suggested creating an activity where volunteers are given different scenarios of being asked questions about food systems issues by program participants. She suggested that the value of this activity would be "because that helps them with recall. But it also helps me to see how they would really answer." Two additional training activities created in response to this suggestion were incorporated into the final curriculum. The confusion and nervousness on these topics that educators and volunteers expressed suggest the need for continued education to better clarify the research behind many controversial issues in the food system.

Intersection of Local Food and Food Insecurity

Food insecurity is another major topic that emerged from the interviews and focus groups that highlights themes related to the intersection of local food and FCS. Volunteers in all five counties mentioned a food access activity in the Food Systems and Local Food module of the curriculum as one of their favorite parts of the program. In this activity, volunteers are paired off and given different amounts of cash (US$9, US$7, and US$5). They are sent to different types of stores (or perform a simulated activity in the classroom) and told to buy a healthy meal for a family of four. Volunteers reported that they found this to be a "fun," "most interesting," and "good" activity. As a volunteer in County 5 said, "It brought home to me that regardless of how much money you have, you can still prepare a healthy meal." A volunteer in County 3 made a similar statement, saying, "It helped everybody learn budgeting on a meal, because a lot of people, especially in this county, don't know how to budget fresh food in their

budget." Volunteers in all of the counties expressed similar sentiments about this activity. They talked about how it helped reinforce concepts about nutrition and healthy eating, while also helping them to better understand experiences of poverty and food insecurity.

However, while it is often assumed that FCS educators' intersection with food systems issues is in integrating low-income consumers and working on issues of food access (Clark et al., 2017; McGuirt et al., 2018; Seguin et al., 2018; Thomson et al., 2011), two volunteers in different counties pointed out the potential incompatibility between reaching these populations and promoting local food. For example, a volunteer in County 2 said, "To buy from the farmers market is expensive. And the emphasis is getting people to eat healthier, but it isn't necessarily eating *fresh* food." This volunteer identified a key tension in integrating local food into FCS programming, especially with low-income audiences. Although research shows that prices at farmers markets are not necessarily higher than at supermarkets (McGuirt, Jilcott, Liu, & Ammerman, 2011), there is a perception that local food costs more. In some cases, this perception may be accurate, such as in urban areas where markets often cater to higher-end consumers and sell organic produce (Salisbury, Curtis, Pozo & Durward, 2018). Either way, this perception influences consumer behavior, and while Extension educators want to provide the public with education about food systems and local food, the priority for FCS educators is to encourage people to eat healthily. As the FCS educator in County 4 quoted above said in response to one of her volunteers talking about the "Dirty Dozen" list,

> That's kind of how I responded to that, was yes, there is a Dirty Dozen list, but we would rather you eat your fruits and vegetables regardless of that list as opposed to not eating it unless you can buy it organically.

Volunteers in County 4 also reflected on the need to prioritize health and nutrition before promoting local food. One volunteer suggested that seasonal food can have a place in educating low-income consumers since it may be less expensive, but then also situated this idea within a larger nutritional message:

> Because if it's grown in season—if we're eating when it's mature in season, it's cheaper … if I was talking to a bunch of mothers who was on a very limited income, you know I wouldn't go into the part where you would immediately do fresh or garden or whatever. Getting a child to eat a vegetable is the priority.

This volunteer also emphasized the need to promote fruit and vegetable consumption regardless of whether the produce was canned, frozen, or fresh. In addition to recognizing the need to prioritize nutrition messaging, volunteers in County 4 were aware of the way the food environment limits access to healthy food. In this case, they talked about transportation in this rural county, indicating an awareness of how food access is a deeper issue than simply being able to afford or knowing how to cook healthy food (Ver Ploeg et al., 2009).

Discussion

An analysis of FCS educators' and EMFV volunteers' responses to the Food Systems and Local Food module of the EMFV curriculum, and their perceptions in general about these topics, highlights the continued training needs associated with integrating local food into traditional FCS Extension programming. While a quantitative, retroactive pre/post-survey delivered at the end of educator and volunteer trainings indicated that FCS educators and their volunteers gained knowledge on focal topics, in interviews and focus groups they verbally expressed the need for additional training. Specialists in this area are working to integrate food systems and local food training into NC Cooperative Extension's New Professional Orientation to establish it as one of the core elements of the FCS program area. In this way, educators would not see these materials for the first time as part of the EMFV program, but rather would have some familiarity with it earlier in their careers.

Findings indicated that FCS educators enjoyed collaborating with educators and volunteers who work in the agricultural field. Participants' comments about collaborations indicated both an inter-

est in cross-program projects as well as a desire to maintain and delineate boundaries when it comes to responsibilities. Through these findings, we can begin to see how the EMFV program spurred educators to think about how food systems could lead them to work more with their colleagues and form bridges to other program areas to meet consumers' and program participants' interests. This observation also intersects with questions of food systems training, since several FCS educators requested that the agriculture or horticulture agent in their counties teach the Food Systems and Local Food section of the curriculum. This raises the question of whether educators who have not been trained specifically in this curriculum are prepared to teach these materials.

In this analysis, we also explored two of the principal areas where FCS programming may overlap with food systems concepts: working with low-income audiences, and educating consumers about controversial food systems issues. In terms of food insecurity, all the volunteers in the pilot EMFV program were interested in this topic and were especially appreciative of an activity that gave them hands-on experience with food access issues. At the same time, volunteers in two counties questioned the compatibility of promoting local food to food-insecure populations and mentioned the importance of prioritizing messaging about healthy eating. Several volunteers also demonstrated their understanding of the deeper causes of food insecurity, including transportation in rural areas and other issues related to poverty. However, others fell back on assumptions and biases about people living in poverty, specifically that they do not know how to budget their finances or that they rely on fast food. The curriculum attempts to address this issue by emphasizing that food insecurity is not only a food systems issue, but rather is determined by poverty, which is a complex issue influenced by multiple factors. Analysis of volunteer focus group transcripts demonstrates interest expressed by volunteers in this topic, combined with the expression of some bias in this area, indicating the need for continued education on this topic.

When it comes to more controversial food systems issues, FCS educators expressed concern that volunteers would be unable to put aside personal opinions about issues such as GMOs or pesticides to provide the public with the type of evidence-based information deemed suitable for Cooperative Extension. While volunteers clearly demonstrated their understanding of the need to refer questions on these types of issues back to the educators with whom they work, they also expressed some confusion and unacknowledged biases on these topics. This issue highlights a potential conflict between traditional Extension education models and best practices for public education on controversial food system issues. One of the hallmarks of Cooperative Extension is its connection to the land-grant university system, where research on a wide array of agricultural and food systems issues takes place. As a result, Extension's reliance on evidence-based information informed by this science is often cited as one of its distinguishing attributes and is the topic of the Programs that Work section of the EMFV curriculum. Approaching consumer education by providing science-based information is known as the deficit model of communication, which assumes that providing consumers with scientific information will change their knowledge, attitudes, and behavior (Sturgis & Allum, 2004). However, when it comes to topics such as genetic engineering, research has shown that people's attitudes are not wholly reliant on scientific knowledge, but are also influenced by cultural, economic, and social values that affect risk perception and trust in new technologies (Davison, Barns, & Schibeci, 1997; Sturgis & Allum, 2004). In addition, Guthman (2011) points out that the deficit model is also prevalent when talking about alternative food systems, including markets such as farmers markets and CSAs. Guthman criticizes the "if they only knew" rhetoric in the alternative food sphere, which assumes that consumers' failure to attend these types of alternative markets or to purchase organic, local food is due to a lack of understanding of food system issues. Guthman also demonstrates that this attitude often maps onto class and racial divides, with white activists attempting to educate people of color and low-income consumers about the food system. Therefore, applying the Extension approach of providing evidence-based information when related to GMOs, organic agriculture, pesticides, and other controversial food

system issues may not be the best way to prepare educators and volunteers to interact with the public. To address this issue, our team is currently working with the Genetic Engineering and Society Center at NC State University to develop curricular materials that could be used within Extension, including as a continuing education module for the EMFV program. These materials will focus more heavily on how educators can communicate with consumers about controversial topics, rather than relying solely on the concept of providing evidence-based information. This disconnect between the deficit model of communication and the need for more nuanced communication on controversial food system topics is one that should be pursued in further Extension programming and research.

In keeping with the place-based nature of local food systems, one interesting finding from this study is the diversity of responses across counties and locations. County 4 appeared to be the most engaged in the focus groups when it came to food systems topics, followed closely by County 2. If we refer to Table 1 (Appendix B), we can note that County 4 has a large number of small farms (638 farms, average 93 acres or 38 ha), and the greatest number of farms selling directly to the consumer (73), though it was also the only county in the sample to experience a decline in direct-to-consumer sales between 2007 and 2012 (–59%). Nonetheless, this county clearly has a vibrant landscape of small farms with a tradition of selling direct to consumers. County 2 data about direct-to-consumer sales for 2012 is unavailable, making it hard to compare to other counties. However, it had the largest increase in the percent of farms selling direct to consumers between 2007 and 2011 of the counties in the sample (+76%). This increase in direct farm sales also indicates a likely growth in interest in local food in this county, which may also be influenced by both the presence of retirees from other regions of the country and its proximity to a neighboring county with a large urban area. While these parallel increases may help to explain why the educators and volunteers in these counties had more responses related to the Food Systems and Local Food module of the EMFV curriculum, it does not totally explain why they appeared more engaged with local food than other counties. For example, County 5 has the highest amount of direct-to-consumer sales (US$482,000) and also saw the largest growth in this area between 2007 and 2012 (+114%), followed by County 1 (+96%); County 3 has the highest number of farmers markets and roadside stands (11). In this case, while context may help to explain some of the different reactions observed among educators and volunteers with regard to local food, it is also possible that the personal interests of both educators and volunteers are a factor that determines how relevant they consider these issues.

Conclusion

Our study indicates that while FCS educators and their volunteers value food systems education, further work is required to determine the best way to integrate local food into FCS programming. This research indicates that future efforts should focus on how to build cross-program collaborations that respect the expertise of each program area, while also illustrating points of intersection. In addition, special attention should be paid to potentially controversial issues that require educators and volunteers to navigate between providing evidence-based information and understanding the values that people bring to food systems decisions. It is also important to be aware of the potential incompatibility between local food systems and other FCS messaging, such as healthy eating. While our ability to make generalizations is limited by both our small sample size and the place-specific context of local food systems, we believe that this case study sheds insight into themes that should be further explored in Extension programming and research. Overall, the passion and dedication that FCS educators and their volunteers displayed about these topics and their commitment to working with their communities indicate great promise for promoting community engagement around local food through the FCS program area.

Acknowledgments

The authors would like to thank all the specialists, educators, and volunteers who have given their time to develop the program and serve their communities. We also appreciate the feedback from the anonymous JAFSCD reviewers.

References

Bauman, A., Thilmany McFadden, D. , & Jablonski, B. B. R. (2018). The financial performance implications of differential marketing strategies: Exploring farms that pursue local markets as a core competitive advantage. *Agricultural and Resource Economics Review, 47*(3), 477–504. https://doi.org/10.1017/age.2017.34

Benson, M. C. (2014). Exploring Extension involvement in farm to school program activities. *Journal of Extension*, *52*(4); 4FEA4. Retrieved from https://www.joe.org/joe/2014august/a4.php

Bloom, J. D., Lelekacs, J. M., Dunning, R., Piner, A., & Brinkmeyer, E. (2017). Local food systems course for Extension educators in North Carolina: Summary of an innovative program. *Journal of Extension*, *55*(4), 4IAW2. Retrieved from https://www.joe.org/joe/2017august/iw2.php

Clark, J. K., Bean, M., Raja, S., Loveridge, S., Freedgood, J., & Hodgson, K. (2017). Cooperative extension and food system change: Goals, strategies and resources. *Agriculture and Human Values, 34*(2), 301–316. https://doi.org/10.1007/s10460-016-9715-2

Colasanti, K., Wright, W., & Reau, B. (2009). Extension, the land-grant mission, and civic agriculture: Cultivating change. *Journal of Extension, 47*(4), 4FEA1. Retrieved from https://www.joe.org/joe/2009august/a1.php

Committee on Accelerating Progress in Obesity Prevention, Food and Nutrition Board, & Institute of Medicine. (2012). Accelerating progress in obesity prevention: Solving the weight of the nation. Washington, D.C.: National Academies Press. https://doi.org/10.17226/13275

Davison, A., Barns, I., & Schibeci, R. (1997). Problematic publics: A critical review of surveys of public attitudes to biotechnology. *Science, Technology, & Human Values, 22*(3), 317–348. https://doi.org/10.1177/016224399702200303

Dunning, R., Creamer, N., Lelekacs, J. M., O'Sullivan, J., Thraves, T., & Wymore, T. (2012). Educator and institutional entrepreneur: Cooperative Extension and the building of localized food systems. *Journal of Agriculture, Food Systems, and Community Development*, *3*(2), 99–112. https://doi.org/10.5304/jafscd.2012.031.010

Gould, F. I., Steele, D., & Woodrum, W. J. (2014). Cooperative Extension: A century of innovation. *Journal of Extension*, *52*(1). 1COM1. Retrieved from https://www.joe.org/joe/2014february/comm1.php

Gussow, J. D. (1999). Dietary guidelines for sustainability: Twelve years later. *Journal of Nutrition Education*, *31*(4), 194–200. https://doi.org/10.1016/S0022-3182(99)70441-3

Gussow, J. D., & Clancy, K. L. (1986). Dietary guidelines for sustainability. *Journal of Nutrition Education, 18*(1), 1–5. https://doi.org/10.1016/S0022-3182(86)80255-2

Guthman, J. (2011). "If they only knew": The unbearable whiteness of alternative food. In A. H. Alkon & J. Agyeman (Eds.), *Cultivating food justice: Race, class and sustainability* (pp. 263–281). Cambridge, Mass.: The MIT Press.

Haynes-Maslow, L., Osborne, I., & Jilcott Pitts, S. B. (2018). Best practices and innovative solutions to overcome barriers to delivering policy, systems and environmental changes in rural communities. *Nutrients, 10*(8), 1012. https://doi.org/10.3390/nu10081012

Ingerson, K., Jayaratne, K. S. U., Wymore, T., & Creamer, N. (2014). Extension educators' perceptions about the NC 10% Local Food Campaign: Impacts, challenges, and alternatives. *Journal of Extension*, *52*(2), 2FEA7. Retrieved from https://www.joe.org/joe/2014april/a7.php

Koch, P., Wolf, R., Graziose, M., Gray, H. L., Trent, R., & Uno, C. (2017). *FoodCorps: Creating Healthy School Environments.* New York: Laurie M. Tisch Center for Food, Education & Policy, Program in Nutrition, Teachers College, Columbia University. Retrieved from https://foodcorps.org/about/impact/foodcorps-creating-healthy-school-environments-teachers-college/

Lelekacs, J. M., Bloom, J. D., Jayaratne, K. S. U., Leach, B., Wymore, T., & Mitchell, C. (2016). Planning, delivering, and evaluating an extension in-service training program for developing local food systems: Lessons learned. *Journal of Human Sciences and Extension*, *4*(2), 1–19. Retrieved from https://www.jhseonline.com

Low, S. A., Adalja, A., Beaulieu, E., Key, N., Martinez, S., Melton, A., … Jablonski, B. B. R. (2015). *Trends in U.S. local and regional food systems: A report to Congress* (No. AP-068); p. 89). Washington, D.C.: U.S. Department of Agriculture, Economic Research Service. Retrieved from https://www.ers.usda.gov/publications/pub-details/?pubid=42807

McGuirt, J. T., Jilcott, S. B., Liu, H., & Ammerman, A. S. (2011). Produce price savings for consumers at farmers' markets compared to supermarkets in North Carolina. *Journal of Hunger & Environmental Nutrition*, *6*(1), 86–98. https://doi.org/10.1080/19320248.2010.551031

McGuirt, J. T., Jilcott Pitts, S. B., Seguin, R. A., Bentley, M., DeMarco, M., & Ammerman, A. S. (2018). Perspectives on a local food access and nutrition education program from Cooperative Extension nutrition educators. *Journal of Agriculture, Food Systems, and Community Development, 8*(3), 105–122. https://doi.org/10.5304/jafscd.2018.083.002

Merrigan, K., Griffin, T., Wilde, P., Robien, K., Goldberg, J., & Dietz, W. (2015). Designing a sustainable diet. *Science, 350*(6257), 165–166. https://doi.org/10.1126/science.aab2031

Morgan, K. T., & Fitzgerald, N. (2014). Thinking collectively: Using a food systems approach to improve public health. *Journal of Extension, 52*(3), 3COM3. Retrieved from https://www.joe.org/joe/2014june/comm3.php

Perez, J., & Howard, P. (2007). Consumer interest in food systems topics: Implications for educators. *Journal of Extension, 45*(4), 4FEA6. Retrieved from https://www.joe.org/joe/2007august/a6.php

Raison, B. (2010). Educators or facilitators? Clarifying Extension's role in the emerging local food systems movement. *Journal of Extension, 48*(3), 3COM1. Retrieved from https://joe.org/joe/2010june/comm1.php

Reynolds, C. J., Buckley, J. D., Weinstein, P., & Boland, J. (2014). Are the dietary guidelines for meat, fat, fruit and vegetable consumption appropriate for environmental sustainability? A review of the literature. *Nutrients*, *6*(6), 2251–2265. https://doi.org/10.3390/nu6062251

Salisbury, K., Curtis, K., Pozo, V., & Durward, C. (2018). Is local produce really more expensive? A comparison of direct market and conventional grocery produce pricing. *Journal of Food Distribution Research, 49*(1), 13–21. https://doi.org/10.22004/ag.econ.274599

Seguin, R. A., McGuirt, J. T., Jilcott Pitts, S. B., Garner, J., Hanson, K. L., Kolodinsky, J., & Sitaker, M. (2018). Knowledge and experience related to community supported agriculture and local foods among nutrition educators. *Journal of Hunger & Environmental Nutrition.* Advance online publication. https://doi.org/10.1080/19320248.2018.1549520

Sturgis, P., & Allum, N. (2004). Science in society: Re-evaluating the deficit model of public attitudes. *Public Understanding of Science, 13*(1), 55–74. https://doi.org/10.1177/0963662504042690

Thomson, J. S., Radhakrishna, R., & Bagdonis, J. (2011). Extension educators' perceptions of the local food system. *Journal of Extension, 49*(4), 4RIB4. Retrieved from http://www.joe.org/joe/2011august/rb4.php

Thomson, J. S., Radhakrishna, R. B., Maretzki, A. N., & Inciong, L. O. (2006). Strengthening community engagement toward sustainable local food systems. *Journal of Extension*, *44*(4), 4FEA2. Retrieved from https://www.joe.org/joe/2006august/a2.php

U.S. Department of Agriculture, National Institute of Food and Agriculture (USDA NIFA). (n.d.-a). *Cooperative Extension System.* Retrieved February 4, 2020, from https://nifa.usda.gov/cooperative-extension-system

USDA NIFA. (n.d.-b). *Extension.* Retrieved February 4, 2020, from https://nifa.usda.gov/extension

Ver Ploeg, M., Breneman, V., Farrigan, T., Hamrick, K., Hopkins, D., Kaufman, P., … Tuckermanty, E. (2009). Access to affordable and nutritious food—Measuring and understanding food deserts and their consequences: Report to Congress (Report No. AP-036). Washington, D.C.: United States Department of Agriculture, Economic Research Service. Retrieved from https://www.ers.usda.gov/publications/pub-details/?pubid=42729

Washburn, L. T. (2017). Engagement of health volunteers: A promising approach for meeting community needs. *Journal of Extension, 55*(3), 3COM1. Retrieved from https://www.joe.org/joe/2017june/comm1.php

Woods, T., Ernst, M., & Tropp, D. (2017). *Community supported agriculture—New models for changing markets.* Retrieved from U.S. Department of Agriculture, Agricultural Marketing Service. Retrieved from https://www.ams.usda.gov/publications/content/community-supported-agriculture-new-models-changing-markets

Appendix A. Curriculum Description

The materials included in the curriculum are four PowerPoint presentations (with scripts), one video, five participant engagement activities, and 17 handouts, described in detail in Table A1. These materials are available upon request from NC Cooperative Extension.

Table A1. Contents of the EMFV Food Systems and Local Food Curriculum

Title	Type of Material	Description
The Place Based Nature of Local Food	PowerPoint	Encourages volunteers to explore the values driving local food system development in their region. Includes descriptions of the history of food and farming in different regions of North Carolina.
Food Systems: Definitions and Examples of North Carolina Projects and Programs	PowerPoint	Introduces volunteers to a definition of the food system and explores different types of local food projects and Cooperative Extension programs in North Carolina according to each sector of the food system.
Introduction to Local Food: Definitions and Common Questions	PowerPoint	Introduces definitions of local food, addressing why there is rising consumer interest in local food, and uses common questions about local food to explore the evidence base for the economic, social, environmental, and health impacts of local food systems.
Standards, Certifications, and Labels	PowerPoint	Reviews some popular certifications and labels, including organic, animal welfare, GMOs, fair trade, sustainability practices, and place-based labels.
Engaging Food Pantries	Video	Provides an overview of food security definitions and rates for the US and North Carolina and introduces volunteers to the emergency food system, including food banks and pantries.
Food Systems: What's the Issue? Activity*	Activity	Asks volunteers to put the sectors of the food system in order and then to brainstorm different issues and projects that exist nationally, state-wide, and at the county level for each sector of the food system.
Local Food Systems: Weaving the Web Activity*	Activity	Demonstrates how the food system is like a web, and how local food systems differ from food systems at other scales.
Common Questions Scenario Activity**	Activity	Gives volunteers a chance to practice how they would respond to consumer and class participants' questions about local food.
Certifications and Labels Scenario Activity**	Activity	Gives volunteers a chance to practice how they would respond to consumer and class participants' questions about different types of standards, certifications, and labels.
Food Access Activity	Activity	Includes taking volunteers to a grocery store to shop for a healthy meal on a limited budget.
North Carolina Agricultural Facts and Commodity Nutrient Content	Handout***	Provides an overview of the major North Carolina commodities, including what season they're grown and basic nutritional content.
General Local Food Resource List	Handout	Includes links to all of the Extension resources referred to in the PowerPoint presentations.
EMFV Reducing Food Waste Guidance*	Handout	Provides links to resources related to using food waste, including composting and preparing vegetable broth, that EMFVs can use in Extension programming and at home.
How Volunteers Can Engage	Handout	Explains the different types of activities volunteers could assist with to engage the public and support their educator around local food system issues and projects.

continued

* Developed by an FCS educator in the pilot program.
** Developed in response to pilot evaluation.
*** In addition to four original handouts listed here that were developed specifically for the EMFV program, the curriculum also includes handouts that were developed by other NC Cooperative Extension programs, as well as seasonality charts from the NC Department of Agriculture & Consumer Services and handouts from the U.S. Department of Agriculture. Other NC Cooperative Extension publications that are used as handouts include:

- "Best Practices for Utilizing Local Food in Cooking and Nutrition Education Classes" (https://content.ces.ncsu.edu/best-practices-for-utilizing-local-food-in-nutrition-education-and-cooking-classes)
- "Local Food Systems: Clarifying Current Research" (https://content.ces.ncsu.edu/local-food-systems-clarifying-current-research)
- "Eat Local. Eat Healthy Brochure" (https://localfood.ces.ncsu.edu/wp-content/uploads/2013/10/NCStateCALS-EatLocalFlyer-051117.pdf?fwd=no)
- "NC Choices Quick Guide to Common Label Claims" (https://cefs.ncsu.edu/resources/quick-guide-to-common-label-claims/)

Appendix B. Select Demographic and Agricultural Characteristics of Pilot Counties

Table B1. Select Demographic and Agricultural Characteristics of Pilot Counties

	County 1	County 2	County 3	County 4	County 5
Region of State	Central	Southeast	Northeast	West	Southeast
Population (2010)	39,464	107,431	23,547	67,810	122,623
Number of Farms (2012)	395	254	82	638	563
Percent Change in Female Principal Operators (PO; 2007–2012)	–46%	+8%	–16%	+54%	-33%
Percent Change in African American Principal Operators (PO; 2007–2012))	+50%	+74%	–50%	+100% [a]	–53%
Percent Change in Number of Farms, 2007–2012	–2%	–4%	+2%	–10%	–22%
Acres of Farmland (2012) [b]	95,299	45,422	33,356	59,540	191,195
Percent Change in Acres of Farmland, 2007–2012	–3%	+2%	+28%	–10%	+9%
Average Farm Size (acres; 2012) [b]	241	179	431	93	340
Percent Change Average Farm Size, 2007–2012	–1%	+7%	+25%	0%	+40%
Number of Farmers Market, Roadside Stands, Produce Markets	2	2	11	4	10
Percent Change in Farms Selling Direct to Consumers, 2007–2012	+54%	+76%	+36%	+33%	0%
Direct to Consumer Sales (2012 US$, unless noted)	$382,000	$139,000 in 2007	$276,000	$123,000	$482,000
Percent Change in Direct to Consumer Sales (2007–2012)	+96%	Unavailable	+14%	–59%	+114%

[a] –85% in Native American principal operators
[b] 1 acre=0.40 hectares
Sources: Population demographics are from the U.S. Census, American FactFinder. Agricultural characteristics are from the 2007 and 2012 USDA Census of Agriculture data, compiled by the Center for Environmental Farming Systems in Infographics/County Ag Profiles: https://cefs.ncsu.edu/food-system-initiatives/local-food-economies/infographicscounty-ag-profiles/

Appendix C. Interview Guide for FCS Educators

Now that you've piloted the EMFV program for one year, I'd like to ask you a little about your experiences, and ask for feedback on the various components of the program.

1. Looking back at the agent training that we held last May, what do you think was the most helpful in terms of how you run your program now? How so?
   (Probes: Did one section of the curriculum stand out for you? Was there an activity that you especially liked?)
   a. What was the least helpful?
   b. Is there anything that wasn't covered that you wish we'd included?

2. In terms of planning your next round of volunteer recruitment and training, what do you plan to do differently? What worked well that you'd like to keep the same?
   (Probes: This includes recruitment of volunteers, training logistics and topics, online versus in person, etc.)

3. Tell me a little about how the shadowing experience has gone for you and your volunteers.
   a. What have volunteers done as part of the shadowing experience?
   b. What has worked well, and what would you do differently?

4. What types of activities do you plan on having volunteers assist you with once they are done with the shadowing (or what do they currently do if they have already finished)?
   a. What are the areas where you have the most need for volunteer assistance?

5. What do you feel like your volunteers are ready to do, and what areas do you feel like they still need additional training or experience?
   a. Are volunteers prepared to help you in the areas where you have the most need for assistance?

6. What are you most excited about for the upcoming year of the EMFV program? Why?

7. Overall, what is one thing you would change about the EMFV program?

8. Overall, what is one thing you would keep the same about the EMFV program?

9. If you had to give advice to an agent just starting the program, what would you tell them?

10. What type of continuing education would you be the most interested in for yourself and your volunteers?
    (Reminder: We're planning some continuing education modules, including one about working with food pantries, one about working with Faithful Families, one about working with SNAP-Ed, Donation Stations, and one about NC Seafood.)

Appendix D. Focus Group Guide for EMFV Volunteers

1. Topic: Recruitment and Program Orientation

a. Can you tell me a little about how you learned about the Extension Master Food Volunteer Program? *(Probes: Had you already volunteered with your agent? Did you see a press release?)*

b. How did the application and interview process go? *(Probes: Did the amount of time that the application and interview took seem appropriate? Did the process help you learn more about the program and whether it was a good fit for you?)*

c. Tell me a little about the program orientation. *(Probe: Did you feel like you learned what you needed to about the history of Extension, what types of programs your agent does, what your role would be, and what forms and procedures you needed to use and follow?)*

d. What *worked well* in the program orientation process?

e. What is *one thing you would change* about the program orientation process?

f. How do you think the program should be advertised and promoted to volunteers?

2. Topic: Training and Curriculum

Let's talk a little about the 30 hours of training. We're interested in learning about your experience with two pieces of that: first, about how the logistics (for example, number of hours, time of day, etc.) of the training worked for you, and second, about the content of the curriculum.

a. Let's talk about the training logistics first.

a.i. How was the training set up? How did that work for your schedule? *(Probes: Was it hard for you to make any of the sessions? How did your agent arrange for make-up classes, and was that effective for you? How did the online portions of the training work for you?)*

a.ii. What worked well for you in terms of how the training was set up?

a.iii. What is one thing you would change about how the training was set up?

b. Now let's talk about the curriculum content.

b.i. What was your favorite session or topic? Why?

b.ii. What was your least favorite session or topic? Why? *(Reminder: Curriculum content includes Nutrition; Food Safety; Food Systems; Cooking Skills; Cooking Techniques; Teaching Strategies; Diversity, Inclusion, Equity)*

b.iii. What was your favorite activity? Why?

b.iv. What was your least favorite activity? Why? *(Reminder: Some of the activities include the food systems activity; low-resource shopping activity; cooking demo relay activity; and others that your agent developed)*

b.v. Can you tell me more about the other sessions? Was there anything that you wanted to know more about?

b.vi. Was there anything you felt like you didn't need to know to be a volunteer?

b.vii. How did you feel about how the curriculum content was evaluated? As a reminder, this includes post-session evaluation forms, the exam, etc. *(Probes: Did you feel like the post-session evaluation forms captured your knowledge gain? How did you feel about the exam? Our new plan moving forward is to have an assessment before the training, short quizzes after each session, and then a short evaluation focused on satisfaction and confidence after the training. Does that sound like an improvement to you?)*

c. Now let's talk about how you put into practice what you learned.
    c.i. Did you feel that you had enough chances to practice teaching or doing cooking demonstrations during the training?
    c.ii. After the 30 hours of training, what types of activities did you feel prepared to do?
    c.iii. What types of questions did you feel prepared to answer?
    c.iv. Are there any areas you have some doubts about?
        c.iv.1. What do you feel like you needed as part of your training to be able to feel more confident in this area?
    c.v. Can you talk about areas where on-going support might be useful, in addition to the 30 hour curriculum?

d. Is there anything you would change about the training and/or curriculum?

3. Topic: Shadowing Agent

a. Tell me a little about your experiences shadowing your agent. What types of activities have you done? *(Probe: Have you assisted with classes? Did that include organizing ahead of time, food purchase or preparation of food, or hands-on teaching? Have you assisted with any community events? What events, and how did you help?)*

b. What is your favorite part about shadowing your agent?

c. What is your least favorite part about shadowing your agent?

d. Do you feel like there are things that you are doing as part of shadowing your agent that weren't covered in the training?
(Probes: If so, what are those things, and do you think they should be incorporated into the training?)

e. After 30 hours of shadowing your agent, what do you feel ready to do as an Extension Master Food Volunteer?
(Probe: Do you feel ready to do a cooking demonstration on your own, or without the agent present? Do you feel ready to represent Extension? Do you feel ready to assist or teach classes?

f. After 30 hours of shadowing your agent, is there anything you feel less confident doing as an Extension Master Food Volunteer?

g. Is there anything you would change about the shadowing portion of your training?

4. Topic: Volunteer Activities

a. Now that you are transitioning from shadowing to being an Extension Master Food Volunteer, what role do you see yourself playing?
(Probe: Do you see yourself primarily supporting your agent? Do you have ideas for new events or programs that you'd like to do within your community?)

b. What is one thing you're most excited about doing as an Extension Master Food Volunteer?

c. What is one thing that you'd prefer not to do as an Extension Master Food Volunteer?

d. How does your agent communicate with you about volunteer opportunities?

5. Topic: Behavior Changes

a. Now that you've gone through the program, do you find that there are things you do differently in your own life?
(Probes: For example, have you made any changes to your diet or what you eat? Have you made any changes related to food safety and how you prepare food at home? Do you think about how equity plays a role in your day to day experience?)

6. Topic: Continuing Education

a. What type of continuing education are you most interested in to help support you as a volunteer? *(Reminder: We're planning some continuing education modules, including one about working with food pantries, one about working with Faithful Families, one about working with SNAP-Ed, Donation Stations, and one about NC Seafood).*

7. Wrapping Up

a. Now that you've gone through the program, do you think that you'd be willing to pay a small fee at the beginning of the program to cover costs (ex. Curriculum, apron, nametag, food for training, etc.)?

a.i. If yes, how much do you think would be appropriate?

a.ii. If not, can you explain why?

Those are all of the questions that I have. Is there anything else you'd like to add that I haven't asked about?

Appendix E. Codebook

1. **Agent Experience with Food**

   → *Full definition:* Agents' experience and comfort level with teaching about food and food systems.

   → *When to Use:* Use this code to capture agents' discussions regarding their prior experience or training (or lack thereof) with food and food systems, and how that level of experience may impact their capabilities and comfort level in teaching the parts of the EMFV curriculum related to food and food systems.

2. **Behavior Changes**

   → *Full definition:* Changes in agents' and volunteers' behavior as a result of training. Also how agents work with volunteers to facilitate change.

   → *When to Use:* Use this code to capture all behavior changes, not just ones associated with the food systems unit. Can be used to capture behavior changes during program (trying new foods, cooking techniques) and at home/outside of the program.

   → *Sub Codes:*
   - Changes in cooking/preparation of food
   - Changes in purchasing
   - Food safety
   - Trying new foods

3. **Cross-program collaboration**

   → *Full definition:* Opportunities for collaboration between program areas and programs to educate audiences on the topic of local food systems.

   → *When to Use:* Use this code to refer to when agents/volunteers discuss the potential for programmatic collaboration to implement the local food systems content. Include when they discuss their comfort level with material (when they think they should work with someone else because they don't feel comfortable with the materials) and drawing boundaries around who does what (ag agents, for example).

4. **Definition of Local Food**

   → *Full definition:* The definition of local food used by agents and volunteers.

   → *When to Use:* Use this code to capture discussions of how volunteer and agents define "local" and "local food," either directly or indirectly. This may be in terms of personal gardens, local markets, region, or state. This code can also capture how the agents/volunteers came up with this definition, and how it may have changed due to the EMFV programming.

5. **Evidence-based Information vs. Personal Opinion**

   → *Full definition:* This code refers to the tension identified by agents or volunteers between providing evidence-based information and relying on personal opinion or experiences. Evidence-based information refers to information and content in the EMFV training program that is research-based.

   → *When to Use:* This code should be used whenever agents or volunteers identify any potential bias on the part of volunteers (due to personal experience or opinion) in terms of EMFV course content. This includes when agents express concern that volunteers may respond with personal opinion rather than evidence-based information (or give an example of when this may have happened). It can also be used when volunteers discuss their personal opinions on topics, whether or not they refer to the distinction between personal opinion and evidence-based information.

→ *Sub Codes:*
- Controversial topics: organic
- Controversial topics: GMOs
- Controversial topics: pesticides

6. Food Insecurity

→ *Full definition:* Any reference agents/volunteers make to people who do not have reliable access to affordable and nutritious food.

→ *When to Use:* This code can be used capture discussions by agents and volunteers of working with low-income audiences and trying to responsibly educate and discuss with them issues such as the cost of healthy foods (budgeting and affordability) and the nutritional quality of "fresh" food (local vs. canned). This code can also be used to capture the tension between the terms "healthy" and "local," and larger issues surrounding food access in their communities, or more generally (access to stores, resources, transportation).

7. Food system activities in training curriculum

→ *Full definition: The activities that were a part of the portion of the EMFV training curriculum on food systems.*

→ *When to Use:* Use this code to capture discussions of volunteers and agents about the types of activities used to educate volunteers about local food systems. These may include field trips/tours as well as classroom activities.

→ *Sub Codes:*
- Food access activity (going to grocery store on limited budget)

8. History of food system: personal experience

→ *Full definition:* Refers to volunteer discussions of personal experience with various aspects of the food system.

→ *When to Use:* Use this code to capture discussions of prior experiences with food (either growing up or present day). This includes gardening and growing one's own food, cooking, food preservation, public health, teaching, and nutrition, etc.

9. Local food markets

→ *Full definition:* Any reference to where local food is sold and purchased.

→ *When to Use:* Use this code to capture agents' and volunteers' knowledge of, experience with, and any behavior changes associated with visiting and/or shopping at local food markets, such as farmers' markets and roadside stands. Includes unfamiliarity or uncertainty about where to purchase local food in their communities. Include any reference to local food markets and supermarkets.

10. Motivations for participation (volunteers)

→ *Full definition:* The reasons why volunteers chose to participate in the EMFV training program.

→ *When to Use:* Use this code to capture the volunteers' discussions of why they chose to train to be an EMFV, including their expectations of the program and if those expectations differed from the actual program content.

11. Nutrition and Health

→ *Full definition:* Any reference to agents' or volunteers' understandings of nutrition and healthy food, as well as health concerns and conditions that result from good/bad nutrition.

→ *When to Use:* Use this code to capture all discussions of nutrition related to the EMFV program, not just those associated with food systems/local food. This code can also capture discussions of health issues facing individuals or communities outside the context of the EMFV program/curriculum, such as obesity and diabetes, as well as issues of nutrition that are affected by food access and food insecurity.

12. Program Accessibility

→ *Full definition:* Refers to issues of access to participation in the EMFV program in regards to a lower income audience.

→ *When to Use:* Use this code to capture whenever agents or volunteers identify and/or discuss potential barriers to participation on the part of lower income audiences. Examples could include the potential future costs of enrolling in the program; the time commitment; and scheduling.

13. Readiness/confidence (agents and volunteers)

→ *Full definition:* Refers to when agents and volunteers feel confident and prepared to teach material from the EMFV curriculum or conduct activities independently (in the case of volunteers, without supervision), and when they don't feel ready or confident to do so.

→ *When to Use:* Use this code to capture discussions by agents about parts of the curriculum which they do or don't feel confident teaching, as well as when agents are discussing the capabilities of volunteers to transition to independent teaching/activities (and with what subject matter). With volunteers, this code can capture discussions of what activities they feel confident leading on their own, and what activities they do not feel comfortable doing so (and would want more training/education). This code can also capture discussions by both agents and volunteers about moments in which volunteers recognize the limits of their knowledge and should refer questions from the public to the agent.

14. Volunteer activities in the community

→ *Full definition:* Refers to activities that require volunteers to go into the community to help educate, either as part of their required "shadowing" of an agent or independently. Any reference to what type of activities volunteers are doing (assisting and leading), and any mention of Extension programs they support.

→ *When to Use:* Use this code to capture volunteers' discussions of the types of outreach activities they have been doing as part of their training, such as cooking demonstrations, assisting with 4-H camps, community health fairs, senior centers, lunch 'n learns, etc. This code can also be used to capture volunteers' discussions of community activities that they performed on their own, thus reaching communities that agents do not necessarily have access to. Can also refer to aspirations- what agents or volunteers hope to do in the future.

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Vendor variety and market sales: A case study of the Williamsburg Farmers Market

Steven J. Archambault [a] *
Cal-Poly Pomona University

Shawn Trivette [b]
University of Tennessee–Chattanooga

Phillip Warsaw [c]
Michigan State University

Alfonso Morales [d]
University of Wisconsin

Submitted March 14, 2019 / Revised July 2 and August 30, 2019 / Accepted August 30, 2019 / Published online February 27, 2020

Citation: Archambault, S. J., Trivette, S., Warsaw, P., & Morales, A. (2020). Vendor variety and market sales: A case study of the Williamsburg Farmers Market. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 221–237. https://doi.org/10.5304/jafscd.2020.092.012

Abstract

Although sales at farmers markets have been on the rise for a few decades, a regular challenge faced by market managers is how to ensure that their vendors are best positioned to maximize what they can capture in market sales. Farmers markets have varying degrees of data collection and data analysis. This study aims to demonstrate the value of understanding data, so that market managers can take informed, effective steps to increase sales for their vendors. This is accomplished using 13 years of weekly sales data from the Williamsburg Farmers Market (WFM). The dataset categorized sales by produce, specialty crops, animal products, value-

[a] * *Corresponding author*: Steven J. Archambault, Assistant Professor, Department of Agribusiness & Food Industry Management–Agricultural Science, Cal-Poly Pomona University; 3801 West Temple Avenue; Pomona, CA 91768 USA; +1-909-869-2190; sarchambault@cpp.edu; Linkedin: https://www.linkedin.com/in/steven-archambault-phd

[b] Shawn Trivette, Ph.D., Assistant Professor of Sociology, Department of Social, Cultural, and Justice Studies, University of Tennessee–Chattanooga; 615 McCallie Avenue; Chattanooga, TN 37403 USA; shawn-trivette@utc.edu

[c] Phillip Warsaw, Assistant Professor, Department of Community Sustainability, Michigan State University; 480 Wilson Road; East Lansing, MI 48824 USA; Linkedin: https://www.linkedin.com/in/phillip-warsaw/; warsawph@msu.edu

[d] Alfonso Morales, Ph.D., Professor, Department of Planning and Landscape Architecture and State Extension Specialist–Food Systems and Marketplaces, University of Wisconsin; 925 Bascom Mall; Madison, WI 53706 USA; morales1@wisc.edu; https://dpla.wisc.edu/staff/alfonso-morales/. Project websites: https://openair.org; and https://www.facebook.com/OpenAirMarketNetwork

Authors' Note

A version of the study results were presented at the Agriculture, Food, and Human Values Society meeting in June 2018 with the title Vendor Variety and Farmer Market Sales: Williamsburg, VA Case Study.

Funding Disclosure

We would like to acknowledge the U.S. Department of Agriculture Agriculture and Food Research Initiative (USDA AFRI) 2014-68006-21857 Indicators for Impact (principal investigator: Alfonso Morales) for funding this work.

Data Statement

Data can be shared with the permission of the Williamsburg Farmers Market Manager.

added products, non-edible crafts, and plant sales. This allowed us to explore the relationship between vendor variety and sales. In this paper we ask: To what extent does vendor and product variety affect sales at farmers markets? We use dynamic panel econometric models, including a vendor variety index and other salient market factors, to explore how market characteristics may affect overall market sales. We find that greater vendor variety in terms of the products they offer increases sales both on the aggregate and across vendor types. Based on these findings we argue that one significant thing that market managers can do to boost sales for their vendors is to increase the variety of offerings through the recruitment of vendors who can bring differing product types to the market.

Keywords
Farmers Markets, Local Food, Vendor Variety, Econometrics, Time Series, Williamsburg Farmers Market

Introduction

Food sold in outdoor marketplaces has a long history of addressing food insecurity, unemployment, and the integration of new immigrant communities (Morales, 2000). While in decline in the mid-20th century, the number of farmers markets in the United States has since grown from 1,755 markets in 1994 to 8,761 in 2019, an increase of nearly 400% (U.S. Department of Agriculture, Agricultural Marketing Service [USDA AMS], n.d.). This consistent rise in popularity is likely a validation of the multitude of ways in which farmers markets benefit local communities. These benefits fall into four primary categories: public health, economic well-being, social engagement, and ecological concerns (Morales, 2011; Olson, 2019; Schmit, Jablonski, & Mansury, 2016).

However, a recent national survey of farmers market managers indicated that at least one-third of farmers markets were not seeing the same kind of growth in customer traffic and sales that others were experiencing (USDA National Agricultural Statistics Service [USDA NASS], 2016). Farmers markets face competition from other channels for the sales of local foods, including community supported agriculture (CSA) programs, grocery stores, and restaurants offering local ingredients in their dishes (Low et al., 2015; Printezis & Grebitus, 2018). Thus, scholars and market participants alike are interested in understanding what factors increase overall competitiveness in a dynamic market for local food (Connell & Hergesheimer, 2014). This information can provide farmer market managers with insight into the steps they can take to maintain and grow a strong customer base and help market vendors maximize their sales.

This context motivates our case study of the Williamsburg Farmers Market (WFM) in southeastern Virginia, which has kept extensive and detailed sales records since its inception. We examine more than a decade of sales data from this market with an eye toward both external (uncontrollable) and internal (controllable) factors that may increase or decrease sales. Sales data were broken down by general vendor type (i.e., vendors selling produce, or animal products, or value-added products, etc.). The data allowed us to explore the question: To what extent does vendor and product variety affect sales at farmers markets? While external factors such as weather, seasonality, and broader macroeconomic forces matter, we find from the data that greater product variety plays a significant role in increasing sales both on the aggregate and across vendor types. It is based on this evidence that we recommend to market managers looking to boost sales for their vendors that they recruit a pool of vendors with diverse product offerings. In addition, one of the primary contributions of our study is to illustrate how data can be used to better understand those factors that promote and inhibit farmers market sales.

We begin this paper with a brief outline of some of the literature on factors that have previously been identified as influencing sales at markets. We then describe the longitudinal dataset used for this study and provide an overview of the variables utilized, giving special attention to how we create a vendor variety index. We use time series regression analyses of overall market sales to examine the ways in which these various factors—especially vendor variety—affect market sales. We conclude by offering possible explanations for some of the associations we find.

Literature Review

Previous studies have considered the many challenges farmers markets face to stay open and remain relevant to the communities they serve. Stephenson, Lev, and Brewer (2008) discussed that the reasons markets struggle or fail is due to too few vendors, minimal product offerings, lack of administrative funds, management turnover, and insufficient compensation for market managers. Additional challenges faced by farmers markets include poor accessibility for many consumers, high prices of products, inconsistent availability of these products, too few farmers willing to participate, competition from conventional food sources, and unpredictable weather (Wittman, Beckie, & Hergesheimer, 2012). The willingness of customers to pay a premium for local food sources has been investigated (Thilmany, Bond, & Bond, 2008), but Printezis & Grebitus (2018) pointed out that consumers are less reliant on farmers markets for local food since it is now more available in grocery stores and other locations.

Farmers markets are still an important part of the food landscape for a variety of reasons. However, it is necessary to understand the unique needs and desires of communities and consumers in order to more successfully attract them to the farmers market (Figueroa-Rodríguez, Álvarez-Ávila, Hernández Castillo, Schwentesius Rindermann, & Figueroa-Sandoval, 2019). Farmers market consumers are highly influenced by their ability to realize a high value for the products they buy, particularly if they are higher priced (Landis, Smith, Lairson, Mckay, Nelson, & O'Briant, 2010; McGuirt et al., 2014).

Consumers are searching for other intangible experiences at farmers markets, which include interacting directly with farmers (Printezis & Grebitus, 2018). There are a number of studies that discuss leisure and recreation as a primary motivation for attending farmers markets (Abelló, Palma, Waller, & Anderson, 2014; Farmer, Chancellor, Gooding, Shubowitz, & Bryant, 2011; Farmer, Chancellor, Robinson, West, & Weddell, 2014). Specifically, customers are motivated by a varying and complex set of factors, which include access to fresh and healthy food, an interest in supporting local agriculture, social appeal, convenience, location, atmosphere, and prices (Byker, Shanks, Misyak, & Serrano, 2012; Detre, Mark, & Clark, 2010; Dodds et al., 2014). Similarly, Buman, Bertmann, Hekler, Winter, Sheats, King, and Wharton (2015) surveyed farmers market shoppers and found that freshness and abundance of produce, product presentation, social interactions, and attractions (live music and prepared food) were important attributes that enhanced the experience for farmers market shoppers; price and convenience were found to be of lesser concern for the majority of shoppers. Conner, Colasanti, Ross, and Smalley (2010) found that the freshness and abundance of produce, product presentation, social interactions, and attractions (live music and prepared food) are the most important attributes that enhance the experience for farmers market shoppers, perhaps even more than concern over price and convenience.

Vendor Variety

Several studies have specifically discussed the customer preference for product variety at farmers markets (Betz & Farmer, 2016; Tey, Arsil, Brindal, Teoh, & Lim, 2017). Hinrichs, Gillespie, and Feenstra (2004) discovered an increase in sales for farmers market vendors who added product types, including value-added and non-edible products. Mack and Tong (2015) found that customers were willing to travel to farmers markets outside their area if the location was open during convenient hours, had memorable marketing, provided an enjoyable social atmosphere, and had good quality and variety of products.

Beyond just farmers markets, consumers have demonstrated across market types that they prefer shopping experiences that provide them with product variety. The marketing literature that describes a positive relationship between variety in product offerings and revenue is well-established (Baumol & Ide, 1956; Kahn & Lehmann, 1991). Briesch, Chintagunta, and Fox (2009) noted that product assortment was even more important than retail price when consumers were determining where to shop. Tan and Cadeaux (2011) observed that an increased variety of brands within a product type increase sales throughout that product type.

Farmers markets by their nature are a diversi-

fied institution in which consumers buy goods they may otherwise purchase at grocery stores, online, or other venues. We are not aware of any studies that attempt to quantify the contribution of variety toward farmers market sales, as the present analysis does. We are also unaware of any studies that have carried out a time series analysis of an individual market's sales. This is not to say there are not econometric analyses of a smaller collection of data points, some across multiple markets. For example, Printezis and Grebitus (2018) analyzed the average sales of markets across Iowa, controlling for population, education level, proximity to markets, household income, and population. Freedman et al. (2017) considered the patterns of SNAP purchases at various farmers markets in Cleveland, Ohio. Roubal and Morales (2016) mapped farmers markets against poverty and race in Chicago. Our research is novel in its attempt to quantify the factors promoting and inhibiting sales, with a particular focus being on one market over an extended period of time.

Methods and Data

In this section we describe the case under consideration and the data available from it. We describe how we use the available data and a few external sources to operationalize our variables. In particular, we explain how we developed the variety index. We then briefly describe our analytic strategy.

The Case: Williamsburg Farmers Market

The Williamsburg Farmers Market[1] (WFM) is a longstanding and prominent market based in Williamsburg, Virginia, which supports direct agricultural commerce. Since opening in 2002, the market manager has collected basic sales reports from every vendor, as well as customer and vendor counts at every Saturday market. Specifically, this includes how many vendors were in attendance, the general product type of the vendor (given further explanation below), the dollar-value sales of every vendor, how many customers turned out, and notes of special events occurring at the market or in the surrounding area that day. It should be noted that the decision of which data were to be collected was made by the market organizers. The data collected did not include surveys of customers, the amount of Supplemental Nutritional Assessment Program credit being spent, or many other potential data elements.

The market ran initially from the start of May through the end of October, with special holiday openings in mid-November and mid-December. In 2007 the market began to open for other holiday-themed days in the spring, specifically once per month in February, March, and April. In 2011 it shifted its full-season opening date to the first weekend of April and has since held this window consistently. Our dataset spans 2002–2014 and contains 399 sets of observations (for each week the market was open). On average, there are 32 market days each year.

Operationalization of Variables

Our primary dependent variable is market sales, adjusted to 2010 U.S. dollars to account for inflation. As the dataset contains individual sales data for each vendor by week of the market, we were able to create the Aggregate Sales variable by summing all vendor sales in a given week.

One of our primary independent variables of interest is the Variety Index. We developed this index by first categorizing all market vendors into one of six general types (see Table 1).[2] Those six non-overlapping types include **Produce** (those offering a general mix of common crops), **Specialty Items** (those that specialize in a specific product, such as berries, orchard fruits, peanuts, asparagus, lavender, or honey), **Livestock** (those that specialize in meat, dairy, or eggs, and occasionally seafood products), **Value-added Products** (e.g., baked goods, cheese [produced from off-site milk], popsicles, canned goods, etc.), **Plants** (flow-

[1] https://williamsburgfarmersmarket.com/

[2] In most cases, the data categorized vendor by the general category of items sold. The data did not indicate exactly which items individual vendors were selling. For example, a vendor selling produce may have been selling microgreens, but also may have been selling sweet corn. The analysis only considers more general vendor categories. If a vendor sold more than one item type (like produce and a value-added product), they were categorized by what their greatest emphasis was.

Table 1. Comparisons by Vendor Types

Vendor Types	Average Number in 2014	Average Ratio at market (%)	Average weekly sales per vendor in 2014 (US$, 2010)
Produce vendors offering a general mix of common crops	7	14–17%	$888.27
Specialty item vendors	9	16%	$982.32
Livestock-related product vendors	7	16%	$710.92
Value-added item vendors	17	40%	$788.56
Vendors specializing in plants typically for gardening/decoration	8	12–13%	$720.97
Non-edible item vendors	9	13%	$361.39

ers, perennials, bulbs, and other items not usually meant for human consumption), and **Non-edibles** (e.g., Christmas decorations, lawn and household ornaments, worm castings, perfume, knife sharpening, and soap). Many vendors in the non-edible category are only present at early spring and winter-holiday markets and/or appear with less frequency in the summer and early fall markets.

Our analysis required tracking the variety of vendors present at each weekly market. The aim was to understand if one vendor type (such as Produce) dominates the market on any given market day. To do this, we used the categorization schema and the records of which vendors were present at the market each week to create a sum of shares Variety Index, as follows:

$$INDEX = 1 / \sum_{i}^{N=6} \left(\frac{\#\text{ of Vendor Type}_i}{\#\text{ of Vendors}} \right)^2 \qquad (1)$$

This index is similar to the Herfindahl Index (HI), which measures concentration in a given industry by summing up the squares of the market share that firms in an industry have (see, for instance, Rhoades, 1993). With the HI, higher values indicate higher levels of concentration and, correspondingly, lower levels of competition. Here, we are summing up the squared shares (or percentage) of total vendors that each vendor type represents. However, for ease of interpretation, we take the reciprocal of this summation so that markets that are less diverse will have a smaller value. For this reason, we also scale the term up by multiplying by 100.

To illustrate this concept, consider a market with 20 vendors, 15 of which are produce vendors, and 5 are value-added vendors. For this market, the INDEX would be =100/[(15/20)^2+(5/20)^2] =106. If, however, at the same market there were ten of each type of vendor, we would have INDEX=100/[(10/20)^2+(10/20)^2]=200. Here, the market with an even split between vendor types has a higher INDEX value than the market with a heavier concentration of produce vendors.

Some markets also run occasional special events, either on their own or in conjunction with happenings in the surrounding area, and the WFM is no exception. The Event variable is a count of the number of special events occurring at or near the market. While we have information on special events at the WFM, one significant limitation is that the information is not complete in the database. Records indicate special events in the spring and summer months (March through August), but not for other times of the year. We further discuss how we handle this limitation in the Analytic Strategy section, below.

There is also a variety of factors that are outside of a market's control but still important to account for when trying to predict sales. As in agriculture generally, market attendance and sales are both seasonal and weather-dependent. Seasonality is assessed using a set of dummy variables for each season (Winter: Dec-Feb, Spring: Mar-May, Summer: June-Aug, and Fall: Sept-Nov) as well as a dummy variable for the annual Christmas Market.

We account for weather using two dimensions, both taken from the weather station at Newport News/Williamsburg International Airport, which, while not precisely at the market, accurately repre-

sents weather conditions in the area.[3] The airport is approximately 18 miles (29 km) from the market's location. The weather station provided us with rainfall measurements for each week (in mm) since the opening of the market. It also provided the recorded high temperature and the historic average high temperature for that day each year. These were combined to make a ratio of the daily high compared to the average high (temperature). This study also includes a second temperature term, which measured the summertime temperature ratio, as warm days in the summer may be a drag on sales specifically in the summer compared to warm days at other times of the year.

As a simple assessment of macroeconomic conditions, we also include the monthly unemployment rate for the city of Williamsburg for each week the market was open. We use Unemployment as a crude measure of general economic conditions on the assumption that if many people are out of work, they may limit their spending at places like farmers markets.[4]

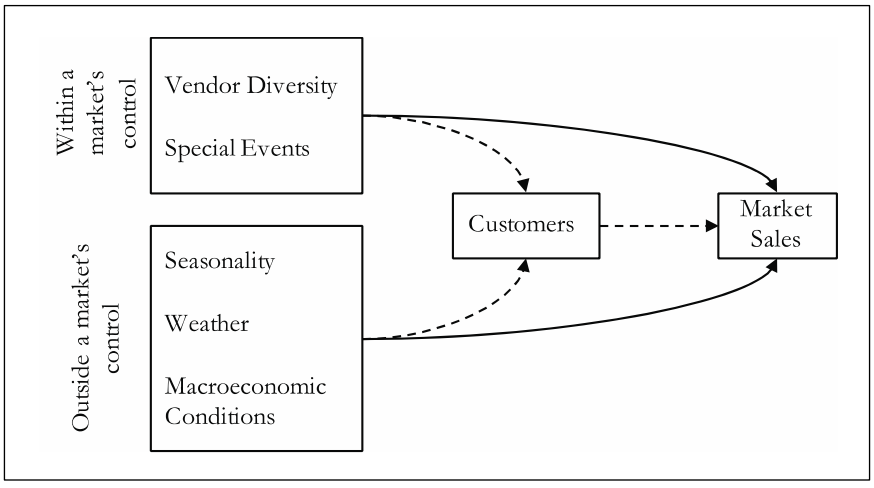
Market sales are a direct function of customers spending money. As such, what we are really trying to explain is what factors will drive customers to both attend the market and to purchase things. Figure 1 indicates how these factors are related, with all the variables listed above linking through customer counts, ultimately to explain market sales. The dataset has customer counts for just under half the weeks the market is open; customer count data are available for the spring and summer, but not for the fall and winter (suggesting a systematic error in their recording). We discuss how we show the relationship between customer turnout and the other variables under study in the Analytic Strategy section, but the primary analyses link the independent variables outlined above directly to market sales, on the assumption that customer activity is the "invisible" mechanism linking them.

Analytic Strategy

The first step in analyzing our data was to visualize the two-way relationships between key explanatory variables and aggregate market sales. The two-way correlation provides an indication of the relationship between sales and key factors in the data set. However, multivariable regression analysis enables us to analyze the effect of various factors simultaneously. The econometric methodology is laid out in this section.

Since most of the continuous variables (everything except seasonality) are not normally distributed, we took the natural log of each before creating our models. This means the coefficients can be interpreted as elasticity, where a percentage change in the explanatory variable results in a percentage

Figure 1. Conceptual Diagram of the Internal and External Factors Influencing Farmers Market Customer Traffic and Resulting Sales



[3] The market manager also tracked average temperature and a simple yes/no indicator of whether or not it rained on a given market day. We use the airport's weather station data for greater precision, but it is worth noting that the datasets are in close alignment. Also, shoppers traveling to the market from outside the immediate area would also be influenced by regional weather.

[4] Incorporating government food benefit programs (such as SNAP-EBT or WIC FMNP) might be another way to approach this, as they also form a general economic indicator. However, we do not know how many such benefits are used at the market, and shifts in such benefits come *after* there is already an economic downturn, making it a lagging indicator.

change in the dependent variable that is equivalent to the coefficient. Dummy variable coefficients are interpreted similarly, but, changing to 1 from 0, or 0 to 1, is considered a 100% change, so coefficients are multiplied by 100 to know the effect of a change in the dummy variable on the dependent variable. Similarly, to account for trends occurring over time, we include a set of dummy variables for each year from 2002 to 2013 (excluding 2014).

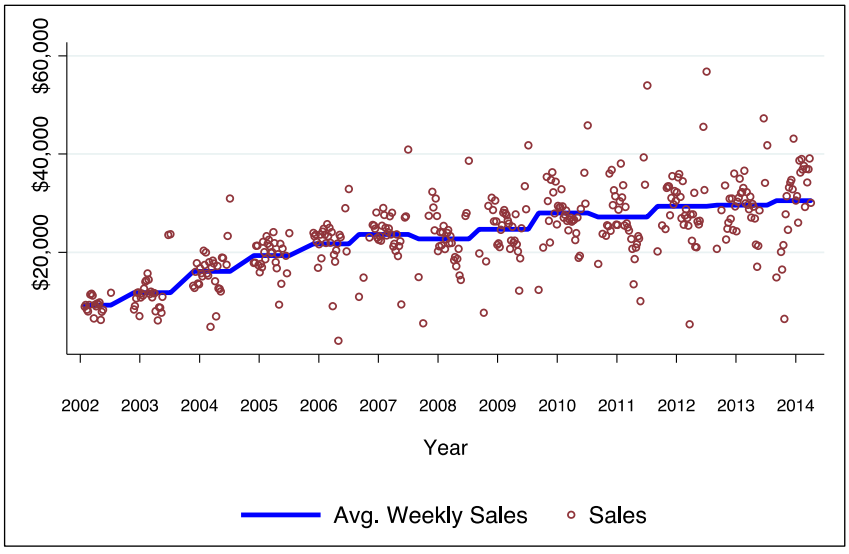
We use three regression approaches to understand the relationships between our variables. We start with a standard OLS multivariate regression model. Because we are using time-series data, we then build an Autoregressive Moving Average with Exogenous Inputs (ARMAX) regression model, which provides a flexible framework to consider the impact of time effects on the independence of the error term (Shumway & Stoffer, 2011) (see the Methodological Appendix). In both models, our dependent variable is the log of Aggregate Sales. We use all independent variables listed above except for Events and Customer Counts, largely because both are incomplete in the dataset and reduce our sample size by over half. Additionally, while it is almost certainly the case that additional customers increase sales, without dealing with this term's endogeneity, our estimates (both for the coefficients for Customer Counts and any co-predicting factors) will be biased.

To further explore (and verify) the role of customers in this overall process of generating market sales, we also create a model using Three Stage Least Square (3SLS). This method is used to estimate a system of structural equations,[5] where the endogenous explanatory variables appear as dependent variables in other equations within the system (Zellner & Theil, 1962). Here, we seek to jointly estimate predictive equations for Aggregate Sales and Customer Counts, where Customer Counts appear as an independent variable predicting Aggregate Sales. Many of the same explanatory terms are in both model components in the 3SLS model. However, the Customer Count equation also includes a Lagged Aggregate Sales term to account for potential autocorrelation and includes the count of Special Events that occurred on the market day (as such data were only collected on the days that Customer Count data were collected). There are many fewer observations in this model due to fewer weeks when such data were reported.

Results

Across the 13-year period, market sales have averaged US$23,500 per week. This translates to about US$785 per vendor each week. However, these figures have not been consistent over time; total market sales have increased steadily across the years, as has the number of vendors. For example, in the first year of the market (2002), average weekly sales for the whole market were US$9,200, but by 2014 this had increased to approximately US$31,000, an increase of more than threefold. Figure 2 provides an illustration of the growth in sales through time. The plateau in sales growth in the last seven years of the data set is not dissimilar to trends in

Figure 2. Aggregate Weekly Sales Data at the Williamsburg Farmers Market, 2002–2014 (Adjusted for Inflation in 2010 US$)



[5] This is in contrast with the Two Stage Least Squares (2SLS) approach, used to estimate a single structural equation in two steps.

Table 2. Descriptive Statistics

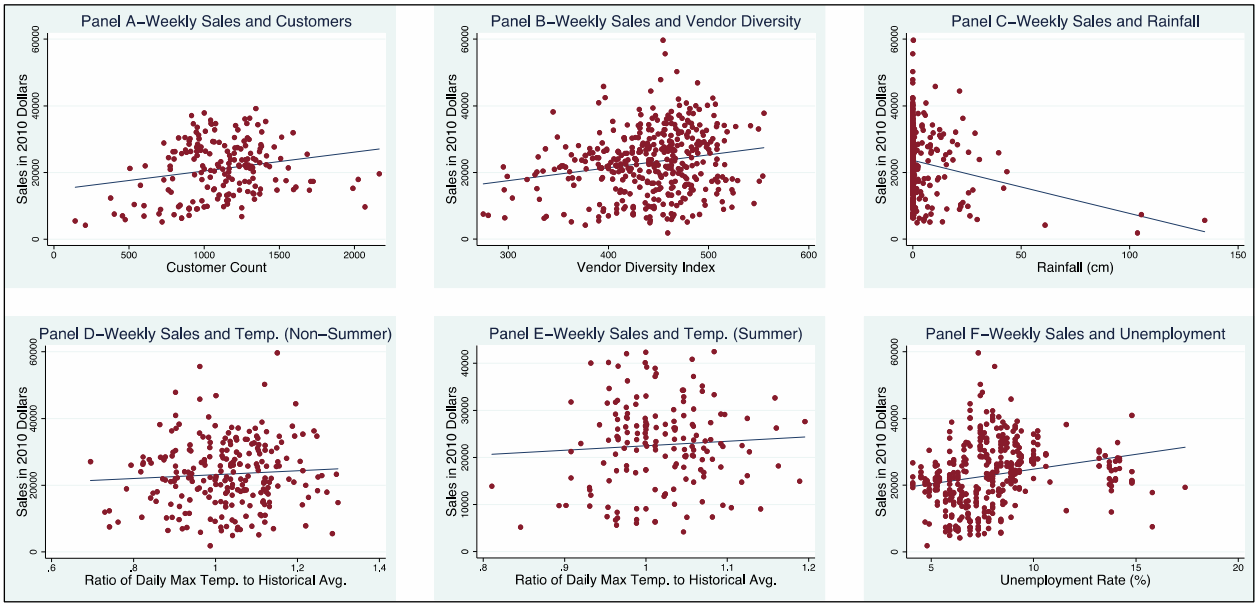
Variable	Explanation	# of Observations	Mean	Std. Dev.	Minimum	Maximum
SALESA	Weekly sales for the market, in 2010 US$	399	23,431.18	8545.6	7.61	10.95
CUST	Number of customers at each market	187	1,112.25	311.353	142.0	2165.0
INDEX	Vendor type variety index	399	4.423	0.4916	2.750	5.553
EVENT	Number of special events occurring at the market	187	0.872	0.9917	0.00	5.000
UNEMP	Monthly percentage of people in the county unemployed	399	7.996	2.3912	4.10	17.400
RAIN	Measured daily precipitation at the Williamsburg-Jamestown Airport, in mm	399	3.634	12.1443	0.00	134.6
TEMPR	Ratio between the daily high temperature and the average temperature for that day	399	1.023	0.0968	0.695	1.299
TEMPRS	Ratio between the daily high temperature and the average temperature for that day, summer days (0 for non-summer days)	399	0.421	0.5032	0.00	1.195
WIN	A dummy variable where 1=winter season (Dec., Jan., Feb.), 0=not winter	399	0.043	0.2022	0	1
SPR	A dummy variable where 1=spring season (Mar., Apr., May), 0=not spring	399	0.228	0.4201	0	1
SUM	A dummy variable where 1=summer season (Jun., Jul., Aug.), 0=not summer	399	0.414	0.4931	0	1
FALL	A dummy variable where 1=fall season (Sept., Oct., Nov.), 0=not fall	399	0.308	0.4624	0	1
XMAS	A dummy variable where 1=Christmas Market, 0=not Christmas	399	0.183	0.3871	0	1
Vendor-level data						
SALESV	Weekly sales per vendor, in 2010 US$	11,862	788.15	595.479	1	7696.7
SPEC	Dummy variable where 1=specialty vendor, 0=other vendor type	11,862	0.122	0.3278	0	1
PROD	Dummy variable where 1=produce vendor, 0=other vendor type	11,862	0.184	0.3877	0	1
VAL	Dummy variable where 1=value-added vendor, 0=other vendor type	11,862	0.330	0.4702	0	1
NONED	Dummy variable where 1=non-edible food vendor, 0=other vendor type	11,862	0.072	0.2582	0	1
MEAT	Dummy variable where 1=meat vendor, 0=other vendor type	11,862	0.149	0.3558	0	1
PLANT	Dummy variable where 1=plant vendor, 0=other vendor type	11,862	0.143	0.3497	0	1

other direct-to-consumer market channels (Printezis & Grebitus, 2018), and highlights the need for markets to consider what they can do to keep themselves relevant and attractive to consumers. Further details on sales trends over time, including those broken down by vendor type, can be found in Trivette, Archambault, and Morales (2015).

Basic summary statistics can be found in Table 2. It rained on 35% of the days the market was open. Generally, the rainfall was less than 4 mm, although in some cases it was recorded as over 25 mm. In both summer and non-summer seasons, 25% of the daily recorded temperatures were below the historical averages. In approximately one-tenth of the market days, the recorded high temperature was 13% greater than the historical average. The Unemployment Rate ranged from

Figure 3. Two-way Graphs Illustrating Data Relationships between Key Explanatory Variables and Weekly Farmers Market Sales, in 2010 Dollars

Each graph includes an estimated trend line to better illustrate the relationship.



4.1% to 17.4% during this period, with the major increases corresponding primarily to the 2008 financial crisis. This was generally on par with unemployment nationwide.

For the spring and summer months (the only periods in which Customer Counts and Events were recorded), there were typically several special events each month, with multiple events during many weeks in the months of July and August. The market typically saw just over 1,000 customers weekly, although as with the sales trends, this grew over the years and varied widely even within a given year. Of the recorded weeks, Customer Counts ranged from fewer than 150 in one week to over 2,000 in another week.

Data Relationships

Figure 3 displays scatter diagrams plotting weekly aggregate sales with many of the key explanatory variables included in the study. Also included in each graph is a fitted line using ordinary least squares. Panel A shows sales increasing with more customers, which is expected. Panel B illustrates increasing sales with increasing vendor variety, as expected. Panel C illustrates a decrease in sales as rainfall increases. Although the relationships appear weak, Panel D and E both show sales going up when the ratio of the daily maximum temperature to the historic average maximum temperature is higher. This is expected in the non-summer season and for the summer season may indicate that customers are not scared off by atypically warm days. Panel F shows a weak positive relationship between sales and the unemployment rate, suggesting there is more farmers market activity when the economy is not performing as well.

Econometric Modeling

The econometric results are somewhat more reliable than the relationships revealed in the two-way analysis, as we are controlling for multiple effects that simultaneously affect sales. The results of Models 1 and 2 are found in Table 3. The results show that higher unemployment rates have a depressing effect on sales, which is different from the two-way effect. It makes sense that higher unemployment would decrease sales, as buying food from local sources is generally a more expensive option than purchasing it from more conventional sources, such as grocery stores.

The presence of rain in the area also shows a negative relationship with farmers market sales, as

expected. Somewhat contrary to our expectations, above-average temperatures in the summer give a slight boost to sales, suggesting that customers may not be dissuaded by unseasonably hot summer days. The weather is a constant concern for market managers and vendors, but the strongest association by far is the relationship between the Variety Index and Aggregate Sales. With the exception of one of the year dummy variables, the Variety Index coefficient has the greatest magnitude of any coefficient in the model. The direct interpretation of these numbers indicates that a percent change in vendor variety would result in a 0.724–0.809% increase in overall sales. The simple takeaway is that more variety among the vendors at the market leads to more sales overall. Further, although other external factors do matter, the effect of vendor variety on market sales is greater than for any of the other components.

Table 3. Overall Weekly Sales Regression Analysis OLS and ARMAX Model

The dependent variable in these models is the natural log(*ln)* of *SALESA*.

	Model 1: OLS		Model 2: ARMAX	
CONS	6.011***	(1.089)	6.638***	(1.102)
ln INDEX	0.809***	(0.159)	0.724***	(0.159)
ln UNEMP	−0.483**	(0.229)	−0.560**	(0.226)
ln RAIN	−0.108***	(0.0267)	−0.109***	(0.00977)
ln TEMPR	0.0738	(0.339)	0.151	(0.293)
ln TEMPRS	0.201***	(0.0509)	0.185**	(0.0827)
SPR	0.279***	(0.0564)	0.266***	(0.0574)
SUM	0.264***	(0.0445)	0.265***	(0.0671)
WIN	0.329***	(0.0842)	0.309***	(0.0590)
XMAS	0.246***	(0.0619)	0.265***	(0.0473)
YR2002	−1.038***	(0.0840)	−1.071***	(0.117)
YR2003	−0.883***	(0.0728)	−0.862***	(0.0917)
YR2004	−0.611***	(0.0755)	−0.606***	(0.0853)
YR2005	−0.493***	(0.0631)	−0.501***	(0.111)
YR2006	−0.425***	(0.0851)	−0.434***	(0.114)
YR2007	−0.290***	(0.0935)	−0.329***	(0.106)
YR2008	−0.0729	(0.0947)	−0.0861	(0.0744)
YR2009	0.293*	(0.169)	0.332**	(0.149)
YR2010	0.124	(0.103)	0.149	(0.0916)
YR2011	0.0475	(0.0874)	0.0610	(0.0881)
YR2012	0.0803	(0.0866)	0.101	(0.0790)
YR2013	0.0884	(0.0695)	0.103	(0.0897)
N	399		399	
R-Sq	0.684		0.687	
LAG.AR			0.222**	(0.105)
Sigma			0.245***	(0.0199)
Portmanteau	43.795		34.275	

Robust standard errors in parentheses, * $p<.10$, ** $p<.05$, *** $p<.01$.

As noted previously, it is likely that the Customer Count term is endogenous with other variables included in the models. If so, including such a variable would likely mean the error term is correlated with other independent variables included, making them no longer independent. To account for this problem, Model 3 analyzes both Aggregate Sales and Customer Counts in the same model, using a three stage least squares approach (3SLS). Results for Model 3 are found in Table 4.

We can see from Model 3 that multiple variables have statistically significant relationships with Customer Counts. The Variety Index has a positive and significant relationship with Customer Counts, indicating that a one percent change in vendor variety increases customer counts by 0.416%. As in the previous models, the presence of rain has a slight (but still significant) negative effect on customer turnout. The coefficient of Events shows a slight positive and significant effect on bringing people to the market, as does the Lag of Aggregate Sales. Other variables are not significant in relationship to customers. Durbin Watson and Harvey LM Tests indicate that there is no serial autocorrelation in Model 3.

The Customer Count coefficient is highly significant in its relationship with Aggregate Sales in Model 3. Many, although not all, of the same variables that were significant in Models 1 and 2 are also significantly associated with Aggregate Sales in Model 3. However, in this simultaneous model, these explanatory variables have two effects on Sales. First, there is a direct effect through the inclusion of the variable in the Sales equation. Second, there is the indirect effect through the Customer equation. For instance, the Variety Index is

strongly significant in its direct relationship with Aggregate Sales in Model 3, but this term is also important in bringing more Customers to the market, represented by a highly statistically significant relationship in the Customer equation. This suggests that vendor variety not only attracts more customers, but also encourages more spending once those customers are present.

As another example of this dynamic relationship, consider the Unemployment term. This coefficient is significant in the Sales model, but not in the Customer model, suggesting that people who attend the market will do so regardless of broader economic conditions. However, when those conditions are tight, they may not be inclined to spend as much money as they would otherwise. Conversely, the presence of rain may keep people away (as seen in the significant coefficient on Rain in the Customer model), but if people show up, they are going to spend whatever they would have on any other day (as seen in the insignificance on Rain in the Sales model).

Table 4. Joint Estimation of Sales and Customers Using a Three-Stage Least Squares Simultaneous Regression Approach

Model 3				
	ln SALESA		*ln CUSTOMERS*	
CONS	6.278***	(0.822)	−0.145	(1.730)
ln INDEX	0.534***	(0.123)	0.416*	(0.238)
ln UNEMP	−0.549***	(0.184)	−0.382	(0.351)
ln RAIN	−0.00944	(0.0146)	−0.0933***	(0.0199)
ln TEMPR	0.216	(0.200)	0.340	(0.416)
ln TEMPRS	0.110**	(0.0433)	0.0587	(0.0891)
ln CUST	0.655***	(0.118)		
ln EVENTS			0.0996**	(0.0425)
ln LAGSALESA			0.0227***	(0.00652)
SPR	−0.0757	(0.0686)	0.238*	(0.124)
SUM	−0.0885	(0.0751)	0.235*	(0.134)
YR2002	−0.725***	(0.0702)	−0.00906	(0.147)
YR2003	−0.583***	(0.0568)	0.0461	(0.119)
YR2004	−0.497***	(0.0569)	0.152	(0.117)
YR2005	−0.394***	(0.0606)	0.227*	(0.119)
YR2006	−0.194***	(0.0634)	0.124	(0.135)
YR2007	−0.175***	(0.0667)	0.179	(0.146)
YR2008	0.0633	(0.0564)	0.204*	(0.113)
YR2009	0.447***	(0.135)	0.441*	(0.244)
YR2010	0.395***	(0.0828)	0.207	(0.159)
YR2011	0.410***	(0.0637)	0.0165	(0.133)
YR2012	0.387***	(0.0694)	0.0314	(0.145)
YR2013	0.284***	(0.0639)	0.0622	(0.134)
N	187		187	
R-Sq	0.909		0.419	

Robust Standard errors in parentheses, * $p<.1$ ** $p<.05$ *** $p<.01$

Discussion and Conclusion

Our models shed light on the relative influence of some of the more likely factors that influence market sales. While weather and the wider economic situation matter and provide a context within which markets operate, this does not mean that markets cannot exert some form of agentic control to better position themselves within these contexts. One significant step that markets can take —which would greatly affect sales—is to increase product diversity. This is not a new concept for analysts of farmers markets (see Betz & Farmer, 2016; Hinrichs et al., 2004; & Tey et al., 2017), but it does provide quantitative evidence that a variety of vendor types is important. As our models indicate, greater variety of vendor types increases overall sales (and does so across all vendor types; separate analyses are available on request).

One possible explanation for this is that greater variety allows customers to more easily engage in "one stop" shopping. Being able to purchase a variety of goods at the same market

space encourages consumers to spend more money overall for the added convenience (Mack & Tong, 2015; McEachern, Warnaby, Carrigan, & Szmigin, 2010). Customers may come to the market intending to purchase one type of good (such as fresh produce) and decide to expand their purchases to other items upon finding a wider array of available options. Although the exact mechanism is beyond the ability of our data to answer definitively (and is an important consideration for future research), what is clear is that increased variety of vendor types contributes to greater sales for all vendors.

Certainly, this points up the problem of product availability. Many market managers observe a relative absence of product diversity, which must be related in part to opportunities local people have to engage in food production. The opportunity to engage in production varies greatly by regulatory context (Meenar, Morales, & Bonarek, 2017). However, let us turn for a moment to factors more clearly within the control of the market. We must remember that Williamsburg, Virginia, is both a college town (the College of William and Mary) as well as a city of historic interest (Colonial Williamsburg, Historic Jamestowne). While the market enjoys educated consumers, like most tourist destinations the community as a whole also has substantial economic inequality and food insecurity. With this heterogenous customer base, there is likely a demand for a diverse array of products. Increasing product diversity is, in part, about bringing in more vendors, but it is also about making sure that those additional vendors are not duplicating (excessively) the products that are already available. It would also be useful to track how the individual product variety within each category (for example, the variety of vegetable types within the produce category) affects sales. This level of detail was not available in this study, but a reasonable hypothesis is that improved variety within categories would positively affect sales at the market. Further, data collection of this type is now possible with tools such as Farm2Facts (discussed below).

Another characteristic that management can control is the number and type of special events. Such events would increase market popularity in a college town and so diversify attendance at the market across customer segments. They are another way to boost sales, adding to the intangible experiences customers are seeking (Buman et al., 2015; Dodds et al. 2014). However, it is important to recognize that not all vendors will experience this boost in the same way, and some may be negatively affected by it. The nuances of such associations and the reasons for them are pertinent questions that managers can answer; we hope that future research endeavors will provide further insight here (again, Farm2Facts would be a useful tool in this area).

Finally, another contextual feature in control of the market is data collection. We want to make clear that the findings we have shown would not have been possible were it not for the consistent data collection efforts by the manager of the market under study. Market management at WFM is committed to a market that serves every subpopulation. The collecting of farmers market data is considered very important by researchers and market practitioners, and many farmers markets have some form of data collection (Karpyn, Kim, DaCosta, Gasinu, & Law, 2012). However, consistent data collected over the long term is absent in most markets, making WFM an exception that demonstrates the need for further engagement. The challenge, of course, is that data collection often falls at the feet of market management, typically volunteers who are not paid and have little to no training in sound data collection techniques (Morales, 2019). Even when paid, they often are too busy to act on opportunities to identify and achieve the goals associated with those data collection benefits. This is an arena in which academics and other supporting organizations have collaborated to produce data collection toolkits that are useful to managers, that further professionalize their work and make them citizen scientists in a relatively inexpensive way. The longitudinal, panel data collection that Farm2Facts is producing will support individual market managers and market organizations, and shed light on local, state, and federal policy questions of interest to the sector.

There are many opportunities to use data from farmers markets to ask specific questions of interest at a market. It is important that data-collection activities match the particular needs of the market,

based on the unique community settings (Wilson, Witzling, Shaw, & Morales, 2018; Witzling, Shaw, Wilson, & Morales, 2019). Market managers influence each other in this regard (Quintana & Morales, 2015). One area of interest is the success of farmers markets as an accessible source of fresh and healthy food for underserved communities, particularly those where a high density of supplemental SNAP recipients reside (Mino, Chung, & Montri, 2018; Roubal, Morales, Timberlake & Martinez-Donate 2016). This multivariate data analysis approach can be useful, particularly if data on SNAP utilization is collected weekly by farmers market managers. Karakus, Milfort, MacAllum, and Hongsheng (2014) found that SNAP recipients found better variety and higher-quality produce at farmers markets than they did at other retail locations (see also Parsons & Morales, 2013). Future research could track the diversity of products with more detail than considered in this paper and might also track the price of products. One data-collection tool to assist farmers markets is Farm2Facts,[6] a tool designed by researchers and practitioners. Farm2Facts suggests collecting metrics in the categories of economic (e.g., visitors and sales data for each market), social (e.g., number of visitors from a specific zip code), and ecological factors (e.g., average distance the food traveled to the market)—all of which can be used to ask questions of interest to market stakeholders. In short, farmers markets can serve as tools of community development (Morales, 2009; Morales, Balkin, & Persky, 1995), and this study has shown the important contribution they make to a local economy.

Acknowledgments

We would like to acknowledge Tracy Herner, market manager of the Williamsburg Farmers Market, for providing access to the market data.

References

Abelló, F. J., Palma, M. A., Waller, M. L., & Anderson, D. P. (2014). Evaluating the factors influencing the number of visits to farmers' markets. *Journal of Food Products Marketing, 20*(1), 17–35. https://doi.org/10.1080/10454446.2013.807406

Baumol, W. J., & Ide, E. A. (1956). Variety in retailing. *Management Science, 3*(1), 93–101. https://doi.org/10.1287/mnsc.3.1.93

Betz, M. E., & Farmer, J. R. (2016). Farmers' market governance and its role on consumer motives and outcomes. *Local Environment, 21*(11), 1420–1434. https://doi.org/10.1080/13549839.2015.1129606

Briesch, R. A., Chintagunta, P. K., & Fox, E. J. (2009). How does assortment affect grocery store choice? *Journal of Marketing Research, 46*(2), 176–189. https://doi.org/10.1509/jmkr.46.2.176

Buman, M. P., Bertmann, F., Hekler, E. B., Winter, S. J., Sheats, J. L., King, A. C., & Wharton, C. M. (2015). A qualitative study of shopper experiences at an urban farmers' market using the Stanford Healthy Neighborhood Discovery Tool. *Public Health Nutrition, 18*(6), 994–1000. https://doi.org/10.1017/S136898001400127X

Byker, C., Shanks, J., Misyak, S., & Serrano, E. (2012). Characterizing farmers' market shoppers: A literature review. *Journal of Hunger & Environmental Nutrition, 7*(1), 38–52. https://doi.org/10.1080/19320248.2012.650074

Connell, D. J., & Hergesheimer, C. (2014). Strengthening the core business of farmers markets through strategic business planning. *Journal of Agriculture, Food Systems, and Community Development, 4*(4), 97–108. https://doi.org/10.5304/jafscd.2014.044.017

Conner, D., Colasanti, K., Ross, R. B., & Smalley, S. B. (2010). Locally grown foods and farmers markets: Consumer attitudes and behaviors. *Sustainability, 2*(3), 742–756. https://doi.org/10.3390/su2030742

Detre, J. D., Mark, T. B., & Clark, B. M. (2010). Understanding why college-educated millennials shop at farmers markets: An analysis of students at Louisiana State University. *Journal of Food Distribution Research, 41*(3), 14–24. https://doi.org/10.22004/ag.econ.139060

Dodds, R., Holmes, M., Arunsopha, V., Chin, N., Le, T., Maung, S., & Shum, M. (2014). Consumer choice and farmers' markets. *Journal of Agricultural and Environmental Ethics, 27*(3), 397–416. https://doi.org/10.1007/s10806-013-9469-4

[6] https://farm2facts.org/

Farmer, J. R., Chancellor, C., Gooding, A., Shubowitz, D., & Bryant, A. (2011). A tale of four farmers markets: Recreation and leisure as a catalyst for sustainability. *Journal of Park and Recreation Administration, 29*(3). Retrieved from https://js.sagamorepub.com/jpra/

Farmer, J. R., Chancellor, C., Robinson, J. M., West, S., & Weddell, M. (2014). Agrileisure. *Journal of Leisure Research, 46*(3), 313–328. https://doi.org/10.1080/00222216.2014.11950328

Figueroa-Rodríguez, K. A., Álvarez-Ávila, M. del C., Hernández Castillo, F., Schwentesius Rindermann, R., & Figueroa-Sandoval, B. (2019). Farmers' market actors, dynamics, and attributes: A bibliometric study. *Sustainability, 11*(3), 745. https://doi.org/10.3390/su11030745

Freedman, D. A., Flocke, S., Shon, E.-J., Matlack, K., Trapl, E., Ohri-Vachaspati, P., … Borawski, E. (2017). Farmers' market use patterns among Supplemental Nutrition Assistance Program recipients with high access to farmers' markets. *Journal of Nutrition Education and Behavior, 49*(5), 397–404.e1. https://doi.org/10.1016/j.jneb.2017.01.007

Hinrichs, C. C., Gillespie, G. W., & Feenstra, G. W. (2004). Social learning and innovation at retail farmers' markets. *Rural Sociology, 69*(1), 31–58. https://doi.org/10.1526/003601104322919892

Kahn, B. E., & Lehmann, D. R. (1991). Modeling choice among assortments. *Journal of Retailing, 67*(3), 274–299. https://doi.org/10.1086/504135

Karakus, M., Milfort, R., MacAllum, K., & Hongsheng, H. (2014). *Nutrition assistance in farmers markets: Understanding the shopping patterns of SNAP participants*. Washington, D.C.: USDA Food and Nutrition Service. Retrieved from https://www.fns.usda.gov/snap/nutrition-assistance-farmers-markets-understanding-shopping-patterns-snap-participants

Karpyn, A., Kim, S. A., DaCosta, R. V., Gasinu, S., & Law, Y.-M. (2012). Growing the field: Current approaches to data collection at farmers' markets. *Journal of Hunger & Environmental Nutrition, 7*(4), 436–448. https://doi.org/10.1080/19320248.2012.732924

Landis, B., Smith, T. E., Lairson, M., Mckay, K., Nelson, H., & O'Briant, J. (2010). Community-supported agriculture in the Research Triangle Region of North Carolina: Demographics and effects of membership on household food supply and diet. *Journal of Hunger & Environmental Nutrition, 5*(1), 70–84. https://doi.org/10.1080/19320240903574403

Low, S. A., Adalja, A., Beaulieu, E., Key, N., Martinez, S., . . . Jablonski, B. B. R. (2015). Trends in U.S. local and regional food systems: A report to Congress (Report No. AP-068). Washington, D.C.: USDA Economic Research Service. Retrieved from https://www.ers.usda.gov/publications/pub-details/?pubid=42807

Mack, J., & Tong, D. (2015). Characterizing the spatial and temporal patterns of farmers' market visits. *Applied Geography, 63*, 43–54. https://doi.org/10.1016/j.apgeog.2015.06.005

McEachern, M. G., Warnaby, G., Carrigan, M., & Szmigin, I. (2010). Thinking locally, acting locally? Conscious consumers and farmers' markets. *Journal of Marketing Management, 26*(5–6), 395–412. https://doi.org/10.1080/02672570903512494

McGuirt, J. T., Jilcott Pitts, S. B., Ward, R., Crawford, T. W., Keyserling, T. C., & Ammerman, A. S. (2014). Examining the influence of price and accessibility on willingness to shop at farmers' markets among low-income eastern North Carolina women. *Journal of Nutrition Education and Behavior, 46*(1), 26–33. https://doi.org/10.1016/j.jneb.2013.06.001

Meenar, M., Morales, A., & Bonarek, L. (2017). Regulatory practices of urban agriculture: A connection to planning and policy. *Journal of the American Planning Association, 83*(4), 389–403. https://doi.org/10.1080/01944363.2017.1369359

Mino, R., Chung, K., & Montri, D. (2018). A look from the inside: Perspectives on the expansion of food assistance programs at Michigan farmers markets. *Agriculture and Human Values, 35*(4), 823–835. https://doi.org/10.1007/s10460-018-9877-1

Morales, A. (2000). Peddling policy: Street vending in historical and contemporary context. *International Journal of Sociology and Social Policy, 20*(3/4), 76–98. https://doi.org/10.1108/01443330010789133

Morales, A. (2009). Public markets as community development tools. *Journal of Planning Education and Research, 28*(4), 426–440. https://doi.org/10.1177/0739456X08329471

Morales, A. (2011). Marketplaces: Prospects for social, economic, and political development. *Journal of Planning Literature, 26*(1), 3–17. https://doi.org/10.1177/0885412210388040

Morales, A. (2019). Food systems: (Im)practical interactions. *The Pluralist, 14*(1), 21–46. https://doi.org/10.5406/pluralist.14.1.0021

Morales, A., Balkin, S., & Persky, J. (1995). The value of benefits of a public street market: The case of Maxwell Street. *Economic Development Quarterly, 9*(4), 304–320. https://doi.org/10.1177/089124249500900402

Olson, K. A. (2019). The town that food saved? Investigating the promise of a local food economy in Vermont. *Local Environment, 24*(1), 18–36. https://doi.org/10.1080/13549839.2018.1545753

Parsons, M., & Morales, A. (2013). Increasing the healthiness of consumers through farmers markets. *Journal of Extension, 51*(4). Retrieved from https://www.joe.org/joe/2013august/iw5.php

Printezis, I., & Grebitus, C. (2018). Marketing channels for local food. *Ecological Economics, 152*, 161–171. https://doi.org/10.1016/j.ecolecon.2018.05.021

Quintana, M., & Morales, A. (2015). Learning from listservs: Collaboration, knowledge exchange, and the formation of distributed leadership for farmers' markets and the food movement. *Studies in the Education of Adults, 47*(2), 160–175. https://doi.org/10.1080/02660830.2015.11661682

Rhoades, S. A. (1993). The Herfindahl-Hirschman Index Note. *Federal Reserve Bulletin, 79*, 188–189. Available by request from https://EconPapers.repec.org/RePEc:fip:fedgrb:y:1993:i:mar:p:188-189:n:v.79no.3

Roubal, A., & Morales, A. (2016). Chicago marketplaces: Advancing access to healthy food. In J. Dawson & A. Morales (Eds.), *Cities of farmers: Problems, possibilities and processes of producing food in cities* (pp. 191–212). Iowa City: University of Iowa Press.

Roubal, A. M., Morales, A., Timberlake, K., & Martinez-Donate, A. (2016). Examining barriers to implementation of electronic benefit transfer (EBT) in farmers markets: Perspectives from market managers. *Journal of Agriculture, Food Systems, and Community Development, 6*(3), 141–161. https://doi.org/10.5304/jafscd.2016.063.011

Schmit, T. M., Jablonski, B. B. R., & Mansury, Y. (2016). Assessing the economic impacts of local food system producers by scale: A case study from New York. *Economic Development Quarterly, 30*(4), 316–328. https://doi.org/10.1177/0891242416657156

Shumway, R. H., & Stoffer, D. S. (2011). *Time series analysis and its applications: With R examples* (3rd ed). New York: Springer.

Stephenson, G., Lev, L., & Brewer, L. (2008). 'I'm getting desperate': What we know about farmers' markets that fail. *Renewable Agriculture and Food Systems, 23*(3), 188–199. https://doi.org/10.1017/S1742170507002153

Tan, L. P., & Cadeaux, J. (2011). Brand and stock-keeping-unit (SKU) assortments, assortment changes and category sales. *The International Review of Retail, Distribution and Consumer Research, 21*(2), 161–185. https://doi.org/10.1080/09593969.2011.562682

Tey, Y. S., Arsil, P., Brindal, M., Teoh, C. T., & Lim, H. W. (2017). Motivations underlying consumers' preference for farmers' markets in Klang Valley: A means-end chain approach. *Sustainability, 9*(11), 1958. https://doi.org/10.3390/su9111958

Thilmany, D., Bond, C. A., & Bond, J. K. (2008). Going local: Exploring consumer behavior and motivations for direct food purchases. *American Journal of Agricultural Economics, 90*(5), 1303–1309. https://doi.org/10.1111/j.1467-8276.2008.01221.x

Trivette, S. A., Archambault, S., & Morales, A. (2015). *Money made at the market: Sales at the Williamsburg Farmers Market – 2002-2014* (URPL Working Paper No. 2015–002). Madison: University of Wisconsin-Madison.

U.S. Department of Agriculture, Agricultural Marketing Service (USDA AMS). (n.d.). Local Food Directories | Agricultural Marketing Service. Retrieved March 10, 2019, from https://www.ams.usda.gov/local-food-directories/farmersmarkets

USDA National Agricultural Statistics Service (USDA NASS). (2016). *Census of Agriculture—Local Food Marketing Practices*. Retrieved June 12, 2019, from https://www.nass.usda.gov/Publications/AgCensus/2012/Online_Resources/Local_Food/index.php

Wilson, M., Witzling, L., Shaw, B., & Morales, A. (2018). Contextualizing farmers' market needs: Assessing the impact of community type on market management. *Journal of Food Distribution Research, 49*(2), 1–18. https://www.fdrsinc.org/journal/

Wittman, H., Beckie, M., & Hergesheimer, C. (2012). Linking local food systems and the social economy? Future roles for farmers' markets in Alberta and British Columbia. *Rural Sociology, 77*(1), 36–61. https://doi.org/10.1111/j.1549-0831.2011.00068.x

Witzling, L., Shaw, B., Wilson, M., & Morales, A. (2019). Promoting farmers' markets: Preferences of farmers' market leaders. *Journal of Extension*, *57*(3), 3FEA4. Retrieved from https://www.joe.org/joe/2019june/a4.php

Zellner, A., & Theil, H. (1962). Three-stage least squares: Simultaneous estimation of simultaneous equations. *Econometrica, 30*(1), 54–78. https://doi.org/10.2307/1911287

Methodological Appendix

The general model for ARMAX is seen in equation 2:

$$SALESA_t = \beta_0 + \mathrm{BX}_t + \omega_t \qquad (2)$$

where $SALESA_t$ represents sales in time period (*t)*, which is predicted by the constant (β_0), and a vector of explanatory variables ($\mathbf{X}_t$) that also change with time. The term ω_t is the residuals component, which we also allow to vary by time. A challenge in the estimation of equation (2) is the potential endogeneity of one or more of the explanatory variables. In this context, it is likely the case that customer counts are both endogenous and predicted by several of the same factors as those that predict sales.

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

A tale of two co-ops in two cities

Leah Halliday [a] * and Michèle Foster [b]
University of Louisville

Submitted January 17, 2019 / Revised March 30, May 10, and July 1, 2019, and January 26, 2020 / Accepted July 3, 2019 / Published online February 28, 2020

Citation: Halliday, L., & Foster, M. (2020). A tale of two co-ops in two cities. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 239–254. https://doi.org/10.5304/jafscd.2020.092.005

Abstract

Conceived in support of the Louisville Association of Cooperative Economics (LACE), this paper presents case studies of two different food cooperatives serving communities of color. After establishing a brief history of food cooperatives, we explore the expansion efforts of Seward Community Co-op, a long-standing and well-established cooperative in a predominantly White area of Minneapolis, Minnesota, into a more diverse area of the city. Next, we explore the Mandela Grocery Co-op in Oakland, California, a relatively new, worker-owned cooperative. We then discuss several points to consider in the development of new co-ops that emerge from these cases.

Keywords

Food Cooperatives, Co-ops, Food Justice, Community Development

Introduction

Food cooperatives (commonly known as co-ops), like genius in Edison's view, are 1% inspiration and 99% perspiration. Reyes (2015) classes this inspiration into two major ideologies. The first type of co-op is primarily designed to "meet a community desire for organic and natural food" (Reyes, para. 6). The other type, aligned with the food justice movement, is primarily focused on promoting access to full-service grocery stores in underserved

[a] * *Corresponding author:* Leah Halliday, Doctoral Candidate, Department of Middle and Secondary Education, College of Education and Human Development, University of Louisville, Louisville, Kentucky, USA; leah.halliday@louisville.edu

[b] Michèle Foster, Henry Heuser Jr. Endowed Chair for Urban Education Partnerships and Professor, Department of Early Childhood and Elementary Education, College of Education and Human Development, University of Louisville, Louisville, Kentucky, USA.

Funding Disclosure

This research was funded by a Transdisciplinary grant from the University of Louisville Social Justice Consortium.

areas, with a complementary goal of building community wealth and ownership.[1] While both types of co-op rely on hard work and dedication, these distinct foundations are rooted in history as well as the current social, economic, political, and geographical contexts. Thus they may contribute to the distinct challenges and opportunities individual food co-ops encounter. Below, we present case studies of two significantly different food co-ops that represent these ideological distinctions. Seward Community Co-op, a well-established, natural-food focused, consumer-owned co-op in Minneapolis, Minnesota; and Mandela Grocery Co-op, a recently developed, food-justice focused, African-American worker-owned co-op in Oakland, California. The two case studies suggest that the ideological focus of a co-op, as well as its temporal and geographic context, can greatly influence the work that will define it and help it flourish.

Literature Review

Grocery co-ops in the United States range in size and scope but are generally founded on principles formally outlined by the Rochdale Equitable Pioneers Society. In 1843, following a failed worker strike, this group of textile workers in Rochdale, England, sought another path to economic strength: a community-owned grocery store (Zimbelman, n.d.). Over the years, the grocery co-op movement in the U.S. has experienced waves of popularity and success: first in the 1920s and '30s, again in the 1960s and '70s, and now, with the current wave beginning in the early 2000s (Kauffman, 2017b). Most second-wave and current examples grew from small community movements: groups of friends and neighbors coming together to pool resources and meet their needs (Kauffman, 2017b). Jessica Gordon Nembhard (2014), a historian and expert on African American cooperatives, traces the roots of African American co-ops to the era of slavery in America, during which Black communities "organized myriad strategies of emancipation" (p. 33). According to Nembhard, in addition to the common principles of cooperation, Black co-ops were born of economic necessity and survival, and relied on ideas of self-help and racial solidarity.

As small societies that are formed to meet the needs of members, co-ops have founding ideologies that are evident in day-to-day operations as well as in challenges and areas of opportunity. Whereas most cooperative communities founded in the second wave of cooperative development in the U.S. were championed by members of a White, college-educated counterculture (Kauffman, 2017b) who often pooled finances to gain access to high-quality bulk and organic food choices, the earliest African-American co-ops often relied on what Nembhard (2014) calls "sweat equity" when money was scarce. The historical distinction in resources between groups who come together to form cooperative communities set a precedent for a distinction that remains today between worker-owned and consumer-owned cooperatives. Exacerbating historical financial challenges, early African American cooperatives, as avenues of economic empowerment, often faced sabotage by White supremacists intent on their failure (Nembhard, 2014), while White cooperative societies, even those without extensive financial support, benefitted from the absence of systemic oppression and sabotage. The needs of the members necessarily influence the development and progression of food co-ops.

While the organizers who initiated the co-op resurgence in the 1970s in Minneapolis were relatively cash-poor, the social privilege of their communities helped them secure access to loans, free locations, and volunteer hours in their quest for "economic and ideological independence from supermarket chain stores" (Olsen, 1998, para. 2). Considering the differences in community problems, the risks and benefits associated with cooperative organizing, and the resources at their disposal, it is not surprising that the majority of cooperatives that survived the boom years of the 1970s were White and consumer-owned. As a result, many African Americans may not be familiar with the

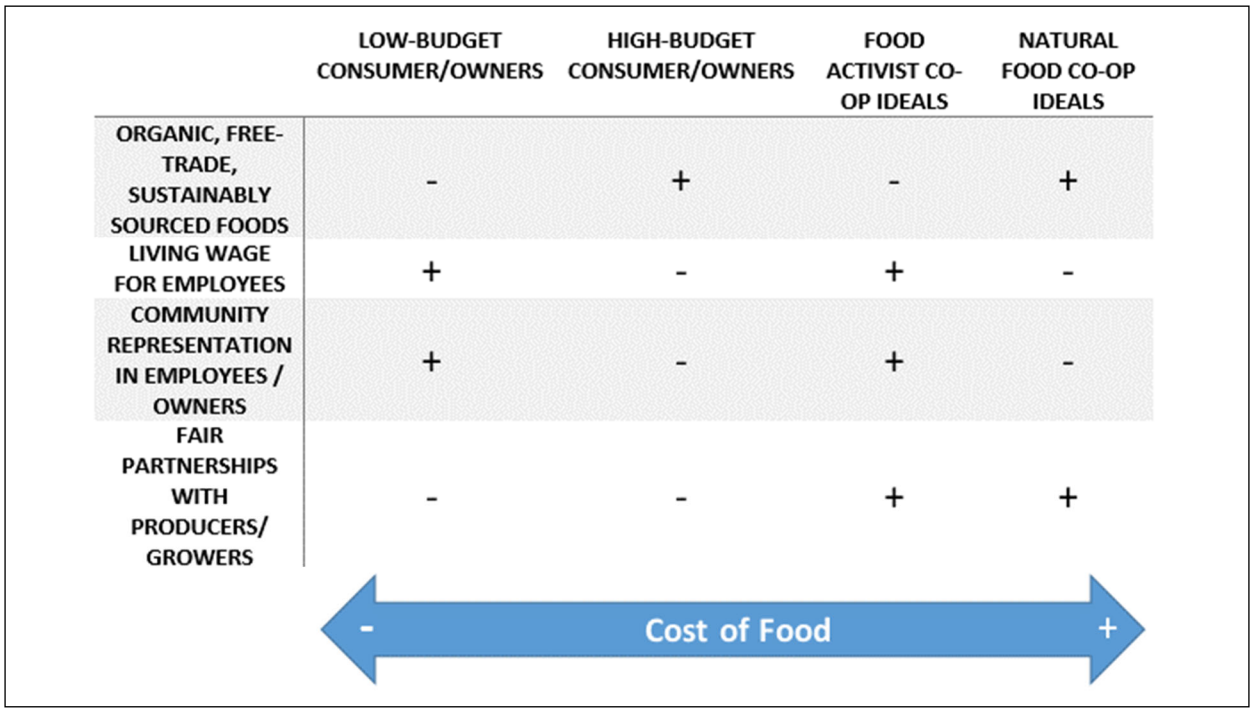
[1] Reyes (2015) and many others in the field label underserved or food-insecure areas with no access to full-service grocery stores as "food deserts." We avoid that term in acknowledgement of the argument outlined in Atkinson (2016) that "'the 'desert imagery,' evoking an absence of life, puts emphasis on the lack of supermarkets rather than on the landscape of racial discrimination and poverty afflicting these communities" (p. 5).

tradition of cooperatives within their communities or be aware that some of the early African American leaders suggested them as a solution or remedy for meeting needs and developing wealth within the community. As Nembhard (2014) points out, "Almost all African American leaders and major thinkers, from the most conservative to the most radical, have at some point promoted cooperative economic development as a strategy for African American well-being and liberation" (p. 213). As we discuss in the case study below of Seward Community Co-op, even some existing cooperative communities are unaware of the rich history of African American co-ops.

Despite the differences in ideological foci and the community resources and goals that inform them, both types of co-op might organize as a group of people who simply purchase goods together periodically without a dedicated physical space or without developing and running a regular storefront (Reid, 2012). Either type may inspire cooperatives that are consumer-owned, worker-owned, or some hybrid of the two. Cooperatives of both types must decide to govern day-to-day operations and larger growth and development plans using strictly democratic collective management methods, more traditional corporate-style governance structures, or something in between (Kauffman, 2017b). Both must choose what products to purchase or stock and how to allocate profits or manage losses. From these decisions emerge many possible outcomes, from those with all the formality of a roadside stand to those that might be indistinguishable from a Whole Foods or Trader Joe's to the uninitiated (Neighboring Food Co-op Association, n.d.).

Indeed, the work of developing a co-op becomes something of a choose-your-own-adventure story, with each decision representing a tradeoff leading to a new set of options in a complex and ever-expanding balancing act among consumer preferences, owner demands, ideological foundations, and food costs. Reyes (2015) notes that "we have to be thoughtful about which needs we're trying to address and which models we're going to implement" (para. 7) and we found careful consideration to be the norm when we discussed these tradeoffs and priorities with co-op leaders for our case studies. We illustrate this balancing act of priorities in Figure 1.

Figure 1. Finding Balance Among Shareholder Values and Food Costs



While the history of food cooperatives is surprisingly littered with conflict and even violent tension among proponents of the different ideologies (Olsen, 1998), an exploration of current thriving co-ops can be instructive, especially to those interested in how new or existing co-ops can engage in meeting the needs of communities in most urgent need of food security. As these case studies of the expansion efforts of the Seward Co-op in Minneapolis, Minnesota, and the birth and growth of the Mandela Co-op in Oakland, California, demonstrate, the ideological foundation supporting a co-op will influence the direction of the hard work that will lead to its ultimate success, but passion, dedication, and respect for community are always a part of the equation.

Methods

The Louisville Association of Cooperative Economics (LACE) requested these case studies to guide them in the development of a community-owned grocery store. Funded by a Transdisciplinary grant from the University of Louisville Social Justice Consortium, these case studies were one of several research projects whose aim was to provide research for LACE. The association generated a list of food co-ops they were interested in learning more about, and from the larger list, selected two to be studied. The first phase of the research began in August 2018 with a comprehensive search of articles published about each co-op, general information about the locations, and other documents retrieved from the web (including information from each co-op's website). From this initial search, we developed a series of questions for each food co-op, in order to round out and give more context to the online research. In addition, we developed a set of questions that probed for information about funding and governance to best address the interests and concerns LACE expressed upon initiating the case studies. Abby Rogosheske, education and outreach coordinator at Seward Co-op, was the first to agree to an interview. We spoke with her by phone in September 2018. She then referred us to and connected us with Ray Williams, head of operations, and Liz Wozniak, head of human resources; we interviewed Mr. Williams and Ms. Wozniac together by phone a week later. We also interviewed worker-owner Adrionna Fike, of Mandela Grocery Co-op, by phone in October 2018.

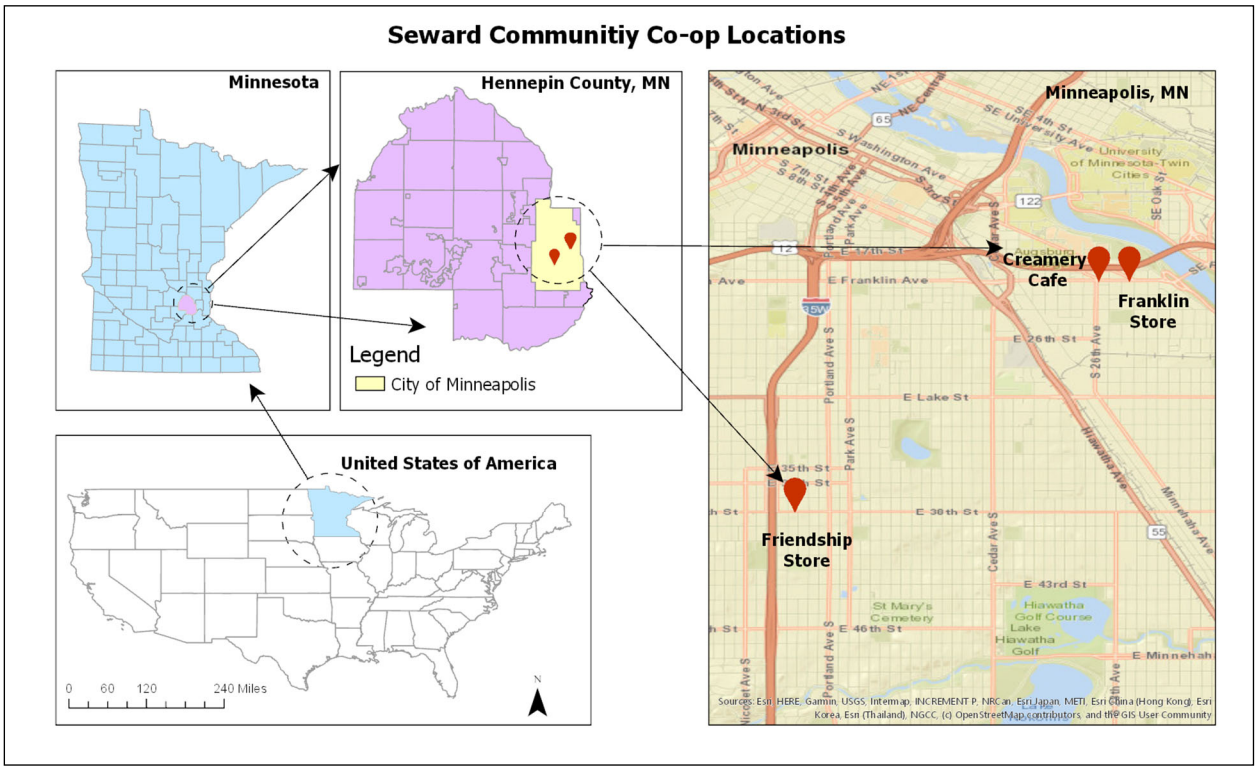
Seward Community Co-op: The Friendship Store, Minneapolis, MN

Today: Seward's Friendship Store

Seward Community Co-op today is a thriving consumer-owned food cooperative with three locations. The focus of this case study is the Friendship Store, the brand's second full-service grocery, which opened in October 2015. The organization also includes the Franklin Store, an older, full-service grocery in the Seward neighborhood where the co-op began, and The Creamery, the site of the administrative offices and distribution center that also boasts a full-service café. The Friendship Store is located at 317 East 38th Street, the primary business corridor in this part of the city, just between the Bryant neighborhood (a district named after American poet William Cullen Bryant), and the Central neighborhood (where musician Prince grew up; his feature film "Purple Rain" is set in this area) (Figure 2).

Understanding the context of the city and the two areas of Seward, and the Bryant and Central neighborhoods, in particular, helps to illuminate the implications of the expansion. Eleven communities in Minneapolis containing between 4 to 13 neighborhoods compose the city. Located in the Northeast not far from the University neighborhood, within walking and biking distance of the University of Minnesota, the Seward neighborhood and co-op is located in the part of the city known as the Longfellow area. Seward, where the original co-op is located, is one of the most politically liberal neighborhoods in Minneapolis. In this neighborhood, the Democratic-Farmer-Labor Party and Green Party are major political forces (Neighborhoods of Minneapolis, 2018). As illustrated in Figure 3 below, the population of Seward recorded in the 2010 census was 55.1% White and 33.2% African-American, with no other category totaling more than 3.7%. Wealth is also important in understanding the neighborhood: the percentage of residents with an income below the poverty level was 25.6%, while 48.6% of residents reported income

Figure 2. Locations of the Seward Cooperatives (Seward Community Co-op, the Franklin Store; Creamery Café; and the Friendship Store) [a]



Sources: Fitzpatrick (2012); Minnesota Department of Transportation (2017, 2018).

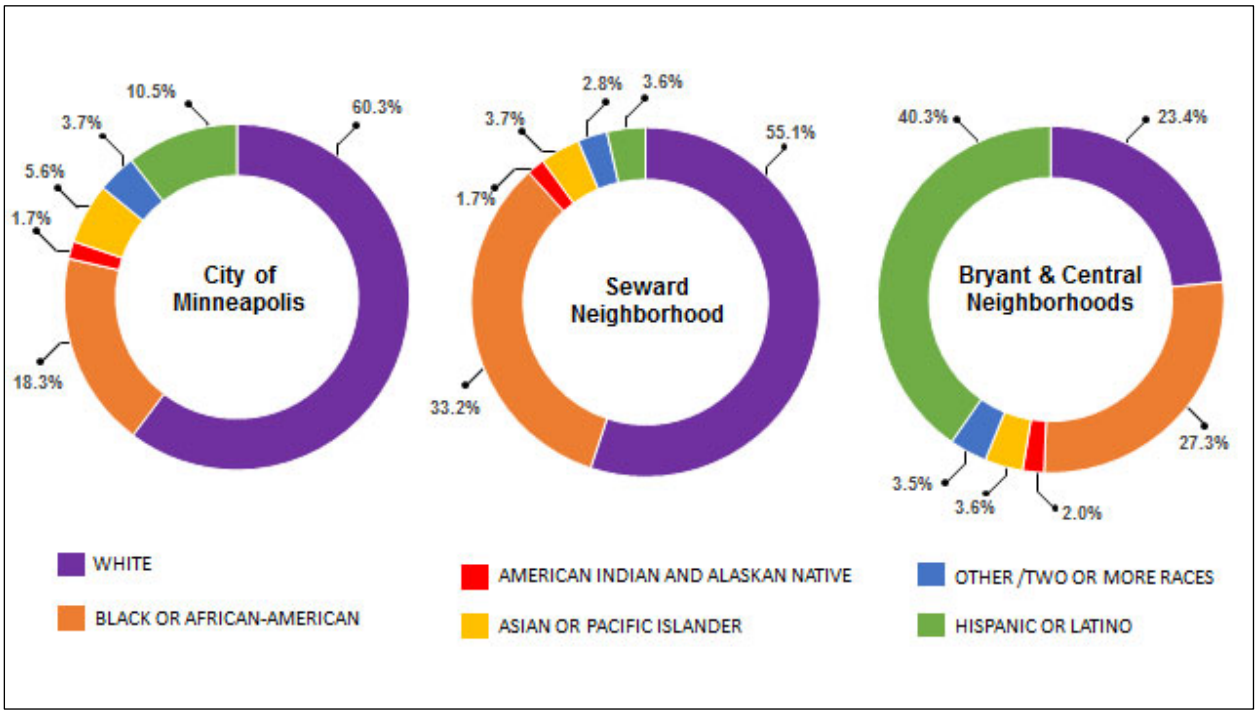
[a] Maps were created by using ArcGIS software by Esri. ArcGIS and ArcMap™ are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved.

of 200% or more above the poverty level (Minneapolis Neighborhood Profile: Seward, 2011).

Bryant and Central are located in the area referred to as the Powderhorn Community (Neighborhoods of Minneapolis, 2018). In 2010, the combined population of the Bryant and Central neighborhoods was 11,140—about 2.9% of the city's total population. As indicated in Figure 3, at the 2010 Census, the populations of Bryant and Central combined were 40.3% Hispanic or Latino, 27.3% Black or African American, and 23.4% White, with all other recorded categories amounting to 4% or less each. The percentage of residents with an income below the poverty level in Bryant and Central was 30.3%, while 38.8% of residents reported an income of 200% or more above the poverty level (Minneapolis Neighborhood Profiles Bryant, 2011, & Minneapolis Neighborhood Profile: Central, 2011). So, while Seward Community Co-op's expansion did not extend beyond Minneapolis, the opening of the Friendship Store represents a major shift in context, a point that we discuss in more depth below.

Seward's commitment to diversity, equity, and inclusion drives efforts at the Friendship Store to make the co-op a full and beneficial part of the community. Seward accepts payment via the Supplemental Nutrition Assistance Program (SNAP) and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Additionally, Seward's Nourish program provides an across-the-board 10% discount to any shopper who qualifies for state or federal nutritional assistance, and it encourages community members enrolled in these assistance programs to shop at the co-op through advertising campaigns that stress the sentiment proudly blazoned on each Seward location: "Everyone Welcome." This welcome at

Figure 3. Comparative Racial Makeup of Minneapolis, Seward Neighborhood, and Bryant/Central Neighborhoods, Based on Data from the 2010 Census



Sources: Minneapolis neighborhood profile: Bryant (2011); Minneapolis neighborhood profile: Central (2011); & Minneapolis neighborhood profile: Seward (2011).

the Friendship Store goes beyond an invitation to shop. Even shoppers on tight budgets are welcome to become member-owners, thanks to the Nourish program's need-based assistance that offers the US$75 membership fee to eligible shoppers for only US$15 upfront, with the rest paid over time and with help of the annual co-op payout to owners in profitable years (A. Rogosheske, personal communication, September 10, 2018).

Seward's efforts to meet the needs of financially constrained shoppers include making food as affordable as possible at the Friendship Store by marking down prices on many bulk items and pantry staples to the absolute minimum profit margin. These items are indicated by a Nourish symbol on the tags. Nourish strives to ameliorate the higher costs associated with ethically and/or sustainably produced and sourced foods by offering courses on shopping at the co-op on a budget and cooking. The Friendship Store, like the other locations, includes classroom space where 4–5 classes are offered every month. Nourish 101 classes, for instance, feature basic scratch-cooking techniques and recipes that will feed a family of four for less than US$10. At the time of this writing, in the early fall of 2018, classes and recipes included a cauliflower curry soup featuring seasonal ingredients, and Three Sisters soup, inspired by the Native American tradition of growing and harvesting corn, beans, and squash together (Seward Community Co-op, 2018).

In addition to the Nourish program, all the Seward stores participate in a round-up program that allows shoppers to round their purchase totals up to the nearest dollar, and the differences are collected and donated to a different local nonprofit every month. This program has allowed Seward to provide up to US$20,000 per month to support less well-established organizations that share their member-owners' values (Seward Community Co-op, n.d). Further, Seward's education and outreach efforts include frequently participating in and/or sponsoring various community events and a competitive grant program for other area organizations.

Also important to its acceptance in the community, the Friendship Store's employees reflect the Central and Bryant neighborhoods. While the challenge of reaching this achievement is addressed later in this piece, the Friendship Store opened with over 60% of its employees representing people of color and over 50% living within one mile (1.6 km) of the store. Those numbers have fluctuated slightly, but remain right around 50% after three years. People enjoy coming in to shop and seeing their neighbors or church members working there (A. Rogosheske, personal communication, September 10, 2018). Seward's commitment to paying these workers a living wage, around US$15 per hour in Minneapolis, further ingratiates the Friendship Store with the Central/Bryant communities (A. Rogosheske, personal communication, September 10, 2018).

Community members have also embraced the Friendship Store as member-owners and shoppers, leading to earlier-than-expected profitability. While many Seward owners lived in the area before the Friendship Store opened, over 1,000 new owners bought into the co-op in the first year, and the total number of member-owners now is between 18,000 and 19,000. Thanks to these new members and other shoppers, the Friendship Store became profitable in a year and a half, cutting the three-year projection the Seward board had determined at the project's onset in half. While the growth in sales has now leveled out across the board at Seward, the Friendship Store represents a financial and social success in the community in the eyes of the organization (A. Rogosheske, personal communication, September 10, 2018).

Yesterday: The Conception of and Path to the Friendship Store

Geographically, the Friendship Store is a mere two miles (3.2 km) west of the main Franklin branch. Despite this proximity, the communities are worlds apart, with differences in racial, cultural, and socioeconomic composition rooted in a history of redlining and other racial discrimination (Lindeke, 2015b). For Seward Community Co-op, the histories of racial discrimination and co-ops in Minneapolis culminated in challenges to its efforts to bring the Friendship Store to fruition, despite the need for a grocery store in the area and the good intentions of everyone involved.

Seward Community Co-op is one of the few remaining co-ops from the tumultuous co-op scene in the '70s in Minneapolis. Olsen (1998) provides an overview of the drama and conflict, known in the area as "The Co-op Wars," that accompanied the surge of food co-ops in Minnesota during the second wave of co-op growth. At this time, several co-ops were founded in the Minneapolis–St. Paul area, some primarily dedicated to providing healthy foods and others dedicated not only to providing wholesome food but also to advancing explicitly political goals.[2] In the predominantly Black community of Bryant, a food co-op begun by Moe Burton, a former Black Panther and avid community organizer, had an absolute focus on community empowerment and self-determination (Lindeke, 2015b). The competing agendas of these cooperatives broke out into a co-op war, with some of the groups attacking each other violently (Olsen, 1998). The co-ops that survived were those with a natural food orientation, including Seward, while the more overtly political co-ops died out, leaving the Bryant area without access to a full-service grocery and likely with a skeptical view of co-ops developed outside the community.

While racial tensions and inequality in America are commonly associated with the Deep South—the result of slavery and Jim Crow legislation—racial inequality is not confined to the South. In fact, Minnesota is second to only Wisconsin in terms of racial inequality, as measured by multiple quality-of-life indicators and evident in rates of unemployment, income, homeownership, incarceration, and education outcomes (Wagner, 2017). For instance, Black people in Minnesota are 10 times more likely to end up in jail or prison than White

[2] In addition to Olsen (1998), see these stories by Deacon Warner from Radical Roots for more on the political tensions that arose in the co-op community in Minneapolis in the 1970s: http://www.radicalrootsfilm.com/blog-1/2015/5/28/bryant-central-three-tries-at-a-co-op; http://www.radicalrootsfilm.com/blog-1/2015/5/28/minneapolis-mayors-husband-breaks-marxists-arm-defending-his-co-op-in-street-brawl; http://www.radicalrootsfilm.com/blog-1/2015/5/28/another-side-of-the-peoples-warehouse-takeover

people. The median income for a Black household is US$30,306, but for a White household it is more than double that at US$66,979. According to data from both the Massachusetts Comprehensive Assessment System (MCAS) and the National Assessment of Educational Progress (NAEP), achievement gaps between White students and students of color in Minneapolis are large and to date immutable, despite prevalent high achievement scores(Wagner, 2017).

Against this backdrop of inequality in the city as well as the contention of the co-op wars, bringing a Seward expansion into Bryant was much more complex than one might have supposed at first glance. After all, Seward's Franklin Store was bursting at the seams, and initial internal research revealed that many of its members lived in the Bryant/Central area already. Further, Bryant/Central residents needed access to the healthy food choices that Seward could provide. One group of area residents even approached Seward to advocate for a Bryant/Central branch. But challenges remained.

Seward's mistake, according to Rogosheske, was in assuming that this small group was representative of the community as a whole. Taking this group's request as a welcome to the neighborhood, Seward staff found themselves planning a new branch in an area where the residents would prove to be much more guarded than Seward had foreseen (A. Rogosheske, personal communication, September 10, 2018). As Rogosheske shares, not enough work had been done to understand the politics of the neighborhood and determine whether this group accurately represented the views of the neighborhood. "In retrospect," she shares, "That's community organizing 101" (A. Rogosheske, personal communication, September 10, 2018).

As it turned out, many Bryant and Central residents were wary of economic development in the area that could lead to gentrification, and they feared that even a nearby store would not alleviate problems in the area if local residents were unable to shop or work there (Boarini, 2013). The community members' wariness illustrates the complexity of the idea of access. For instance, Usher (2015) identifies five dimensions of access, and store location represents just one part of one of those dimensions. Community members in Bryant and Central knew that proximity to expensive groceries and inaccessible jobs would not help the most vulnerable in the community and might even cause harm by driving up property values. During the planning process, some Bryant/Central community members directly expressed concern about negative outcomes such as gentrification; costly or overpriced foodstuffs, particularly produce; a lack of job opportunities; and all-White management. These concerns were expressed at a meeting where questions were raised to which the co-op management issued written responses (Boarini, 2013).

Despite this effort by Seward to assure the community of its goodwill, many residents saw that they needed a seat at the table. At this point, two neighborhood organizations, the Bryant Neighborhood Organization (BNO) and the Central Area Neighborhood Development Organization (CANDO), had come together to get the communities engaged in the process of pushing back against Seward in an attempt to represent the communities' needs. They advocated for a community benefits agreement (CBA) that would hold Seward financially responsible if it did not deliver on its assurances to the community, and this became a bone of contention. Seward was hesitant to agree to fines or sanctions if they were unable, as they saw it, to hire the percentage of community residents demanded, pay the approximately US$15 per hour living wage, or were otherwise to fail in their good-faith efforts to meet the needs of the community (Lindeke, 2015a). As Liz Wozniac, director of human resources at Seward explained, Seward saw the proposed CBA as a threat to the financial well-being of the organization as a whole, something Seward could not accept in light of its responsibilities to its current member-owners and loyal supporters from its 40-year history (L. Wozniac, personal communication, September 17, 2018). The neighborhood residents deeply felt their lack of leverage and could not fully credit the goodwill expressed by Seward, especially considering the historic tensions and a scarcity of employees of color that Seward explained as due to a scarcity in the pool of applicants (Boarini, 2013).

Development was almost certain to move for-

ward, however, even without community buy-in, and neither Seward nor community leaders were satisfied. At this time, as Rogosheske recalls, Seward realized that genuine community organizing efforts were long past due, and they recruited LaDonna Sanders-Redmond to take the lead. With a background in food justice activism forged in the school systems of Chicago, Sanders-Redmond hit the ground running with a strong community organizing plan and some unlikely help from a zoning imperative. Since the plans to build were set to move forward, Seward needed signatures from every household within 1,000 feet of the new site to change the zoning of the location. Consistent with Sanders-Redmond's boots-on-the-ground approach, this zoning requirement meant knocking on doors. As Rogosheske puts it, being forced to knock on "every single door" in the neighborhood for permission to rezone was a blessing in disguise. Sanders-Redmond and her assistant were able to address not only zoning questions and concerns, but often even negative perceptions of co-ops. They found that many residents viewed co-ops as White spaces, or elite spaces, where only the wealthy could or would choose to shop (A. Rogosheske, personal communication, September 10, 2018).[3]

In addition to speaking with families in their homes, Seward also took internal steps to address the community concern that the economic opportunities presented by the Friendship Store would not directly benefit the community. To attract diverse employees, particularly from the immediate neighborhood, Seward held a job fair for the new branch in a Bryant/Central community center. Further, Sanders-Redmond was able to move the needle toward the diverse hiring practices advocated for by community leaders by rethinking and rewriting some of the job descriptions that may have discouraged potential applicants who were unfamiliar with food co-ops. As Pagani (2016) explains, "The co-op added questions about cultural competency to its interview process and rewrote job descriptions to emphasize essential skills over experience" (para. 20). Sanders-Redmond explained that job applicants might have been put off by co-op specific language: "But you don't need that to bag groceries…. You need to be attentive to detail, able to lift 50 pounds [23 kg], and have great customer service skills. We can teach you the difference between gluten-free and organic" (quoted in Pagani, 2016, para. 20).

In their continuing efforts, both Sanders-Redmond and Ray Williams, Seward's current head of operations, spoke at community events and churches. Sanders-Redmond's experience as a food justice advocate in multiple capacities helped bridge any lingering gaps from the ideological contention of the co-op wars as well as the widespread problem of food inequity. She served as the point person for questions and concerns of community members and brought her understanding of and focus on community education to bear through writing and outreach aimed at the Bryant/Central community. Williams stressed the lessons in humility that confronted Seward organizers throughout the process. He explained how going into a long-standing community and using language that often accompanies co-operative economic ventures, like "cultivating a community," was often received as insulting or condescending to the residents. Williams explains that negative pushback made listening to and engaging with community members a priority (R. Williams, personal communication, September 17, 2018). But time was running short to foster buy-in if the Friendship Store were to open both on schedule and with the community's support.

With Seward steadily working to earn support on the ground, yet another important mediating force joined the efforts just weeks before the Friendship Store was set to open. Elizabeth Glidden, a city council member who recognized the potential benefit of this project to the city, stepped in to bring leaders from CANDO, BNA, and Seward all together to try to find common ground in a series of professionally mediated meetings. These important meetings, in addition to the efforts of Sanders-Redmond, Williams, and others at Seward, helped the groups find common ground

[3] See also Boarini (2013), Slocum (2007), and Zitcer (2015) for further discussion of perceptions of food co-ops as exclusionary and/or White spaces.

in community commitments and a common language in which to communicate. This journey, and the coalescence of community around Seward's efforts to open the Friendship Store, reflect a wide range of the challenges, failures, and successes involved in bringing a grocery co-op to an economically and culturally diverse community that is wary of gentrification, despite its need for access to healthy food.

Tomorrow: Continuing Challenges for the Friendship Store

The tensions that emerged during the balancing of priorities have not disappeared entirely. Despite the classes and discounts the Nourish program supports, the cost of the locally sourced, organic foods favored by the co-op member-owners remains a barrier to full community support and use. In online user reviews on Yelp (n.d.-b) and in the Google business listing for the Friendship Store, the high price of food is a major and recurring theme. But, as Wozniac points out, food co-ops have a responsibility to everyone along the line: farmers, producers, workers, consumers, and owners (L. Wozniac, personal communication, September 17, 2018). She notes that the same people who advocate for lower prices will argue, often in the same breath, for higher wages for workers (L. Wozniac, personal communication, September 17, 2018). Much of the co-op enterprise, then, becomes educating people on the real costs of food, or as Wozniac puts it, "telling the story of why" (L. Wozniac, personal communication, September 17, 2018). The process of fostering community support and providing education is ongoing. As Rogosheske sees it, it is Seward's explicit commitment to diversity, equity, and inclusion that will keep it on track: "We make mistakes all the time, but we always come back to that. This is our commitment. Through our successes and our mistakes, we hope we can learn and teach other people, and other co-ops from what we're doing" (A. Rogosheske, personal communication, September 10, 2018).

While the Friendship Store appears to be a thriving part of the Seward Community Co-op team now, its path to success reveals the particular challenges that an established cooperative can experience when branching out to meet the needs of an underserved area, despite having the capital and resources to sustain expansion.

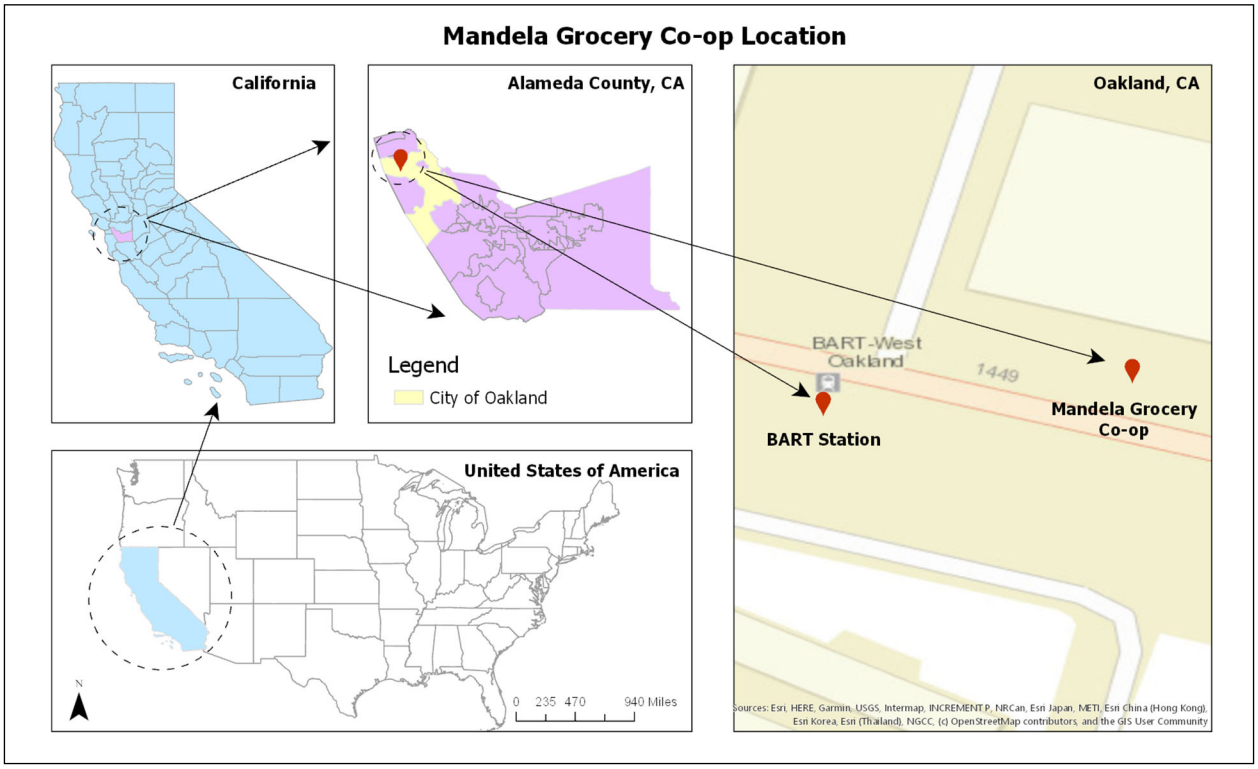
Mandela Grocery Co-op, Oakland, CA

Next, we look at a relatively new co-op in another part of the country that, like Minnesota, already supports multiple grocery co-ops, but unlike Seward, had to make its way without financial backing from an established parent store: Mandela Grocery Co-op in Oakland, CA.

Today: Small but Mighty

Mandela Food Co-op, located in a small storefront just across the street from the West Oakland area's Bay Area Rapid Transit (BART) stop in a steadily gentrifying area, is entirely worker-owned and operated (Figure 4). The space is distinctly African American. From the art on the walls to the arrangement of products, the entire space is designed to reflect the African American community and African American ownership. All of the worker-owners are African American, and the worker-owners do everything that needs to be done for the co-op themselves. As Adrionna Fike, a worker-owner since 2012, explains, "We absolutely do not outsource" (A. Fike, personal communication, October 24, 2018). From negotiating prices with vendors to developing relationships throughout the community and beyond, to placing orders, stocking shelves, raising funds, conducting outreach and marketing, checking customers out and bagging groceries, the worker-owners do it all. When the co-op needed to do marketing research, the worker-owners themselves set out knocking on doors and conducting over 200 surveys, offering US$10 gift certificates to community members whether they completed a survey or not. Despite the demands of the work, the store boasts only 10 employees, of whom seven are worker-owners and two are on track to become worker-owners; one employee, whom Fike says originally wanted simply to volunteer, works part-time at the co-op with no intention of buying in. While they do have a general manager, she is, according to Fike, egalitarian, and management of the store remains cooperative (A. Fike, personal communication, October 24, 2018).

Figure 4. Mandela Grocery Co-op Location Map[a]



Sources: Fitzpatrick (2012); United States Census Bureau (2017a, 2017b, 2017c).

[a] Maps were created by using ArcGIS software by Esri. ArcGIS and ArcMap™ are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved.

Indeed, the appeal of co-ownership and collective management helped attract Fike, who first encountered Mandela as a shopper and developed her relationship with the co-op over time. Becoming a worker-owner is not the work of a moment. It requires a commitment reflective of the spirit of cooperative economics and the dedication of small-business ownership. Workers' hours are dependent on their own availability and schedules, but the co-op prefers workers who can dedicate at least 15 hours per week. Workers must work at Mandela for at least one year or 1,000 hours, whichever comes first, before they earn the opportunity to buy in. The financial buy-in is US$2,000, payable either as a lump sum or over time through payroll deduction. Benefits of ownership include a voice in how profits are distributed in profitable years. For instance, Fike shares that in one profit-making year, the worker-owners at Mandela decided to distribute a portion among worker-owners, put more money into the business, and then distribute money to other worker-owned businesses. They did this with the insight of experience; another co-op, Rainbow Grocery Cooperative, had given Mandela US$20,000, funding that had helped them succeed. They wanted to provide similar support to other organizations.

The complementary goals of public service and public ownership are generally evident in Mandela's practices and policies. In addition to filling the community's need for a full-service grocery store, to bolster community health through food, Mandela seeks to attract and serve recipients of SNAP and WIC benefits by offering these shoppers a 50% discount on everything that does not contain sugar, salt, or grease. Fike explains that this benefit is so well-known and popular that it attracts shoppers from outside the community as well, as does the idea of shopping at a Black-owned and operated business. However, shoppers at Mandela rep-

resent a diverse group: both long-term West Oakland residents and newer residents, including White technology workers, anarchists, and vegans are among the regular clientele of Mandela (Henry, 2018).

Supporting the community and empowering others is a large part of Mandela's focus. It sponsors pop-up resource villages on the first Friday of every month. These pop-up resource villages, designed by a restorative justice architecture firm to bring people and resources together, celebrate Black culture and feature Black-owned businesses and resources. Participants can receive free haircuts, hear local music, engage in educational experiences, and simply enjoy the community., Its focus is also clear in its recent decision to part ways with its long-time fundraising partner, Mandela Marketplace, because of a shift in the shared vision of developing a space for partner nonprofit and worker-owned ventures to develop and thrive. As Mandela Marketplace shifted its focus toward making loans, Mandela Grocery Co-op decided to forego the opportunity to relocate to a much larger space in favor of dedicating its profits to the development of the community and other worker-owned co-ops and businesses.

The community has seemed to embrace these efforts. Worker-owners at Mandela, for instance, know the history of the neighborhood and appreciate their own place in that history. Worker-owner James Bell imagines how proud his grandparents, who were residents during the economic prosperity of the Pullman Porter era, would be to see him working to revive the community (Mandela Partners, 2015). The challenge of foods being more expensive than what can be purchased at larger corporate outlets remains a part of the co-op reality, but online shopper comments demonstrate that nearly everyone, both shoppers and worker-owners, understands what Mandela stands for: building wealth and helping the community. Many comments express sentiments that while prices may be higher than at other retailers, the benefit to the community makes the cost worthwhile (Yelp, n.d.-a).

Yesterday: Mandela Grocery Co-op's Oakland Roots

The eastern part of the Bay Area in California, Oakland (West Oakland in particular) embodies a rich history of race, economics, and political and community organizing in America. Once home to a thriving and influential Black middle class thanks to early unionization and wartime economic opportunities, post-war economic realities have left Oakland's economy decimated. In its heyday, many male residents in Oakland reaped the economic benefits of employment as Pullman Porters, because the city is home to the western terminus of the Central Pacific Railroad. The city was home to the first West Coast branch of the Brotherhood of Sleeping Car Porters, the union serving porters as well as cooks and domestic servants. One of its organizers and leaders, Cottrell Laurence (C. L.) Dellums, was a civil rights activist and labor leader.

Along with Black economic prosperity and social activism, Oakland's roots are rich in Black political and cultural activism. In 1966, the Black Panther Party for Self Defense was born in Oakland. Although he did not reside in Northern California, through his involvement in the Congress of Racial Equality (CORE) and the Student Non-Violent Coordinating Committee, UCLA student Maulana (a.k.a. Ron) Karenga developed an activist agenda. As an influential Black cultural nationalist, Karenga created Kwanzaa, the African American alternative holiday to Christmas that is now popular throughout the U.S. Founded on seven principles known as Nguzo Saba, which Karenga characterizes as a communitarian African philosophy, Kwanzaa embraces several ideas that undergird the philosophy of worker-owned co-ops such as Mandela Grocery Co-op. Three particular principals of Nguzo Saba are evident in Mandela's work and mission:

- Kujichagulia (Self-Determination): To define and name ourselves, as well as to create and speak for ourselves.
- Ujima (Collective Work and Responsibility): To build and maintain our community together and make our brothers' and sisters' problems our problems and to solve them together.
- Ujamaa (Cooperative Economics): To build and maintain our own stores, shops, and other businesses and to profit from them

> together. (Kwanzaa, 2019, Section 2, Principles and Symbols, para. 5)

However, if one economic principle is consistent, it is change. Following World War II, both the loss of manufacturing jobs and the dwindling of the railroad as the hub of luxury travel contributed to the decline of Oakland as an economically thriving Black neighborhood. The decline continued to the point that the neighborhood, once a hub of Black culture and economic success, could not even claim access to a full-service grocery store at the beginning of the 21st century.

A look at recent numbers might suggest that Oakland is reclaiming its former economic prosperity, with the addition of 45,000 new jobs from 2010 to 2017. Although the overall unemployment rate has declined sharply , the unemployment rates for Blacks at 9.7% and Latinos at 7.1% remain exorbitant compared to the 4.3% for White residents (Torres, 2017). This employment indicator, along with rising home and business costs, are harbingers of the type of gentrification that continually encroaches on Black communities in growing urban areas. But in this case, Oakland's history of community activism set the stage for a response.

As West Oakland was in desperate need of a store, Fike explains that the elders in the community, primarily women, organized and put out a call. Many people and groups interested in providing a store gathered at a meeting. Debate around whether it should be worker-owned or a sole proprietorship ensued, and the meeting inspired the founding of Mandela Marketplace, an organization that helped get Mandela Grocery Co-op started.

It took seven years to get Mandela Grocery Co-op up and running. In the meantime, two groups filled in the gap and provided fresh food for the community: a Black farmers market and a People's Grocery that began by delivering fresh food. Representatives of the People's Grocery attended the first meeting about bringing a grocery store to the area, but they did not want to be part of the food co-op. Now this group has a location and plans for a community market. It has already put US$2 million worth of work into the building and needs an additional US$500,000. While it will be a community market, it won't be a food co-op. Fike explains: "We don't see ourselves competing with this store. We may share some customers because it is a store in the community, but our focus is primarily on the people in our community" (A. Fike, personal communication, October 24, 2018).

The spirit of collaboration and cooperation that defines Mandela Grocery Co-op now was won through hard work and compromise. Refused a lease at the large retail space they originally wanted, by the landlord who favored a big box 99-cent store that also sought the space, Mandela Grocery Co-op's founders accepted the much smaller space next door and began working to build solutions to the problems in the community. Shortly after they opened the doors, Mandela Marketplace was formed as a partner nonprofit organization to support not only Mandela Co-op but also other initiatives based on food justice principles in the community.

Tomorrow: Challenges and Opportunities for Mandela Grocery Co-op

Nonprofit and grant-funded support, like that once provided by Mandela Marketplace, has helped keep Mandela Grocery Co-op up and running over the years. It currently funds the position of general manager, which was added when the logistics of running the store demanded it, according to Fike. But grant funding can be an uncertain foundation. In its efforts to build a customer base as strong as its grant funding, the co-op changed its name from its original choice, Mandela Food Co-op, to Mandela Grocery Co-op. Worker-owners believed this name change would illuminate its purpose to more people. Finally, after 10 years, (five of them spent striving against the challenge of limited space), Mandela Grocery Co-op had an opportunity to move to a larger space. It reached an agreement with the property owner to expand to the larger space the founders had originally wanted, the 99-cent store having left the area as soon as the tax incentives ended (Kauffman, 2017a). The space would have provided opportunities for Mandela to support other community businesses, housing a community pharmacy, and sharing warehouse space with other food-distribution organizations. The move and associated renovations of the new space were expected to cost approximately US$1 million.

However, even with this widespread and consistent community goodwill fostered by the co-op's ideological focus on developing community wealth and its outreach efforts like the pop-up resource village, Mandela Co-op faces continual financial challenges. Although Mandela had become profitable, it could not fund the long-anticipated expansion. After several failed attempts to raise funds for the expansion, Mandela has chosen to shift direction instead. On a GoFundMe page once dedicated to raising funds for expansion, Mandela's worker-owners explain that Mandela has given up the expansion plans as a result of funding challenges and is instead striving to meet a goal of US$200,000 to update and improve its current location and offerings and to expand its support for other worker-owned co-op efforts in surrounding communities (GoFundMe, 2018).

Mandela's primary challenge moving forward, considering its strong community support, will be remaining profitable and developing its financial standing to become a consistent supporter of other worker-owned initiatives and organizations. Its place in the history of the community of Oakland both strengthens its foundation and demands continual advocacy and support for others.

Conclusions

Seward Community Co-op's expansion into the Bryant/Central neighborhoods and Mandela Grocery Co-op's activism in Oakland serve as just two of the many ways that food co-ops can take shape. Founded in the natural foods movement, Seward Co-op still was able to broaden its views and grow both internally and externally to navigate expansion into an originally resistant area. The growth and learning represented by that process are instructive for anyone undertaking community organizing efforts.

The story of Mandela is easy to celebrate in many ways. Still, while the community empowerment is undeniable, the recent unsuccessful effort to expand may seem disheartening. But just as the governance structure of a worker-owned cooperative has little in common with a corporate grocery store model, these organizations should not measure success in the same ways, either. Money, while clearly important, is not the bottom line for food co-ops. For the last 10 years, Mandela has provided a full-service grocery store to a community where there had been none. In an era of gentrification and growing disparities between economic growth for people of color and Whites in the Oakland area, Mandela represents a fiscally viable and profitable Black-owned business that creates community wealth and supports community health. With its newly articulated goal to focus on helping other ground-up organizations in surrounding communities, Mandela may well represent yet another trend in the ever-evolving landscape of American food co-ops.

Clearly, all food co-ops have to balance decisions about food costs and quality with what to stock and whom to hire. Beyond that, what these two case studies reveal is that co-op leaders must consider the ideological foundations and social, historical, and geographical contexts that will define the focus of their work, especially if they seek to reach the communities most in need of them, as these two co-ops did. Seward, originally a natural foods–based organization, enjoyed the benefit of middle- and upper-middle-class member/owners who were more able to contribute money to the cause. However, to serve a diverse and less wealthy community, Seward had to devote much more effort to earning the trust and buy-in of the stakeholders in that community. Mandela, begun by community members to provide access to healthy food and build community wealth, was firmly embedded in the Oakland community from its inception. It enjoyed an advantage in community good-will and buy-in, but had to devote much more of its effort to raising capital and remaining financially afloat. While generalizing or suggesting algorithms for success is beyond the purview of these case studies, those interested in understanding or developing food co-ops might find a foothold in their ideological foundations as well as the social, historical, and geographical contexts.

Acknowledgments

We would like to thank the editors at JAFSCD and two anonymous JAFSCD reviewers for their helpful comments on earlier versions of this article. We are also indebted to George R. Johnson for creating the maps and graphs that appear in this article.

References

Atkinson, S. R. (2016, April). What's missing from the discussion of "food deserts"? An analysis of discursive justice in "food desert" related articles in *The New York Times, Chicago Tribune* and *The Los Angeles Times* from 2008-2015. In P. Mendez & K. Spreyer (Instructors), Environmental Sciences Senior Thesis Symposium. Symposium conducted by the University of California Berkeley Environmental Sciences Department. Retrieved from https://nature.berkeley.edu/classes/es196/projects/2016final/AtkinsonS_2016.pdf

Boarini, C. (2013, July 10). Community residents want to be heard, not 'saved' by new Seward Co-op in South Minneapolis. *Twin Cities Daily Planet.* Retrieved from https://www.tcdailyplanet.net/more-another-grocery-store-seward-co-op-listening-session-south-minneapolis/

Fitzpatrick, C. (2012) States_basic (Shape file). Redlands, CA: Esri. Retrieved on May 8, 2019, from https://www.arcgis.com/home/item.html?id=f7f805eb65eb4ab787a0a3e1116ca7e5#overview

GoFundMe. (2018, March 22). *Funding Healthy West Oakland.* Retrieved December 27, 2019, from https://www.gofundme.com/f/mandelagrocery

Gordon Nembhard, J. (2014). *Collective courage: A history of African American cooperative economic thought and practice.* University Park: Pennsylvania State University Press.

Henry, S. (2018, July 9). An Oakland community grocery store feeds its people. *KQED Food.* Retrieved from https://www.kqed.org/bayareabites/129251/an-oakland-community-grocery-store-feeds-its-people

Kauffman, J. (2017a, March 21). Mandela Foods Co-operative set to expand into larger West Oakland space. *SF Gate.* Retrieved from https://www.sfgate.com/test-5-5-2017/article/Mandela-Foods-Co-operative-set-to-expand-into-11015430.php

Kauffman, J. (2017b, March 31) The rise of the modern food cooperative. *SF Gate.* Retrieved from https://www.sfgate.com/news/article/The-rise-of-the-modern-food-cooperative-11006896.php

Kwanzaa. (2019, June 25). Retrieved June 27, 2019, from https://en.wikipedia.org/wiki/Kwanzaa

Lindeke, B. (2015a, November 19). Neighborhood groups and Friendship Store agree to agree. *Twin Cities Daily Planet.* Retrieved from https://www.tcdailyplanet.net/neighborhood-groups-and-seward-friendship-store-agree-to-agree/

Lindeke, B. (2015b, July 10). The Seward Friendship Store sparks return of the co-op war. *Twin Cities Daily Planet.* Retrieved from https://www.tcdailyplanet.net/the-seward-friendship-store-sparks-return-of-the-co-op-war/

Mandela Partners. (2015, February 3). *The Victory Garden's Edible Feast Episode 5 - The Bay Area* [Video file]. Retrieved from https://www.youtube.com/watch?v=_2pOmZImI0Q

Minneapolis neighborhood profile: Bryant. (2011) *Minnesota Compass.* Retrieved from https://www.mncompass.org/_pdfs/neighborhood-profiles/Minneapolis-Bryant-102011.pdf

Minneapolis neighborhood profile: Central. (2011). *Minnesota Compass.* Retrieved from https://www.mncompass.org/_pdfs/neighborhood-profiles/Minneapolis-Central-102011.pdf

Minneapolis neighborhood profile: Seward. (2011). *Minnesota Compass.* Retrieved from https://www.mncompass.org/_pdfs/neighborhood-profiles/Minneapolis-Seward-102011.pdf

Minnesota Department of Transportation. (2018). City boundaries of Minnesota [Shape file]. St. Paul: Minnesota Department of Transportation. Retrieved on May 5, 2019, from https://gisdata.mn.gov/dataset/bdry-jurisdiction

Minnesota Department of Transportation. (2017). County boundaries of Minnesota. [Shape file]. St. Paul: Minnesota Department of Transportation. Retrieved on May 5, 2019, from https://gisdata.mn.gov/dataset/bdry-counties

Neighborhoods of Minneapolis. (2018). In *Wikipedia.* Retrieved on October 30, 2018, from https://en.wikipedia.org/wiki/Neighborhoods_of_Minneapolis

Neighboring Food Co-op Association. (n.d.). What is a co-op? Retrieved from http://nfca.coop/definition/

Olsen, K. E. (1998). Minnesota food cooperatives records. Retrieved from http://www2.mnhs.org/library/findaids/00561.xml

Pagani, S. (2016, September 20). This cooperative grocery store wants to break the diversity mold. *Civil Eats.* Retrieved from https://civileats.com/2016/09/20/this-minneapolis-cooperative-grocery-store-is-working-to-break-the-diversity-mold/

Reid, S. (2012). Buying clubs: Diverse organizations with complicated relations to retail co-ops. *Cooperative Grocer, 160*(May–June), 8–10. Retrieved from https://www.grocer.coop/articles/buying-clubs

Reyes, D. (2015). How cooperative grocery stores are bringing food access to low-income neighborhoods. Retrieved January 15, 2020, from the Cooperative Development Institute website: http://cdi.coop/food-coops-food-deserts-low-income-communities/

Seward Community Co-op. (n.d.). SEED round-up program. Retrieved on January 16, 2020, from https://seward.coop/seed/

Seward Community Co-op. (2018, September). Classes and events calendar, September 2018. Retrieved on September 15, 2018, from https://seward.coop/news/calendar

Slocum, R. (2007). Whiteness, space and alternative food practice. *Geoforum, 38*(3), 520–533. https://doi.org/10.1016/j.geoforum.2006.10.006

Torres, B. (2017, November 30). Oakland struggles with keeping economic diversity. *San Francisco Business Times.* Retrieved from https://www.bizjournals.com/sanfrancisco/news/2017/11/30/oakland-diversity-jobs-employment-demographics.html

U.S. Census Bureau. (2017a). CA county boundaries [Shape file]. Suitland-Silver Hill, MD: U.S. Census Bureau. Retrieved on May 9, 2019, from https://data.ca.gov/dataset/ca-geographic-boundaries

U.S. Census Bureau. (2017b). CA places boundaries [Shape file]. Suitland-Silver Hill, MD: United States Census Bureau. Retrieved on May 9, 2019, from https://data.ca.gov/dataset/ca-geographic-boundaries

U.S. Census Bureau. (2017c). CA state boundary [Shape file]. Suitland-Silver Hill, MD: U.S. Census Bureau. Retrieved on May 9, 2019, from https://data.ca.gov/dataset/ca-geographic-boundaries

Us Organization. (1999). *Nguzo Saba.* Retrieved from http://www.us-organization.org/nguzosaba/NguzoSaba.html

Usher, K. M. (2015). Valuing all knowledges through an expanded definition of access. *Journal of Agriculture, Food Systems, and Community Development, 5*(4), 109–114. https://doi.org/10.5304/jafscd.2015.054.018

Wagner, J. (2017). Minnesota ranked 2nd-worst in U.S. for racial equality. Retrieved from https://minnesota.cbslocal.com/2017/08/22/minnesota-racial-inequality/

Yelp. (n.d.-a). Mandela Foods Cooperative [Reviews]. Retrieved on October 3, 2018, from https://www.yelp.com/biz/mandela-foods-cooperative-oakland

Yelp. (n.d.-b). Seward Community Co-op [Reviews]. Retrieved on September 20, 2018, from https://www.yelp.com/biz/seward-community-co-op-minneapolis-4

Zimbelman, K. (n.d.). A deeper dive into co-op history. Retrieved September 20, 2018, from the National Cooperative Growers Association website: http://strongertogether.coop/food-coops/history-of-co-ops/

Zitcer, A. (2015). Food co-ops and the paradox of exclusivity. *Antipode, 47*(3), 812–828. https://doi.org/10.1111/anti.12129

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Implementation of a farmers market incentive program in Maryland: Perspectives from vendors

Caitlin A. Misiaszek,[a] * Amelie A. Hecht,[a, b] and Gabby Headrick [c]
Johns Hopkins Bloomberg School of Public Health

Shelley Brosius [d] and Amy Crone [d]
Maryland Farmers Market Association

Pamela J. Surkan [c]
Johns Hopkins Bloomberg School of Public Health

Submitted February 22, 2019 / Revised May 13 and June 14, 2019 / Accepted June 17, 2019 / Published online February 28, 2020

Citation: Misiaszek, C. A., Hecht, A. A., Headrick, G., Brosius, S., Crone, A., & Surkan, P. J. (2020). Implementation of a farmers market incentive program in Maryland: Perspectives from vendors. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 255–266. https://doi.org/10.5304/jafscd.2020.092.004

Abstract

A number of farmers markets have begun to offer matching incentive programs as a way to increase access to fresh foods for low-income families and increase sales among vendors. However, research evaluating the implementation of these programs is limited. This process evaluation study employed a qualitative approach, interviewing vendors (*n*=19) selling at four farmers markets in Maryland to understand the barriers and facilitators to implementing the Maryland Market Money program. Overall, vendors reported positive attitudes toward the incentive program. Interviewed vendors identified key facilitators such as ease of implementation and positive social and economic impact of the program for participants and themselves. Vendors also discussed barriers, which included a lack of understanding among customers about how the program operated, poor program promotion, and lack of educational materials. Some vendors described nega-

[a] Caitlin A. Misiaszek and Amelie A. Hecht, Center for a Livable Future, Johns Hopkins Bloomberg School of Public Health; Baltimore, MD 21202 USA.

[b] Amelie A. Hecht, BA, Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health; Baltimore, MD 21202 USA.

[c] Gabby Headrick, MSPH, RD, LDN, and Pamela J. Surkan, ScD, Department of International Health, Johns Hopkins Bloomberg School of Public Health; Baltimore, MD 21202 USA.

[d] Shelley Brosius, MPH, and Amy Crone, MA, Maryland Farmers Market Association; Millersville, MD 21108 USA.

* *Corresponding author:* Caitlin Misiaszek, MPH, Center for a Livable Future, Johns Hopkins Bloomberg School of Public Health; 111 Market Place, Suite 840; Baltimore, Maryland 21202 USA; +1-410-223-1732; cfishe29@jhu.edu

Funding Disclosure

This research was supported by funding from the Johns Hopkins Center for a Livable Future and a cooperative agreement between the Maryland Farmers Market Association and the U.S. Department of Agriculture Agricultural Marketing Service. Training support for AAH was provided by the Johns Hopkins Center for a Livable Future–Lerner Fellowship. The funders had no role in the design, analysis, or writing of this manuscript.

tive experiences with customers and expressed stigmatizing views toward customers. Given that vendors are key stakeholders in program implementation, as incentive programs continue to expand, it is important to take into account their views and concerns to create successful programs.

Keywords
Barrier, Facilitator, Farmers, Farmers Markets, Nutrition Incentive Program, SNAP, WIC

Introduction

The number of farmers markets (FMs) operating in the U.S. has grown dramatically in recent decades, with almost 8,700 operating markets in 2017 as compared to only 1,755 in 1994 (U.S. Department of Agriculture [USDA] Agriculture Marketing Service, 2017). Research suggests that FMs result in social and economic benefits for both buyers and sellers by promoting a sense of community, providing fresh and local foods for consumers, and increasing sales and opportunities to develop business for farmers (Brown & Miller, 2008; Hunt, 2007). In addition, FMs have been promoted as one potential strategy to increase fresh food access and fruit and vegetable consumption, especially among low-income populations (Centers for Disease Control and Prevention, 2011).

The ability to use federal nutrition assistance benefits at FMs can further increase healthy food accessibility for low-income households (Hughes, Brown, Miller, & McConnell, 2008; Jilcott Pitts et al., 2014; Olsho et al., 2015; Woodruff et al., 2018). In 2017, over 7,000 authorized FMs accepted Supplemental Nutrition Assistance Program (SNAP) benefits, the largest federal nutrition program in the U.S., with a total of US$22,440,312 in annual FM SNAP redemption (USDA Economic Research Service, 2017). Many FMs also accept other benefits, including the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and the Farmers Market Nutrition Program (FMNP) for WIC participants and seniors.

A growing number of FMs have begun providing incentives or matching programs to customers who use their nutrition assistance benefits to both further increase access to healthy foods and encourage FM use (King, Dixit-Joshi, MacAllum, Steketee, & Leard, 2014). Many matching programs at FMs in the U.S. provide a dollar-for-dollar match up to a designated amount, but differ according to the amount of match, the types of benefits matched, and the types of food purchases eligible for match. These factors are often determined by the organization managing the program and the source of funding. For example, the Maryland Farmers Market Association (MDFMA) established the state's first unified matching initiative, the Maryland Market Money (MMM) program in 2013 (Maryland Farmers Market Association, 2017). The MDFMA provides participating FMs with funds to support a match of US$5 per customer per day for individuals using federal nutrition assistance benefits, including SNAP, WIC, and FMNP (WIC and senior).

Previous research on matching programs has primarily focused on customer impacts and perspectives. Studies have found positive impacts on participating customers, including increased food security, FM use, and fruit and vegetable consumption (Pellegrino et al., 2018; Savoie Roskos, Wengreen, Gast, LeBlanc, & Durward, 2017; Young et al., 2013). While some research has explored the economic benefits to vendors, including an increase in sales and new customers (Lehnerd, Sacheck, Griffin, Goldberg, & Cash, 2018; Mann et al., 2018; Oberholtzer, Dimitri, & Schumacher, 2012), few studies to date have examined vendor perspectives on participation in matching programs. These studies conducted surveys with vendors and report that vendors participating in matching programs did not perceive program logistics as complex or burdensome to their business (Lehnerd et al., 2018; Payne et al., 2013). In addition, one study found that the lack of matching program promotion is a major barrier to maximizing benefits for vendors (Lehnerd et al., 2018). These studies lack qualitative data to provide an in-depth understanding of vendor perspectives.

Due to the significant role FM vendors play in administering match programs and the potential economic and social benefits they may receive, more research is needed to understand their perspective on barriers and best practices for program implementation. This study addresses this gap by employing a qualitative approach to explore FM

vendors' overall perspective on the MMM program, barriers and facilitators in program implementation, and experiences with customers. A multilevel evaluation framework established by Grol and Wensing (2004) was used to conceptualize barriers and facilitators and vendor recommendations to strengthen program operations at each level of implementation. The findings from this process evaluation can be used to identify best practices that can be employed by other FM matching programs across the country.

Methods

Program Background

Maryland Farmers Market Association launched the MMM program in order to streamline multiple incentive programs across the state by centralizing and expanding program operations (Maryland Farmers Market Association, 2017). In 2017, there were a total of 156 FMs across the state, ranging in size and days and hours in operation, with 24 markets participating in the MMM program (Maryland Farmers Market Association, 2017). A total of US$333,961 in federal nutrition benefits and matching dollars were spent with 237 vendors (Maryland Farmers Market Association, 2017). Grant and government funding, local business sponsorships, private donations, and contributions by participating FMs financially support the MMM program.

The Maryland Market Money match was distributed as US$1 tokens and could be used to purchase any SNAP-eligible item, including fruits and vegetables; breads and baked goods; meats, fish and poultry; dairy; eggs; jams, preserves, condiments; and seeds and plants that produce food. Market managers distributed MMM tokens differently to customers based on benefit type. Customers using WIC and FMNP benefits spent their WIC and FMNP benefits directly at vendors' stands on eligible products (fruits and vegetables), and in turn, vendors were responsible for providing WIC and FMNP customers with a receipt. Customers then turned in the receipt at the market manager's table in exchange for MMM tokens to spend directly with vendors. In contrast, SNAP customers first visited the market manager's table to swipe their Electronic Benefits Transfer (EBT) card to receive market-specific SNAP tokens and their MMM tokens to spend directly with vendors, eliminating the vendor receipt process.

Some FMs required vendors to have special equipment to process SNAP transactions. In 2016, all but one market participating in MMM received the necessary equipment for processing SNAP on behalf of their vendors through federal funds. However, during the year of the study, the federal funding was no longer available, and vendors had to pay for the processing equipment out of pocket. At the one market (in our study) without market-level SNAP processing equipment, SNAP customers had to register for the "Loyalty" program, a pilot program of an electronic version of MMM (since discontinued) if they wished to receive the MMM match for their purchases with SNAP. In the Loyalty program, the match was automatically loaded onto an electronic Loyalty account, which could be accessed and spent using the customer's EBT card. At this market, vendors were responsible for managing the equipment required to process the EBT cards.

MMM tokens could be spent at any participating market, but Loyalty was only valid at the one market described above. Customers had to spend their tokens in full over the course of the market season and were not able to receive change. Vendors were reimbursed by turning in the MMM tokens spent at their stand to market managers, who then provided checks to the vendors with corresponding amounts.

Data Collection

Researchers conducted semistructured interviews with vendors selling at four FMs participating in the MMM program from December 2016 through December 2017. The four FMs were selected based on high MMM participation across all benefit types (SNAP, WIC, and FMNP), market diversity (e.g., geographic, diversity in number of vendors, and differences in management), and a consistent matching cap (US$5) per customer per day. All four markets were located in urban or suburban communities, with a total of 162 vendors (prepared food and farm-raised products). One FM was selected because it utilized the Loyalty program for

distributing MMM match for SNAP purchases.

An initial sample of vendors (n=20) selling at the four selected FMs was invited to participate in the study. Researchers recruited vendors, in consultation with MDFMA, based on high volume of MMM spent at their stands and to represent a diversity of products sold (e.g., fruits and vegetable vendors, meat and poultry vendors). We sampled vendors who had a high volume of MMM, based on empirical knowledge from MDFMA, spent at their stands with the assumption that they had the most interaction with the program and could speak to specific process barriers and facilitators they faced. Vendors who had minimal sales or did not participate would have fewer or no experiences with the program to draw from and therefore were not included in this study. Researchers recruited vendors in-person at the four selected FMs, by phone, and by email.

The research team developed the protocol for the semistructured interviews. Interviews included questions about the number of years they have participated at FMs and with the MMM program, their overall perception of MMM, the ways in which MMM affected their businesses, facilitators and barriers to implementing MMM, customer interactions, and recommendations to improve the program. After approximately half of the interviews were completed, researchers added additional probes to provide a deeper understanding of challenges and facilitators to program implementation. Interviewers were trained on qualitative methods and interview protocols. Senior research team members read each interview, provided feedback on techniques for administering the remaining interviews, and assessed whether theoretical saturation had been met. We believed no new themes emerged in final interviews, which factored into our decision to not conduct additional interviews.

Researchers conducted in-depth interviews in-person or by phone, depending on the preference of the interviewee. Interviews lasted, on average, approximately 30 minutes, and interviewees received a US$20 gift card for participating. The interviewer or a third party transcribed all recordings. All the participants provided verbal informed consent prior to the interview. The Johns Hopkins Bloomberg School of Public Health Institutional Review Board determined this study protocol to be exempt. The overall study included interviews and surveys with market managers and participating customers. Results from these analyses are reported in additional publications (Hecht et al., 2019, Headrick et al., 2019).

Data Analysis

Two members of the research team who had conducted or supervised the interviews analyzed transcripts using ATLAS.ti (version 6.0, ATLAS.ti). Researchers coded all transcripts independently, after which they discussed inconsistencies to come to agreement on emerging themes. The final codebook included a total of 79 codes. The established Grol and Wensing implementation framework was used to organize all major themes identified (Grol & Wensing, 2004). The framework employs a multilevel approach to describe barriers and facilitators to implementing interventions, illuminating how results can be used to impact change at multiple levels of implementation. The levels include innovation (MMM program); professional delivering innovation (vendors); patient (customers); social context (FM vendor culture and opinions); organizational context (FM itself and market managers); and economic and external context. Results presented characterize major themes as well as ideas put forth by a small subset of participants that researchers found to be especially novel. Quotations were chosen based on representativeness and clarity.

Results

Vendor Overview

Nineteen of 20 vendors contacted agreed to participate. One vendor could not be reached to schedule an interview. Four were interviewed in person, and 15 were interviewed by phone. Most vendors sold their products at more than one FM, and all vendors had participated in the MMM program for at least one year.

Barriers and Facilitators to Implementation and Program Recommendations

Vendors interviewed described many perceived barriers and facilitators to implementing the MMM

program (Table 1), presented according to Grol and Wensing level of implementation. In addition, vendors provided recommendations to strengthen and improve the MMM program (Table 2).

Innovation: Maryland Market Money Program

Within the first level of the implementation framework, the innovation (in this case, the MMM program), we examined vendor perspectives on the feasibility and impact of the MMM program. Overall, most vendors interviewed described MMM as an effective program that was easy to implement. The majority of vendors described the structure and logistics of the program as straightforward and easy, and not time-consuming to participate in. One vendor summed up their role in the program:

Table 1. Perceived Facilitators and Barriers to Implementation of the Maryland Market Money Program among Vendors (*n*=19)

Level of Implementation	Themes	Facilitators/Barriers
Innovation: Maryland Market Money Program	Feasibility of program	+ Easy to implement
	Impact of program	+ Helps families stretch their dollars – Match amount may not be enough – Unsure program has long-term impact
Professionals Delivering Innovation: Vendors	Motivation to participate in program	+ Extra revenue and additional customers + Helping families in need
	Knowledge to implement program	+/– Varying degrees of comprehension
Participants: Customers	Knowledge about program	– Lack of knowledge about program, including program details and funding sources
	Attitude toward program	+ Most customers are appreciative of program – Some customers may take program for granted
Social Context: Vendor Culture and Opinions	Opinions and culture of network	+ Empathy towards customers – Stigmatizing views towards customers
Organizational Context: Farmers Market and Market Managers	Staff	+ Market staff are helpful
	Resources	– More education and communication are needed
	Promotion	– More promotion is needed
Economic and External Context	Financial arrangements	+ Reimbursement process is easy
	Role of other organizations	– Lack of promotion and education from other organizations

+ Facilitator
– Barrier

Table 2. Vendor Recommendations to Improve Maryland Market Money (*n*=19)

Barrier	Recommendation
Incentive	Increase match amount for customers
Education	Provide customers with educational opportunities and materials to improve understanding of program details and funding sources
	Include other organizations in providing education to customers on program details and funding sources
	Provide vendors with more educational opportunities and materials to improve understanding of program details and funding sources
Communication	Increase communication between MDFMA, managers, and vendors about funding status
Promotion	Increase signage at market and vendor stands
	Include other external organizations in marketing and promotion strategies, including WIC clinics and senior centers

"It's been flawless. I mean, people pay with [the tokens] and . . . I accumulate them and count it and write it down, how many I received, turn them into the Market Master at the end of the market, and the next week I have a check for that money."

Many vendors described MMM as a program with a positive impact that has helped low-income families to stretch their budgets and purchase more fresh items from the FM. One vendor explained how important the additional money is for many families: "Well, I think it's a great incentive program, because the people really appreciate that dollar savings, you know, that—getting that bonus dollars is important for them. For them, it's an important contribution to their budget."

While many vendors saw the MMM program as helping stretch budgets, some described the match amount as too low and having limited impact. Some vendors recommended an increase in the match amount if the budget allowed for it, noting that both customers and vendors would benefit from an increase. When asked whether the US$5 match was an appropriate amount, one vendor said: "I wish it could be as much as it could be, but I know that it just can't always be the case given—the program, I'm sure it is not funded as much as it could be or as well as it should be. I mean, that's a million-dollar question. I mean, if it was 10 or 15 dollars it would be great, because realistically, five dollars is not—that's not that much produce. The prices that most farmers sell, that's a bunch and a half of kale, or two pounds of tomatoes or like a box of cherries. Five dollars doesn't buy that much, especially if you have kids to feed."

A small number of vendors were skeptical of the long-term impact of the MMM program. One vendor explained that while they understood some families benefit from the MMM program, they worried that the program would not increase participants' overall shopping at FMs or result in a healthier diet, as intended. When asked about their opinion of the MMM program, one vendor explained their concerns: "Well, I have a lot of opinions . . . It creates a system of . . . where our food has no value. It's worth nothing. Because you can get it for free. And, so, I have a concern that we are devaluing the most important products that we have…, so when people have money, they are spending it on Coca-Cola and Twinkies. Or candy, or cigarettes, or alcohol—or whatever else, you know. So I'm a little concerned that that's what we have done. I don't know how to change that, and I'm not saying that there aren't people that desperately need it and [whom] it helps tremendously."

Professionals Delivering Innovation: Vendors

The next level of the framework describes the vendors' personal motivation for participating in the MMM program and knowledge of program details. Most vendors described the economic benefits of participating in MMM. Many described the program as a win-win program that benefited both customers and vendors and was worth the time required to participate; they were motivated to participate due to an increased income. One vendor described: "So I'm willing to do whatever it takes and work with them, to accept that money. Because that's increased revenue for us."

A few vendors disagreed and believed that MMM was not financially worthwhile, as it represented a very small percentage of overall sales, although they recognized that other vendors may benefit more. According to one vendor, MMM did not have a major impact on sales: "…as a percentage of my total overall sales, it's minimal. I mean, it may be—it's less than one percent of my total sales, but yet it probably takes 10, 15 minutes of my time to record and transact with it, so I would say if the program disappeared and went away, I wouldn't be disappointed because I wouldn't be losing that much in sales. So that's my personal experience. There's probably some vendors there that it's a much larger portion of their sales. But for me, it's not."

Vendors mentioned other economic benefits, including gaining new customers they may not have attracted without the MMM program. While FMNP and WIC customers could only use their benefits at fruit and vegetable stands, they could use their MMM match at stands selling any SNAP-eligible foods—which also include meat, dairy, and bread. Therefore, some vendors that sold SNAP-eligible foods other than fresh fruits and vegetables mentioned the benefit of growing their customer base through the MMM program. One vendor said: "For us, when they use the WIC checks, they're

not able to, say, buy eggs or honey or even some of the meats that we sell. When they use the matching program there aren't restrictions on there to buy the eggs or buy the meats. Some of the people that are using that money are trying to eat healthier, and with that program they're able to actually eat healthier. They're able to afford the products that, because there are rules for those programs, they have to work within the confines of it. But with the matching program they're able to get those extra things."

Some vendors recognized the need that the program helped to fill and were motivated by altruistic reasons, including giving back to their community and helping low-income individuals and families. As one vendor described, "But when it comes to getting access to people who need it, that is why we got into the FM. And that's why we will remain in the FM. That aspect alone is why we're here or why we come to the markets—is to be able to give people that opportunity."

Many vendors reported that they understood the rules of MMM; however, when asked about specific details, the majority of vendors answered incorrectly or asked clarifying questions throughout the interview. For example, some vendors did not know the dollar amount customers were matched per day or which foods could be purchased using MMM. While lack of knowledge was not a perceived barrier from the vendors' perspective, we identified it as a potential barrier to implementation.

Participants: Customers

The next level of the framework focuses on how vendors perceived customers' knowledge of and attitude toward receiving the MMM match. Most vendors agreed that a key challenge in program implementation was customers' lack of understanding of MMM program implementation and funding. Some vendors found customers' lack of knowledge challenging as they were often responsible for answering questions at the point of purchase. One vendor mentioned how taking the time to explain the program, especially if there was a language barrier, could interfere with business. Another vendor described the process of explaining to WIC and FMNP customers that they have to return to the market manager's stall to receive their MMM tokens, which resulted in some unpleasant interactions: "Some people I guess it's hard for them to understand how much they should get. There's a language barrier with some people, and so it can be time-consuming when we're trying to explain things to them, and we have other customers that we're trying to help, and then they get upset because we're trying to talk to someone for five minutes. So I don't know if there is a way to clarify things for people, so it'd make it easier and faster for everyone." Further, the year prior to the study, funding for the MMM program ran out before the season was over, and some vendors described challenging experiences with customers who were upset or confused by the program ending early.

A few vendors mentioned that other specific details of how the program operated were unclear to customers and were a challenge to clarify, such as the inability to give change back from purchases made with match tokens. In contrast, a few vendors described giving customers a few extra items to compensate for not giving change. One vendor explained, "When the numbers don't come out to five, I always give them six dollars' worth of something rather than five, and that makes the math come out better, and I always tell them that that's my contribution to the program."

When describing customers' attitudes toward the program, vendors shared a range of views. A small number of vendors described customers as ungrateful for the additional match. One vendor described customers as taking the MMM program for granted: "Yeah, I have a problem with it, and it's just that the people come to expect from us, it's just gimme, gimme."

In contrast, many vendors described how customers valued and appreciated the program. One vendor told a story of a customer who saved up their MMM tokens throughout the season to buy a turkey for Thanksgiving, something they may not have been able to do without the program. Another vendor explained the excitement when customers received their MMM tokens: "I would say half of the customers that get the matching money have no idea they're going to get the matching money and they're tickled pink when they do get

the matching money…so they're all very happy to have the matching dollars."

Social Context: Vendor Culture and Opinions

The next level of the Grol and Wensing framework focuses on the social context, including the broader opinions and culture of the vendors as it relates to the MMM program and customers. A handful of vendors described above who believed customers had ungrateful attitudes expressed broadly stigmatizing and discriminatory views toward customers participating in the MMM program. Some of these vendors described the MMM customer base in a negative light, such as rude or taking the program for granted. One vendor described their view toward customers and the program: "There again I think it would be better for everybody if they teach them how to participate in the workforce and make their own money and not depend on me and you to pay—you know—for food. They are used to it now."

However, some vendors recognized the stigma associated with receiving nutrition assistance benefits and were empathetic toward customers. One described their interaction with MMM customers: "And the whole thing is with programs like this, the whole idea is to be able to not draw too much attention because there's still a stigma out there with these kinds of programs. And some people are more comfortable with using them than others as far as consumers. And sometimes they're a little sheepish to ask because they're afraid; maybe somebody is going to think whatever about me. But we're also happy to explain it. And we're not yelling it across the aisle. We just explain it one-on-one nice and discreetly, so people don't feel like we're calling all their business out on the street."

Organizational Context: Market and Market Manager

The next framework level explores the organization, including the staff, resources, and market managers' promotional efforts. Vendors interviewed described the market staff as a valuable resource who helped both vendors and customers navigate the MMM program. While most vendors said they did not receive any formal training on the MMM program, some vendors described receiving information from market managers about it, such as paper or email instructions. Many vendors also described witnessing market managers helping customers navigate the program and answering questions as needed. One vendor said: "And that's because when they get [the tokens] from the market manager, he gives them a thorough description of what they can do with that, so that helps a lot, yeah. He has a booth there at the market, and he's always busy."

Some vendors, however, still wanted market staff to provide additional information on the program for themselves and for customers. Some vendors indicated that more reading material, not only on the details of the program but also on the mission and purpose of providing matching dollars to low-income families, would be helpful. One vendor recommended providing more information, or a class, for customers to learn more about why the program exists and how to use the match: "Well, for the customers that are actually receiving it, I think maybe like a class that actually emphasizes … where it comes from, how it's spent, and how can they use it. So if they have, I don't know, a crash course, that way they know what they're getting, what's the value of it and how it can be used."

A few vendors mentioned how it would be beneficial to receive updates on the status of funding throughout the season, given negative past experiences with funds running out early. Vendors recommended that managers send program updates via email so they could feel prepared and able to communicate new information to customers.

Lastly, vendors mentioned the lack of marketing and promotion by market managers as a barrier to implementation. According to vendors, more promotion could increase customer participation. One vendor suggested having more promotional materials at participating markets and vendor stands, suggesting, "Maybe print up a little placard or a—sometimes we get a sign the size of a piece of paper, and maybe that would be good to have, something like, 'Maryland Market Money offered at this market,' that we could just hang up at our stand, and . . . maybe a small sign that would be easy to read and advertise that this market and all the vendors participate in the Maryland Market Money."

Economic and External Context

The last level of the framework addresses external influences, such as economic context and the role of outside organizations. Most vendors were content with the reimbursement process and described it as easy and efficient. Some vendors mentioned the amount of time to receive their reimbursement varied from market to market, but most did not view this as a barrier. According to one vendor, "Yeah, every day we have to count up the market tokens and turn them in at the end of the day, and then—like at [one market], we get a check once a week for the Maryland Market Money, and then at [another market] we also get a check once a week for the Maryland Market Money. So it's pretty easy."

Vendors that sold at the market with the Loyalty program described some economic barriers. In order to accept Loyalty, vendors must have specific processing equipment, and during the year of the study, vendors were required to pay for that out of their pocket. Some vendors described this cost as a burden and opted to not participate further in MMM at this market.

Lastly, some vendors described a lack of involvement from external organizations that have contact with nutrition assistance program beneficiaries, such as senior centers and WIC clinics, as a potential barrier. Some vendors recommended that these organizations be more involved in disseminating information on program details and helping to promote the program among their clients. As one vendor said, "Well, I think it would be helpful when they pick up their [voucher] books at the WIC clinics, [and] for the seniors, that they also go over [the MMM program] with them and say, 'Hey, this is a program that will help you to stretch your food dollar.'"

Discussion

This study found that most vendors reported positive attitudes at each level of program implementation. Vendors interviewed identified key facilitators, such as ease of implementation and positive social and economic impacts for nutrition assistance benefit customers and themselves, as well as barriers, including lack of understanding among customers about how the program operated and lack of promotion and educational materials. While some vendors described negative experiences and expressed stigmatizing views toward MMM customers, many recognized the positive impact on both customers' budgets and their own business.

Our findings provide additional support that matching programs like MMM benefit participating vendors through a perceived increase in sales and new customers. Payne et al.'s (2013) evaluation of the implementation of the Health Bucks Program, an FM incentive program in New York City, included customer, market manager and vendor perspectives. In that study, interviewed vendors noted that they had an increase in sales and gained new customers by participating in the program (Payne et al., 2013). In our study, most vendors stated that they were motivated to participate because of an increase in sales, and many vendors who were unable to accept WIC and FMNP benefits perceived a value in gaining new customers due to the MMM program. These findings are also consistent with quantitative studies that show a positive economic impact for vendors participating in FM matching programs. This is important to consider in light of major funders across the country moving toward restricting match-eligible foods to fruits and vegetables only (Mann et al., 2018; Oberholtzer et al., 2012). Limiting the variety of items available for purchase may affect vendors selling items that may contribute to a market basket of healthy items.

A similar study conducted by Lehnerd and colleagues (2018) surveyed fruit and vegetable farmers in the Mid-Atlantic region with the goal of understanding farmers' perceptions of adopting FM nutrition incentive programs. In their study, vendors who participated in incentive programs reported high product pricing as a top barrier to successful program implementation (Lehnerd et al., 2018). Similarly, our study found that some vendors described the US$5 match amount to be too low due to price points and recommended increasing the match amount if the budget allowed for it. Additional research should be conducted to better understand what match amount is optimal for both consumers and vendors, while remaining within the program's budget and reaching as many customers as possible.

In our study, many vendors agreed that addi-

tional promotion and educational resources for customers would strengthen the program. While not perceived by vendors as a challenge, we also identified a lack of understanding of how components of the program operate among the vendors. This is an important finding, as lack of vendors' understanding of program details, including the match amount or which products can be purchased using benefits, may discourage customers from using the program. Vendors play an important role in educating customers; therefore, training for vendors and improving educational resources would help increase knowledge among vendors and customers alike. Recommendations included communicating more regularly about program updates, creating resources for vendors and consumers, and connecting with senior centers and WIC clinics that have regular contact with consumers to promote and educate about the program. In addition, vendors should take advantage of existing opportunities through MDFMA or markets they participate in, such as annual kick-off market meetings, to learn about the MMM program. These strategies could increase the number of MMM participants and better inform both customers and vendors about program logistics, reducing the potential for negative interactions resulting from misunderstandings.

Lastly, our study found a unique and important challenge highlighted by vendors. Some vendors described negative experiences with and views toward participating customers. While there were only a few vendors who spoke critically of customers, educational efforts such as racial equity or cultural sensitivity classes may be important to dismantle biases and explain the importance of programs such as MMM and federal nutrition assistance benefits as a whole. The social stigma expressed should be further explored to understand how this may affect the culture of FMs and customer experience.

This study has several limitations. First, it included interviews only with vendors who were participating in the MMM program and had high sales (as determined by the MDFMA), and therefore the perspectives of vendors who do not participate or had varying levels of sales are missing. Future research should include perspectives of those who decline or are unable to participate and have varying levels of sales in order to gain a more complete picture of the vendor experience at markets with matching programs. Second, while this study provides insight into facilitators and barriers that may be useful for other programs across the country to learn from, it is important to note that programs differ nationwide due contextual factors. Some findings may not be applicable in other FM, and the specific context will need to be considered when applying these findings. Third, we only sampled vendors from four markets, all of which are located in suburban and urban areas in one state, and therefore represent a limited perspective on program implementation. Perspectives from vendors selling at rural FMs should be included in future research. Fourth, quantitative methods were not included to verify and evaluate impact on vendor sales. Quantitative measures in future research may also help identify how vendor sales affect perceptions. For example, does a vendor with high sales perceive the program differently from vendors who have fewer sales? Future research should consider both qualitative and quantitative data to further understand program perceptions and benefits of participation for vendors at multiple scales. Lastly, we conducted this study during the season before the electronic benefits issuance system for WIC ("eWIC") was implemented in Maryland, which may affect MMM implementation. In particular, the potential effects of eWIC are varied and could affect vendors' willingness to participate in the program; for example, it may enable markets to streamline the token disbursement process and reduce administrative burden for vendors, but also could result in increased vendor fees for processing equipment.

Conclusion

As FM incentive programs continue to expand, it is essential to understand the perceptions of vendors, as they are key stakeholders in making the program work. This process evaluation study provides evidence that the program benefits not only consumers but also participating vendors, providing a win-win program that is easy to implement. This study adds novel findings to the literature, including vendors' lack of knowledge on

program details and the small number of vendors who expressed negative beliefs and attitudes toward customers. The results from this study can be used to strengthen MMM programming and vendor training as well as insight into programs in other localities.

References

ATLAS.ti Scientific Software Development. (2011). ATLAS.ti (version 6.0) [Software]. Berlin: ATLAS.ti Scientific Software Development.

Brown, C., & Miller, S. (2008). The impacts of local markets: A review of research on farmers markets and community supported agriculture (CSA). *American Journal of Agricultural Economics, 90*(5), 1298–1302. https://doi.org/10.1111/j.1467-8276.2008.01220.x

Centers for Disease Control and Prevention. (2011). *The CDC guide to strategies to increase the consumption of fruits and vegetables*. Atlanta: U.S. Department of Health and Human Services. Retrieved from http://www.cdc.gov/obesity/downloads/fandv_2011_web_tag508.pdf

Grol, R., & Wensing, M. (2004). What drives change? Barriers to and incentives for achieving evidence-based practice. *Medical Journal of Australia*, *180*(Suppl. 6), S57–S60. https://doi.org/10.5694/j.1326-5377.2004.tb05948.x

Headrick, G., Hecht, A. A., Misiaszek, C., Brosius, S., Crone, A., & Surkan, P. J. (2019). *Customers' views on the implementation of a farmers market incentive program: Success and opportunities for improvement*. Manuscript submitted for publication.

Hecht, A. A., Misiaszek, C., Headrick, G., Brosius, S., Crone, A., & Surkan, P. J. (2019). Manager perspectives on implementation of a farmers' market incentive program in Maryland. *Journal of Nutrition Education and Behavior, 51*(8), 926–935. https://doi.org/10.1016/j.jneb.2019.04.001

Hughes, D. W., Brown, C., Miller, S., & McConnell, T. (2008). Evaluating the economic impact of farmers' markets using an opportunity cost framework. *Journal of Agricultural and Applied Economics, 40*(1), 253–265. https://doi.org/10.1017/S1074070800028091

Hunt, A. R. (2007). Consumer interactions and influences on farmers' market vendors. *Renewable Agriculture and Food Systems, 22*(1), 54–66. https://doi.org/10.1017/S1742170507001597

Jilcott Pitts, S. B., Gustafson, A., Wu, Q., Mayo, M. L., Ward, R. K., McGuirt, J. T., … Ammerman, A. S. (2014). Farmers' market use is associated with fruit and vegetable consumption in diverse southern rural communities. *Nutrition Journal*, *13*, Article 1. https://doi.org/10.1186/1475-2891-13-1

King, M., Dixit-Joshi, S., MacAllum, K., Steketee, M., & Leard, S. (2014, March). Farmers market incentive provider study. Washington, D.C.: Food and Nutrition Service, United States Department of Agriculture. Retrieved from https://www.fns.usda.gov/sites/default/files/FarmersMarketIncentiveProvider.pdf

Lehnerd, M. E., Sacheck, J. M., Griffin, T. S., Goldberg, J. P., & Cash, S. B. (2018). Farmers' perspectives on adoption and impacts of nutrition incentive and farm to school programs. *Journal of Agriculture, Food Systems, and Community Development, 8*(1), 147–165. https://doi.org/10.5304/jafscd.2018.081.012

Mann, J., Miller, S., O'Hara, J., Goddeeris, L., Pirog, R., & Trumbull, E. (2018). Healthy food incentive impacts on direct-to-consumer sales: A Michigan example. *Journal of Agriculture, Food Systems, and Community Development, 8*(1), 97–112. https://doi.org/10.5304/jafscd.2018.081.006

Maryland Farmers Market Association. (2017). *Maryland Market Money 2017 annual report*. Millersville: Maryland Farmers Market Association. Retrieved from http://www.marylandfma.org/wp-content/uploads/2018/03/MMM_AnnualReport_2017_v2.pdf

Oberholtzer, L., Dimitri, C., & Schumacher, G. (2012). Linking farmers, healthy foods, and underserved consumers: Exploring the impact of nutrition incentive programs on farmers and farmers' markets. *Journal of Agriculture, Food Systems, and Community Development, 2*(4), 63–77. https://doi.org/10.5304/jafscd.2012.024.002

Olsho, L. E. W., Payne, G. H., Walker, D. K., Baronberg, S., Jernigan, J., & Abrami, A. (2015). Impacts of a farmers' market incentive programme on fruit and vegetable access, purchase and consumption. *Public Health Nutrition, 18*(Suppl. 15), 2712–2721. https://doi.org/10.1017/S1368980015001056

Payne, G. H., Wethington, H., Olsho, L., Jernigan, J., Farris, R., & Walker, D. K. (2013). Implementing a farmers' market incentive program: Perspectives on the New York City Health Bucks Program. *Preventing Chronic Disease, 10*(1), Article 120285. https://doi.org/10.5888/pcd10.120285

Pellegrino, S., Bost, A., McGonigle, M., Rosen, L., Peterson-Kosecki, A., Colon-Ramos, U., & Robien, K. (2018). Fruit and vegetable intake among participants in a District of Columbia farmers' market incentive programme. *Public Health Nutrition, 21*(3), 601–606. https://doi.org/10.1017/S1368980017003020

Savoie Roskos, M. R., Wengreen, H., Gast, J., LeBlanc, H., & Durward, C. (2017). Understanding the experiences of low-income individuals receiving farmers' market incentives in the United States: A qualitative study. *Health Promotion Practice, 18*(6), 869–878. https://doi.org/10.1177/1524839917715438

U.S. Department of Agriculture Agriculture Marketing Service. (2017). *National count of farmers market directory listings* [Graph]. Retrieved from https://www.ams.usda.gov/sites/default/files/media/NationalCountofFMDirectory17.JPG

U.S. Department of Agriculture Economic Research Service. (2017). *Comparison of SNAP authorized farmers and markets FY2012 and FY2017*. Retrieved from https://fns-prod.azureedge.net/sites/default/files/snap/SNAP-Farmers-Markets-Redemptions.pdf

Woodruff, R. C., Arriola, K. J., Powell-Threets, K., Nuri, K. R., Hunter, C., & Kegler, M. C. (2018). Urban farmers markets as a strategy to increase access to and consumption of fresh vegetables among SNAP and non-SNAP participants: Results from an evaluation. *Journal of Agriculture, Food Systems, and Community Development, 8*(2), 93–105. https://doi.org/10.5304/jafscd.2018.082.013

Young, C. R., Aquilante, J. L., Solomon, S., Colby, L., Kawinzi, M. A., Uy, N., & Mallya, G. (2013). Improving fruit and vegetable consumption among low-income customers at farmers markets: Philly Food Bucks, Philadelphia, Pennsylvania, 2011. *Preventing Chronic Disease, 10,* Article 120356. https://doi.org/10.5888/pcd10.120356

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Comparative analysis of four maple species for syrup production in south-central Appalachia

Jacob D. J. Peters,[a] Ryan D. Huish,[b] * Dakota C. Taylor,[a] and Benjamin A. Munson [a]
The University of Virginia's College at Wise

Submitted January 17, 2019 / Revised March 16, June 26, and September 21, 2019 / Accepted September 21, 2019 / Published online March 6, 2020

Citation: Peters, J. D. J., Huish, R. D., Taylor, D. C., & Munson, B. A. (2020). Comparative analysis of four maple species for syrup production in south-central Appalachia. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 267–276. https://doi.org/10.5304/jafscd.2020.092.015

Abstract

Sugar maple (*Acer saccharum* L.) is a key cultural and economic resource from eastern Canada to south-central Appalachia. Environmental uncertainties could create problems for this iconic species, in particular affecting the southern extent of its range and thus increasing the need for alternative species in maple syrup production. To mediate uncertainties, some producers tap additional species, including box elder (*Acer negundo* L.), red maple (*Acer rubrum* L.), and silver maple (*Acer saccharinum* L.). For viable marketability, sap from alternative species should be comparable to sugar maple in volume and sugar concentration. In the 2016 and 2017 tapping seasons, data were collected on sap volume and sap sugar concentration (SSC) for each of these maple species. Sap parameter performance data revealed box elder and to a lesser extent silver maple as the most appropriate alternative species for syrup production in the south-central Appalachian region, while red maple, which is a commonly tapped species in northern regions, performed comparably in SSC but very poorly in sap volume in this study. Diversifying sap sources could provide additional sap and tree counts available to producers, allowing for more varied management strategies to mediate climatic variations and uncertainties. This diversification can also allow for industry expansion into areas without sufficient sugar maples and potentially create a new product niche in the maple industry, which can promote rural economic development in south-central Appalachia through ways compatible with other sustainable agroforestry and outdoor tourism efforts.

Keywords

Maple Syrup, Sugar Maple, Silver Maple, Red Maple, Box Elder, South-central Appalachia, Agroforestry, Non-Timber Forest Products

[a] Undergraduate Research Assistants, Department of Natural Sciences, The University of Virginia's College at Wise.
Jacob Peters is currently a master's candidate in biology at James Madison University.

[b] * *Corresponding author:* Ryan D. Huish, Associate Professor of Biology, Department of Natural Sciences, The University of Virginia's College at Wise; 1 College Avenue; Wise, Virginia 24293 USA; rdh5b@uvawise.edu

Introduction

Sugar maple (*Acer saccharum* L.) is a significant economic and cultural resource from eastern Canada to south-central Appalachia. For centuries, North Americans have been extracting sap from maple trees to concentrate into syrup and other foodstuffs; these maple products have become a notable part of North American economies. With a US$147 million industry in the U.S. (U.S. Department of Agriculture [USDA] National Agricultural Statistics Service, 2017) that nevertheless supplies less than 20% of domestic syrup consumption, there is significant potential for U.S. industry growth (Farrell & Chabot, 2012). However, the potential in the southern range for maple tapping is generally overlooked in the maple industry and related research.

South-central Appalachia has seen an economic decline, largely due to the fading coal industry (Lobao, Zhou, Partridge, & Betz, 2016; Maggard, 1994; Taylor, Hufford, & Bilbrey, 2017). In pursuit of economic recovery, some communities are switching to a more tourism-based economy, which could benefit from the sustainable use of natural resources such as non-timber forest products like maple syrup. Maple tapping, when done according to industry standards (Heiligmann, Koelling, & Perkins, 2006), does not significantly harm the trees, but rather relies on healthy, long-lived trees and forests, and therefore incorporates and encourages sustainable stewardship and provides lucrative alternatives to timbering. A more robust maple industry in this region could help promote rural economic development through product sales and associated opportunities for agritourism, particularly in January through March, when other tourism opportunities may be reduced. Annual maple festivals, which are common in areas with a prevalent maple industry, can generate significant revenue (Farrell & Chabot, 2012) and provide opportunities to advertise other area attractions. Through sound management and planning, maple-tapping operations generally are environmentally sustainable (Clark & McLeman, 2011). However, agritourism should be conducted with due environmental consideration so as not to put significant pressures on forest ecosystems.

Maple syrup production is heavily linked to climatic conditions, as the flow of maple sap depends on frequent freeze-thaw cycles and other variables (Skinner, DeGaetono, & Chabot, 2010). Maple tapping in south-central Appalachia—at the farthest and warmest extent of the sugar maple's range—is therefore particularly sensitive to variations in climatic conditions that can affect maple syrup production negatively in this region during some years. Other environmental stresses, such as climate change, create additional concerns for maple syrup producers in all regions, a major concern being maple tree resilience to changes (Kuehn, Chase, & Sharkey, 2017; Rapp et al., 2019). This cultural icon may be threatened with population range shifts, decreased health, lower sap volume, and inferior quality, all increasing the need to identify alternative species for syrup production (Houle et al., 2015; Kawasaki & Uchida, 2016; Skinner et al., 2010).

Alternative sap sources could particularly benefit the southern portion of the range of sugar maple, in south-central Appalachia, which includes northeastern Tennessee, southwestern Virginia, northwestern North Carolina, southeastern Kentucky, and West Virginia. Maple tapping has long been a part of the culture of south-central Appalachia, but it is mainly restricted to high elevation areas where sugar maples grow. If alternative maple species can be found to be suitable, then syrup production could expand within the region, helping preserve its cultural heritage and promote food system resilience. Furthermore, a thriving maple tapping industry could encourage good ecological management practices for forest lands and wetlands to maintain valuable species and habitats.

In searching for alternative species for syrup production, one of the most important factors to consider is the capacity to produce a high volume of sap that contains enough sugar to be economically viable for syrup production. When producing maple syrup, sap is boiled typically until the sugar concentration is 66 °Bx[1] (roughly 66% sugar by mass). Considering that the ratio of sap to syrup

[1] Degrees Brix (°Bx) indicates the sugar content of an aqueous solution. One degree Brix is one gram of sugar per 100 grams of solution.

generally ranges from 40:1 to 60:1, the initial sap sugar concentration (SSC) is an important consideration (Blouin, 1992; Kort & Michiels, 1997; Munson, 1989). A viable alternative for maple syrup production, therefore, should reasonably contain, on average, an SSC of at least 1% and have a competitive volume of sap production when compared to sugar maple.

There are several groups of trees from which syrup can be produced, including birches (*Betula* spp.), walnuts (*Juglans* spp.), and maples (*Acer* spp.) (Farrell, 2013). The species most commonly utilized for maple syrup production are sugar maple and, to a lesser extent, red maple (*Acer rubrum*), which are abundant in New England and Canada (Farrell & Chabot, 2012). Some producers also tap alternative maple species, including box elder (*Acer negundo*) and silver maple (*Acer saccharinum*). Previous studies in Canada on box elder (Blouin, 1992; Kort & Michiels, 1997) and in Illinois on silver maple (Crum et al., 2004) suggest that these species potentially have commercial value in the syrup industry. Furthermore, the alternative species of box elder, red maple, and silver maple have a broader geographic and habitat range than sugar maple (USDA Natural Resources Conservation Service [NRCS], 2019), which could facilitate expansion in the region to areas with insufficient populations of sugar maple.

Research on maple sap is generally conducted in northern regions, with little data on sap parameter performance of maples in the southern Appalachian region. This study, done during the 2016 and 2017 tapping seasons, investigates the comparative sap production volume and SSC of mature and wild box elder, red maple, silver maple, and sugar maple trees across several counties and four states in the south-central Appalachian region, in order to better comprehend the potential for diversifying the maple tapping species in this region.

Methods

Eight sites were selected to represent gradients across southwest Virginia, and also to include representative sites farther across the geographic range to include possible diversity of individual trees within the region (Figure 1). In total, data were collected from three sites in 2016, and an additional five sites in 2017 (eight total). Data were collected from 25 box elders, 57 red maples, 24 silver maples, and 46 sugar maples across the eight sites (Table 1). Sites were named for the closest neighboring city or town.

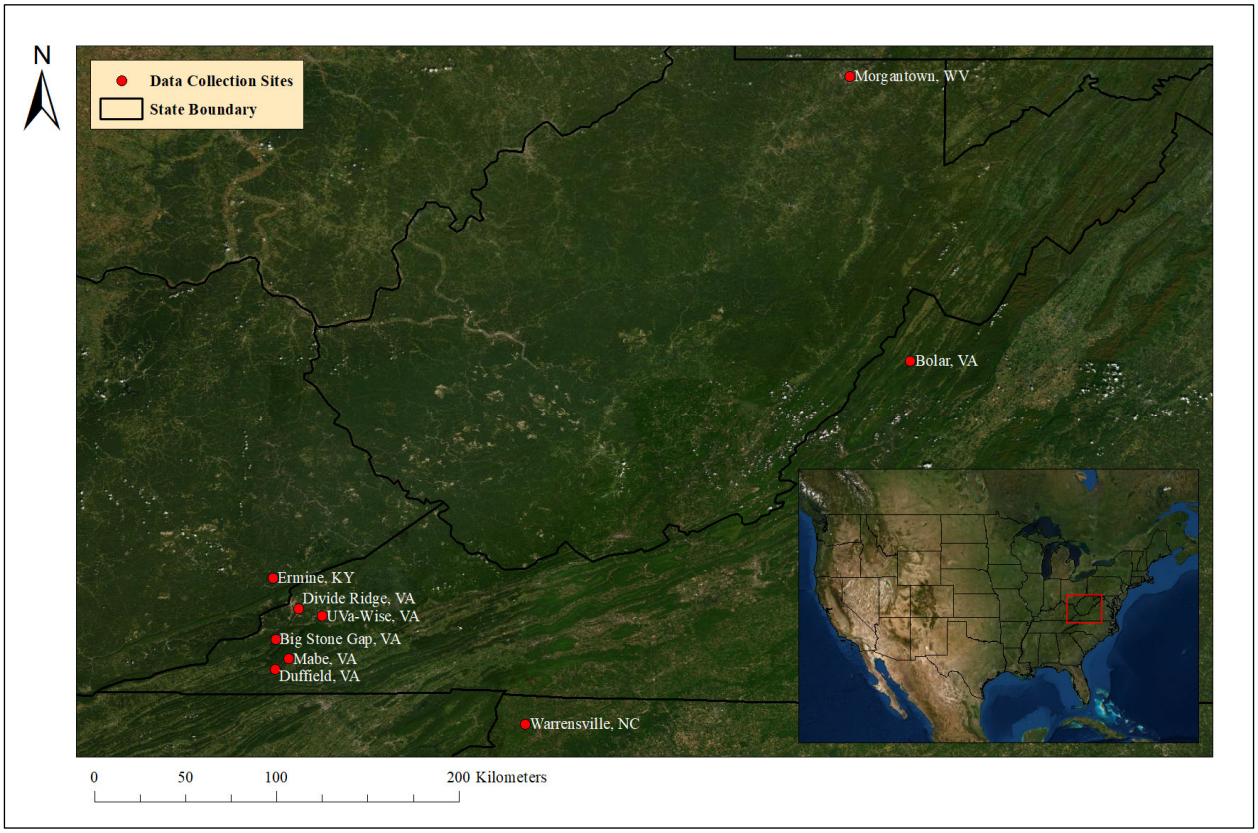
Tree selection and tapping were conducted according to guidelines from the North American Maple Syrup Producers Manual (Heiligmann et al., 2006). Only trees with a diameter at breast height (DBH) greater than 30 cm were considered for tapping. Trees with a DBH greater than 50 cm were eligible to receive two taps with the stipulation that the taps be located 180° around the trunk from each other. To avoid bias in tap orientation and placement, a random bearing and height (80–160 cm) was chosen, with care taken to avoid previous seasons' tap holes and visible wounds on the tree. Tap holes were drilled at a slight upward angle (10 degrees) and no more than two inches into the wood, using a $^{5}/_{16}$" bit. The hole was cleared of any debris, and a spile was immediately tapped into place, with galvanized steel buckets with lids placed on every spile to collect sap. Tapping was completed in late January and early February and proceeded for the following four to six weeks.

Early-spring xylem sap flow for syrup production is dependent on several climatic variables, including barometric pressure, precipitation, and temperature cycles (freezing night temperatures and thawing day temperatures) (Skinner et al., 2010). Sap volume data were collected for each individual tap when these environmental variables aligned to initiate sap flow. The sap was emptied into weighing buckets and placed on a hanging scale, and sap production levels for each tap were recorded in kilograms. Sugar concentration of the fresh sap was measured in °Bx with a refractometer and recorded each time that sap was actively flowing at the time of sap collection. One drop of fresh sap was collected from the spile onto the refractometer. The refractometer was cleaned with deionized water and a disposable, lint-free tissue between measurements and was periodically zeroed, using deionized water, to ensure accuracy.

Sap production data were aggregated per tap by species to obtain the total amount of sap produced by a single tap throughout a season of data collection. Data were analyzed in an R program-

ming environment, using data.table, dplyr, and ggplot2 packages (Dowle & Srinivasan, 2016; Wickham, 2016; Wickham, François, Henry & Müller, 2018). Due to the nonparametric nature of both SSC and sap production data (Shapiro-Wilk test, $p<0.001$) and equal variance of SSC (Levene test, $p=0.3334$) and sap production (Levene test, $p=0.3334$) across species, median values were used for pairwise Wilcoxon rank-sum tests to compare values between species.

Figure 1. Map of Field Sites



Map service layer credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.

Table 1. Field Site Summary

		Total No. of Taps			
Site	**Elevation (m)**	**Box Elder**	**Red Maple**	**Silver Maple**	**Sugar Maple**
Warrensville, North Carolina	1035	–	2	–	5
Duffield, Virginia	413	–	1	3	–
Big Stone Gap, Virginia [a]	442	15	–	21	2
Wise, Virginia	758	5	6	–	–
Dixiana, Virginia [a]	789	–	26	–	15
Ermine, Kentucky	387	–	5	–	5
Bolar, Virginia [a]	763	–	14	–	12
Morgantown, West Virginia	280	5	3	–	7
Total	–	**25**	**57**	**24**	**46**

[a] Sites where data were collected in both 2016 and 2017.

Table 2. Sap Parameters Per Tap by Species

	Box Elder	Red Maple	Silver Maple	Sugar Maple
Mean Sap Production	13.69 kg	5.71 kg	9.37 kg	10.14 kg
Median Sap Production	[a]11.22 kg	[b]1.88 kg	[b]5.18 kg	[a]6.15 kg
Maximum Sap Production	48.06 kg	25.69 kg	53.46 kg	34.16 kg
Minimum Sap Production	0.06 kg	0.00 kg	0.00 kg	0.06 kg
Mean SSC	1.3° Bx	1.4° Bx	1.6° Bx	1.5° Bx
Median SSC	[c]1.2° Bx	[b]1.3° Bx	[a]1.5° Bx	[a]1.5° Bx
Maximum SSC	2.0° Bx	3.0° Bx	2.8° Bx	2.7° Bx
Minimum SSC	0.5° Bx	0.7° Bx	1.1° Bx	0.7° Bx

Note: SSC=sap sugar concentration. Superscript letters for median sap production and SSC denote significantly similar values (e. g., all values denoted with "a" are statistically different from "b" and "c," but not significantly different from other values denoted with "a").

Table 3. Pairwise Comparisons Using Wilcoxon Rank Sum Test: Sap Production

	Box Elder	Red Maple	Silver Maple
Red Maple	0.00089*	–	–
Silver Maple	0.04799*	0.64670	–
Sugar Maple	0.76196	0.00004*	0.00823*

* Statistically significant

The approximation of potential syrup production was calculated with the median sap volume per tap and median SSC values for each species, and utilizing the improved formula for the Jones "Rule of 86" as adjusted by Perkins and Isselhardt (2013): $S=(87.1/x)-0.32$, where S is the initial sap volume required to produce one unit of syrup and x is sap sugar concentration in °Bx. Syrup volume produced can then generally be calculated as syrup volume=sap volume×$(1/S)$. The number of taps needed to produce one unit of syrup was calculated by S/median sap volume produced per tap. Syrup produced from 100 taps was calculated by (100×median volume produced per tap)×$(1/S)$. The sap volume was measured in kilograms and converted to liters (using an approximated 1:1 ratio) and to gallons (using the volume conversion for water of 1 gallon=3.79 kg). Syrup production volume is reported in both liters, and also in gallons for the convenience of maple tappers.

Results

Mean and median sap production per tap by species and range values are shown in Table 2. Box elder had the highest sap yield, followed by sugar maple, silver maple, and red maple. Sugar maple and box elder showed no significant difference in the median volume of sap produced per tap per season (p=0.76), but box elder and sugar maple both had a higher median sap volume per tap than red maple (p<0.0009, p<0.0001) and silver maple (p<0.048, p<0.0083) (Table 3).

Figure 2 illustrates the range and variation in sap production per tap by species. Box elder had the largest range in sap volume produced per tap, followed by silver maple and sugar maple. Red maple had the narrowest range in sap volume per tap. Sugar maple and red maple had more consistent sap volumes, with 50% of the data falling in narrower ranges than for box elder and silver maple.

The mean and median SSC by species and range values are shown in Table 2. The analysis of median SSC data shows that sugar maple and silver maple sap had the highest median SSC, with no significant difference (p=0.168). The red maple median SSC was significantly lower than both sugar and silver maple (p<0.0035, p<0.00063), while box elder had a significantly lower median SSC than sugar maple, silver maple, and red maple (p<0.005) (Table 4). Range and variation in SSC per tap by species are further illustrated in Figure 3. Red maple demonstrated the widest range in SSC, while silver maple had the narrowest range and showed the most consistent SSC, with 50% of data points falling within the narrowest range.

An approximation of potential capacity for syrup production based on the median values of sap production and SSC for each species is pre-

sented in Table 5. This table helps illustrate the comparability of species more clearly and indicates that while box elder sap contained significantly less SSC than the three other species, it could produce the most syrup from the same number of taps due to its high volume. Median sap volume for box elder was two and six times higher than for silver maple and red maple sap volume, respectively, while SSC was only 0.1–0.3 °Bx less. In contrast, while silver maple and red maple sap had a significantly higher SSC than box elder sap, their approximate performance for conversion to syrup requires almost two to five times more taps.

Figure 2. Seasonal Sap Yield Per Tap by Species

The horizontal line bisecting each box represents median values, with 50% of data points falling within the box, and the upper and lower 25% of data points falling along the vertical lines above or below the box. Filled circles above boxes represent outliers that are more than two standard deviations from the mean.

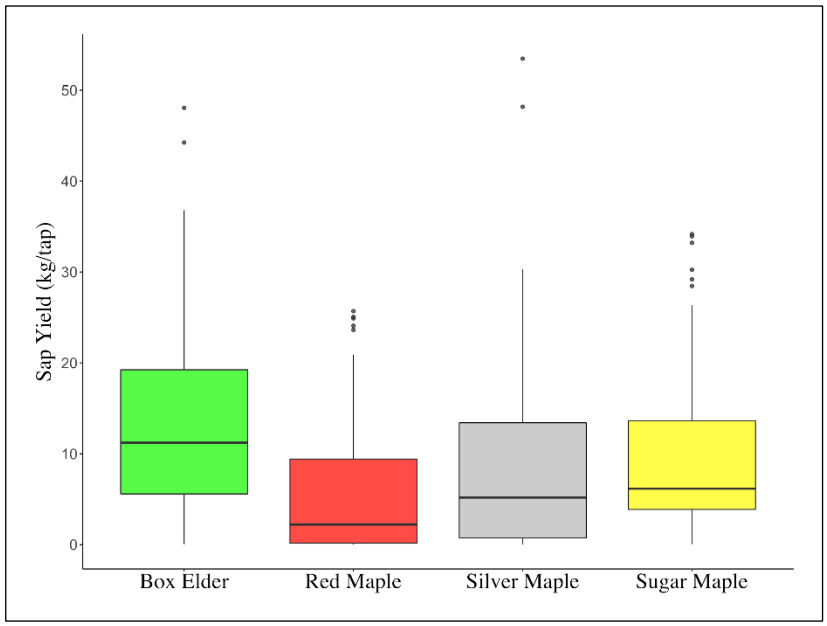


Table 4. Pairwise Comparisons Using Wilcoxon Rank Sum Test: Sap Sugar Concentration

	Box Elder	Red Maple	Silver Maple
Red Maple	0.00275*	–	–
Silver Maple	0.00001*	0.00062*	–
Sugar Maple	0.00001*	0.00343*	0.16799

* Statistically significant

Discussion

The results of this region-specific study suggest that box elder is the best alternative species for potential syrup production volume in south-central Appalachia. The syrup produced from box elder trees, however, requires 25% more sap than sugar maple and silver maple to produce one unit of syrup, while red maple syrup requires 15.5% more sap. Fuel efficiency in boiling down the sap is an important factor; however, if syrup volume produced per tap is the ultimate consideration, then box elder performs even better than sugar maple in the region. Because SSC can vary widely (Table 2), if producers test the SSC of individual trees and focus sap collection on those with higher SSC, then conversion of sap to syrup ratios could be improved.

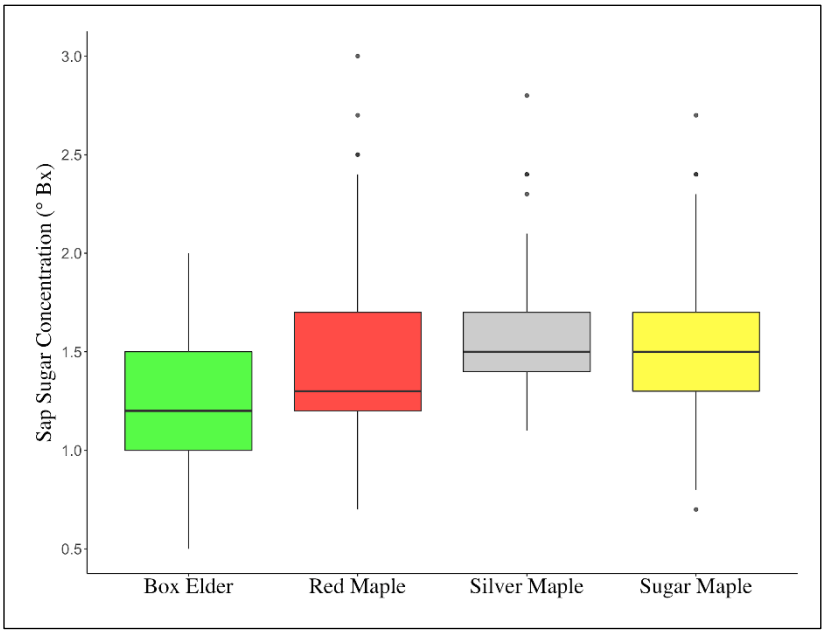
Availability and accessibility are significant factors in selecting maple trees for tapping, and different species may be more readily available in different areas. Therefore, while box elder performs best in this region, silver maple, which showed excellent comparability in SSC and reasonable volume production, may also be a suitable alternative maple sap source for producers to consider. Our data suggest that red maple is not a suitable alternative syrup species for this region, although it is commonly tapped in northern regions.

Taste tests should be conducted to further clarify the suitability of each species before significant investments are made into syrup production using alternative species. Producers could conduct preliminary taste tests on small batches of alternative syrups and mixed-species syrups in order to gain insights into their suitability.

While sap volumes reported here could be expected to increase if trees are tapped using

Figure 3. Sap Sugar Concentration by Species

The horizontal line bisecting each box represents median values, with 50% of data points falling within the box, and the upper and lower 25% of data points falling along the vertical lines above or below the box. Filled circles placed above or below the plot represent outliers that are more than two standard deviations from the mean.



modern methods such as vacuums and tubing, SSC values reported here are lower in this region than values commonly found in northern regions for sugar maple. More sap is therefore required by producers in the southern region to produce similar volumes of syrup. The comparability of box elder and silver maple with sugar maple for syrup production in this region-specific comparison is therefore particularly informative.

The inherent challenges of the maple tapping industry in south-central Appalachia underscore the potential benefit of alternative maple species for tappers there. If producers can access varied species and therefore a larger number of trees to tap, they can employ strategic management strategies. For example, maple tree flowering in early spring marks the end of the tapping season, due to changes in the sap that occur when flowering of the tree has begun. Incorporating multiple species into syrup production can allow producers to stagger their tapping schedules based on flowering cycles, as red maple and silver maple bloom earlier than sugar maple and box elder. This might help extend the tapping season and mediate weather inconsistencies early and late in the season.

In addition to differences in flowering schedule, and the associated potential length of the tapping season, each of these alternative species has other unique characteristics for potential producers in south-central Appalachia to consider. All the species studied can be successfully planted out of their natural elevation ranges; however, box elder and silver maple are naturally riparian species, growing at lower and wetter elevations, while red maple is found across low and high elevations and sugar maple is generally found only at higher elevations. Box elder and silver maple may be good options for producers in areas with lower elevation and wetter habitats that are less desirable for other agricultural and forestry activities, and where those species may already be occurring.

The habitat versatility and broad distribution of box elder and silver maple suggest that these species may be less sensitive to climate and weather fluctuations, which could provide a more resilient

Table 5. Potential Capacity for Syrup Production by Species

	Box Elder	Red Maple	Silver Maple	Sugar Maple
Initial sap volume to produce 1 unit of syrup	72.26	66.68	57.75	57.75
Taps needed to produce 1 liter (gallon) of syrup	7 (25)	36 (135)	12 (41)	10 (27)
Syrup produced from 100 taps in liters (gallons)	15.61 (4.12)	2.80 (0.74)	9.36 (2.47)	14.48 (3.82)

Note: Values are calculated using median sap volume and median SSC and the improved formula for the "Jones Rule of 86" created by Perkins and Isselhardt (2013).

sap source for producers. Throughout this study, it was also noted consistently that box elder flowed on days when other species did not and also seemed to flow for longer periods after a freeze-thaw cycle. Further research into the flow-day cycles per species would be informative, if indeed one species performs better during warm spells and other climate fluctuations.

The wide range of SSC between individual trees in this and other studies shows potential for selective breeding to improve sap quality over time (Crum et al., 2004). Box elder and silver maple can be propagated through softwood cuttings (Ingram & Schutzman, 2013), and producers are encouraged to test the SSC of trees currently available for tapping to identify preferred individuals to propagate through softwood cuttings into new areas. Box elder and silver maple also have faster growth rates than sugar maple, so trees could reach a tappable size in 15–20 years, rather than the 40–60 years necessary for sugar maple (Crum et al., 2004; USDA Natural Resources Conservation Service, 2019). However, box elder and silver maple are not as long-lived as sugar maple, so producers would need to be more active in regeneration to maintain their tree stands for long-term production.

Conclusion

These results support the suitability of box elder and silver maple as sap sources. These alternative species can provide more tappable trees, and consequently more sap volume, thus allowing for more varied management, which could help to sustain the southern maple syrup industry through climatic variations and uncertainties. Diversifying tappable maple species may also provide an opportunity to expand the industry within this region to areas without sufficient sugar maples.

This could also lead to a unique southern niche in the maple syrup industry. Marketing is one of the most significant strategies for improving the economic impact of maple syrup (Farrell & Chabot, 2012). The market viability of southern maple syrup could be enhanced when advertised as a unique syrup, produced from just one alternative sap species or a specified blend, and sold in small-volume containers to emphasize its quality and rarity (Blouin, 1992; Kort & Michiels, 1997). Further research into taste tests and consumer preferences is important if producers plan to incorporate large percentages of alternative sap into their syrup production. Similarly, research into the phytochemistry of alternative maple saps—such as antioxidant levels or other beneficial compounds and desirable flavors—could identify other distinct, marketable advantages (or disadvantages) of tapping particular alternative maple species.

The use of box elder and silver maple as sap sources presents the potential to give maple tapping a larger foothold in south-central Appalachia and a broader economic impact, such as through supporting larger product yields and also encouraging outdoor tourism such as maple festivals. Furthermore, increasing the maple species tapped across the diverse woodlands of south-central Appalachia encourages food system resilience and sustainable land use, preserving the cultural heritage, natural beauty, and environmental health of this unique ecological region.

Acknowledgments

We would like to sincerely thank the SAMaRA (Southern Appalachian Maple Research and Activities) team members who helped in the data collection for this analysis, including students from the University of Virginia's College at Wise (Alex Allen, Skyler Allen, Brooke Colley, Katlin Dellis, Leon Dreher, Layton Gardner, Kyle Hill, Michael Hinkle, Kaitlyn Kessinger, David Kihiu, Tre Mullins, McKenna Robinson, Conner Stanley, and Eric White); a faculty member and student from West Virginia University (Jamie Schuler and John Howell); and community members Mike Puffenbarger, Melissa Ailstock, Ed Ailstock, and Abigail Ailstock (Southernmost Maple), Seth and Sheryl Long (Southdown Farms), Ammon, Magnolia, and Abraham Huish (Appalachian Cove Forest Farm and Homestead), and Wheeler Munroe (Waterfall Farm).

References

Blouin, G. (1992). *Manitoba maple—an untapped resource. A preliminary report on the feasibility of developing a viable industry in the Canadian prairie provinces based upon the utilization of products derived from the sap of Manitoba maple (*Acer negundo L.*).* (Misc. report catalog no. 19647). Prince Albert, SK: Canada-Saskatchewan Partnership Agreement in Forestry, Forestry Canada, Northwest Region. Retrieved from http://www.cfs.nrcan.gc.ca/publications/?id=19647

Clark, K., & McLeman, R. A. (2011). Maple sugar bush management and forest biodiversity conservation in eastern Ontario, Canada. *Small-scale Forestry, 11*(2), 263–284. https://doi.org/10.1007/s11842-011-9183-x

Crum, M. L., Zaczek, J. J., Carver, A. D., Williard, K., Buchheit, J. K., Preece, J. E., & Mangun, J. C. (2004). Riparian silver maple and upland sugar maple trees sap sugar parameters in southern Illinois. In D. A. Yaussy, D. M. Hix, R. P. Long, & P. C. Goebel (Eds.), *Proceedings of the 14th Central Hardwood Forest Conference, Wooster OH* (pp. 122–129). Newtown Square, PA: U.S. Department of Agriculture, Forest Service Northeastern Research Station. Retrieved from https://www.fs.fed.us/ne/newtown_square/publications/technical_reports/pdfs/2004/316papers/CrumGTR316.pdf

Dowle, M., & Srinivasan, A. (2016). data.table: Extension of 'data.frame.' R package version 1.10.0. Mountain View, CA: H2O.ai. Retrieved from https://CRAN.R-project.org/package=data.table

Farrell, M. L., & Chabot, B. F. (2012). Assessing the growth potential and economic impact of the U.S. maple syrup industry. *Journal of Agriculture, Food Systems, and Community Development, 2*(2), 11–27. https://doi.org/10.5304/jafscd.2012.022.009

Farrell, M. (2013). *The sugarmaker's companion: An integrated approach to producing syrup from maple, birch, and walnut trees.* White River Junction, VT: Chelsea Green.

Heiligmann, R. B., Koelling, M. R., & Perkins, T. D. (2006). *North American maple syrup producers manual* (2nd ed.). Columbus: Ohio State University Extension.

Houle, D., Paquette, A., Benoî, C., Logan, T., Power, H., Charron, I., & Duchesne, L. (2015). Impacts of climate change on the timing of the production season of maple syrup in eastern Canada. *PloS One, 10*(12), e0144844. https://doi.org/10.1371/journal.pone.0144844

Ingram, D. L., & Schutzman, B. (2013). *Landscape plant propagation information.* Gainesville: Institute of Food and Agricultural Sciences, University of Florida. Retrieved from https://hort.ifas.ufl.edu/database/lppi/index_scientific.shtml#A

Kawasaki, K., & Uchida, S. (2016). Quality matters more than quantity: Asymmetric temperature effects on crop yield and quality grade. *American Journal of Agricultural Economics, 98*(4), 1195–1209. https://doi.org/10.1093/ajae/aaw036

Kort, J., & Michiels, P. (1997). Maple syrup from Manitoba maple (*Acer negundo* L.) on the Canadian prairies. *The Forestry Chronicle, 73*(3), 327–330. https://doi.org/10.5558/tfc73327-3

Kuehn, D., Chase, L., & Sharkey, T. (2017). Adapting to climate change: Perceptions of maple producers in New York and Vermont. *Journal of Agriculture, Food Systems, and Community Development, 7*(3), 43–65. https://doi.org/10.5304/jafscd.2017.073.020

Lobao, L., Zhou, M., Partridge, M., & Betz, M. (2016). Poverty, place, and coal employment across Appalachia and the United States in a new economic era. *Rural Sociology, 81*(3), 343–386. https://doi.org/10.1111/ruso.12098

Maggard, S. W. (1994). From farm to coal camp to back office and McDonald's: Living in the midst of Appalachia's latest transformation. *Journal of the Appalachian Studies Association, 6,* 14–38. https://www.jstor.org/stable/41445659

Munson, P. (1989). Still more on the antiquity of maple sugar and syrup in aboriginal eastern North America. *Journal of Ethnobiology, 9*(2), 159–170. Retrieved from https://ethnobiology.org/sites/default/files/pdfs/JoE/9-2/Munson.pdf

Perkins, T. D., & Isselhardt, M. L. (2013). The "Jones Rule of 86" revisited. *Maple Syrup Digest, 25A*(3), 26–28. Retrieved from https://mapleresearch.org/wp-content/uploads/1013jonesruleof86.pdf

Rapp, J. M., Lutz, D. A., Huish, R. D., Dufour, B., Ahmed, S., Morelli, T. L., & Stinson, K. A. (2019). Finding the sweet spot: Shifting climate optima for maple syrup production in North America. *Forest Ecology and Management, 448,* 187–197. https://doi.org/10.1016/j.foreco.2019.05.045

Skinner, C. B., DeGaetono, A. T., & Chabot, B. F. (2010). Implications of twenty-first century climate change on Northeastern United States maple syrup production: Impacts and adaptations. *Climatic Change, 100*(3–4), 685–702. https://doi.org/10.1007/s10584-009-9685-0

Taylor, B., Hufford, M., & Bilbrey, K. (2017). A green new deal for Appalachia: Economic transition, coal reclamation costs, bottom-up policymaking (Part 1). *Journal of Appalachian Studies, 23*(1), 8–28. https://doi.org/10.5406/jappastud.23.1.0008

U.S. Department of Agriculture, National Agricultural Statistics Service (USDA NASS). (2017). *United States maple syrup production.* Harrisburg, PA: USDA NASS, Northeastern Regional Field Office. Retrieved from https://www.agmrc.org/media/cms/2017_Maple_Syrup_BB42E310D83BA.pdf

USDA Natural Resources Conservation Service (USDA NRCS). (2019). The PLANTS Database. Greensboro, NC: USDA, Natural Resources Conservation Service, NPDT National Plant Data Team. Retrieved January 12, 2019, from http://plants.usda.gov

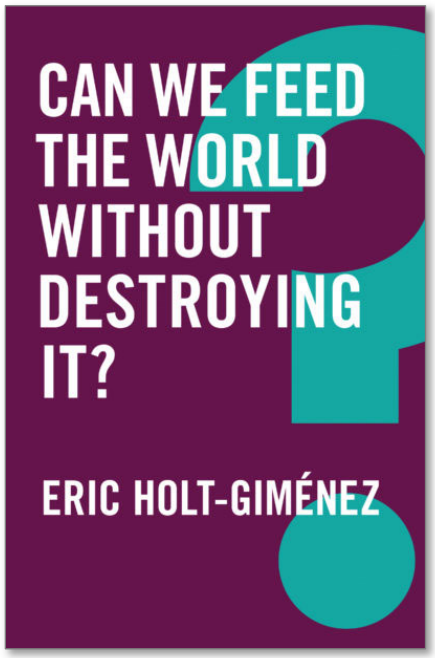
Wickham, H. (2016). ggplot2: Elegant graphics for data analysis. New York: Springer-Verlag. https://doi.org/10.1007/978-3-319-24277-4_9

Wickham, H., François, R., Henry, L., & Müller, K. (2018). dplyr: A grammar of data manipulation. R package version 0.7.8. San Francisco, CA: RStudio. Retrieved from https://CRAN.R-project.org/package=dplyr

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

The political economy of food for your non-foodie friend in under 120 pages

Review by Aliza Tuttle, Portland State University *



Review of *Can We Feed the World Without Destroying It?* by Eric Holt-Giménez. (2019). Co-published by Polity Press & Food First, Cambridge, UK, & Medford, Massachusetts. Available in hard-cover, paperback, and Kindle; 136 pages. Publisher's website: https://foodfirst.org/can-we-feed-the-world-without-destroying-it/

Submitted March 25, 2019 / Published online January 27, 2020

Citation: Tuttle, A. (2020). The political economy of food for your non-foodie friend in under 120 pages [Book review]. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 277–278. https://doi.org/10.5304/jafscd.2020.092.018

Eric Holt-Giménez, former executive director of Food First, adds the themes of agriculture, food policy, and food justice to Polity Press' Global Futures Series with *Can We Feed The World Without Destroying It?* Following previous publications in this series, this is a brief (118 pages) yet comprehensive introduction to the political economy of food written by one of the foremost authorities on food justice. Readers start at the food system's twisted capitalist roots and finish with hope in the transformative power of food-based social movements, food sovereignty, and agroecology.

Holt-Giménez critically interrogates the question posed by the title, rhetorically answering simultaneously yes, no, and neither yes nor no. No, we cannot feed the world under the current system; but also yes, we *can* feed the world through systemic, fundamental changes to capitalism itself. This, he argues, "requires a critical understanding of capitalism" which, once attained, can be leveraged to "unleash the tremendous social power within the world's food systems not just to change the way we produce and consume our food, but also to transform society itself" (p. 9). This essay starts the reader on a whirlwind history of the capitalist food system, introduces failed historical fixes and impending climate catastrophes, and ends with a firm call to action.

Chapter One, "The Politics, Power, and Potential of Food," introduces the food system not as a bucolic scene in which farmers grow sustenance for the population, but as a market sector operating within capitalism, in which farmers produce a commodity to be sold on the market. Understood

* Aliza Tuttle is an urban studies graduate student at Portland State University. She focuses on older adults and homelessness through the lens of the political economy of the food system. She can be reached at taliza@pdx.edu

through the lenses of political economy and critical theory, the food system becomes simply a capitalist market sector—but with dire consequences for those without access to the market: starvation and death. The final paragraph of the introductory chapter is a call to action, the summary of a university course syllabus, and an introduction to a pop-culture TED talk: "The perpetual calls to end hunger, on the one hand, and to maintain our faith in technological progress, on the other, is a globalized form of cognitive dissonance that avoids addressing the contradiction of hunger in a world caught in the grips of overproduction and overconsumption" (p. 7).

Holt-Giménez leads the reader deeper into understanding hunger, overproduction, and overconsumption in Chapter Two, "Hunger in a World of Plenty." The chapter critiques the Food and Agriculture Organization of the United Nations (FAO)'s "slippery statistics" on global hunger, the global food price crisis, the green revolution, biofortification, food waste as a commodity, and food as a political commodity. He introduces the concepts of overproduction as endemic to capitalist food production and poverty as the cause of hunger.

This theme is explained using Friedmann and McMichael's food regime theory framework, augmented with Donella Meadows' systems thinking concepts in Chapter Three, "Food, Environment, and Systems Change." Holt-Giménez includes a lightning explanation of colonialism, Marxist theories of use value and exchange value, Neo-Marxist theories of metabolic rift, Ikerd's "technology treadmill," biodiversity, agriculture's contribution to climate change (including carbon sequestration), and a scathing critique of the "climate-smart trifecta" (p. 75). Here, Giménez introduces the concept of agroecology in response to the assumptions of the new agriculture. He closes the chapter by listing the upcoming tipping points, which are wide-ranging and intimidating. By now, the reader who is not actively outraged, exhausted, engaged, and worried is not reading carefully enough.

The concluding chapter's title asks the reader, "Who Can Feed the World Without Destroying It?" If the FAO is undercounting hungry people, corporations already monopolize production and distribution, and the food system is financialized and land speculative, the answer must be something structurally unique from all these forces. This is what Holt-Giménez leaves the reader with: a list of green techno-fixes and agroecology. The science, practice, and social movement that is agroecology is "anathema to capitalist agriculture" (p. 99), and represents the "no, but yes," to the titular question. The book ends by tying the restructuring of the food system to a concomitant global economic restructuring.

The middle-class, out-of-season eating, overconsumers reading this essay are the ones who can feed the world without destroying it—but only by "changing everything" (p. 118). *Can We Feed The World Without Destroying It?* is written for just this audience, albeit those already having a working knowledge of Meadows and Marx or else with access to the Internet and interest to look up terms such as "metabolic rift" and "negative feedback loops." The abbreviated length of the essay and the short chapters make this a versatile read for various audiences. A graduate course could begin by reading the entire essay, or the essay could supplement a section on agroecology (Chapter Four) or food regime theory (Chapter Two), using the readings referenced to round out concepts mentioned in passing in the text. The text could also be useful for current food scholars or political ecologists as a theory refresher. In general, the content is an abbreviated version of Holt-Giménez's earlier book, *A Foodie's Guide to Capitalism* (Holt-Giménez, 2017). The message in both books is similar: we are in for, and must create, a structural shift in how food is produced, distributed, and conceptualized . . . or we won't be around to eat.

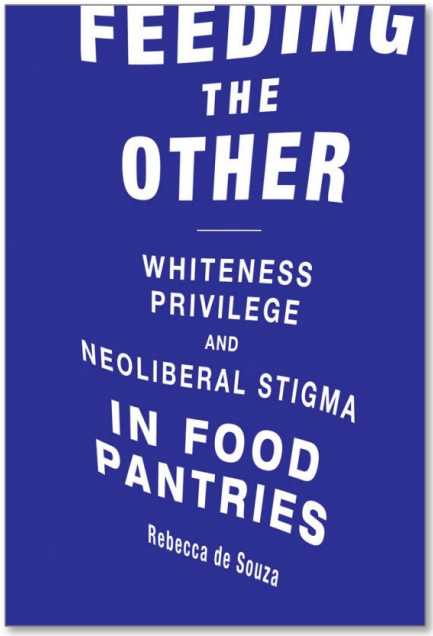
Reference

Holt-Giménez, E. (2017). *A foodie's guide to capitalism*. New York: Monthly Review Press & Food First Books. https://doi.org/10.2307/j.ctt1pwt8gg

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

"Us" and "them" at the food pantry

Review by Amy Rosenthal, Rutgers University *



Review of *Feeding the Other: Whiteness, Privilege, and Neoliberal Stigma in Food Pantries,* by Rebecca de Souza. (2019). Co-published by The MIT Press, Cambridge, Massachusetts, and London. Available in hardcover, paperback, and Kindle; 312 pages. Publisher's website: https://mitpress.mit.edu/books/feeding-other

Submitted September 25, 2019 / Published online February 14, 2020

Citation: Rosenthal, A. (2020). "Us" and "them" at the food pantry [Book review]. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 279–281. https://doi.org/10.5304/jafscd.2020.092.021

Food pantries have become a regular part of American life, not only for those who receive food but also for those who provide it through canned food drives, donations at the supermarket, and volunteer events. Millions of adults and children participate in this form of charity, grateful that they have enough to eat and glad that they have a way to "give back."

In her new book, *Feeding the Other: Whiteness, Privilege, and Neoliberal Stigma in Food Pantries*, Rebecca de Souza troubles the narrative by which middle- and upper-class, often white, Americans see themselves as doing good through the charitable provision of food. She argues that conventional food assistance reflects and perpetuates the neoliberal, racist, and patriarchal ideologies that underlie our conventional food system and keep certain people poor and hungry. De Souza uses her ethnographic research in two food pantries in Duluth, Minnesota, to show how staff, volunteers, and even clients draw on the neoliberal values of hard work, responsibility, and material wealth to define who deserves food, respect, and citizenship and who deserves suspicion, surveillance, and discipline.

This "neoliberal stigma," as de Souza names it, is demonstrated by the founder of one of the food pantries, who divides people into three types: those who work, those who don't work but want to, and those who don't want to work (chapter 3). He is very clear in stating that his food pantry only intends to help the first two types. This specter of

* Amy Rosenthal is a doctoral candidate at the Bloustein School of Planning and Public Policy at Rutgers University. She specializes in food policy, especially the ways in which food assistance programs can enhance individual and community well-being. Her dissertation project explores implementation of the National School Lunch Program as related to preparation and consumption of healthy meals. Amy received a master's degree in food studies from New York University and a bachelor's degree in history from Stanford University. She can be contacted at amy.rosenthal@rutgers.edu

the undeserving poor, magnified by racial and gender stereotypes, informs the interactions, discourse, and practices of the individuals and organizations that De Souza presents. For individuals, this stigmatizing process results in an experience of food assistance that is isolating, demeaning, burdensome, and insufficient, especially for women of color. More broadly, it facilitates a "charitable" system that individualizes the problem of food insecurity as one of personal failings and does not adequately address the structural economic and racial inequities that actually cause hunger.

The book's first two chapters provide an overview of food assistance in the U.S. (chapter one) and lay out the conceptual foundations of this argument, drawing from communications, feminist and critical race studies, and political philosophy (chapter two). The unifying commitment across disciplines is to the power of changing discourse; de Souza argues that to counteract neoliberal stigma, we must hear directly from the "Others" who are generally dehumanized and voiceless—that is, the food pantry users.

She practices what she recommends by foregrounding the stories of pantry clients in her first empirical chapter (chapter three). Her interviewees describe the common challenges of poverty in the U.S., but they also describe fond childhood memories, favorite recipes, coping mechanisms, and meaningful relationships. As she explicitly aims to do, De Souza provides a view of "the hungry" as full individuals "with complex, contradictory, and nuanced lives" (p. 219), portraying them beyond the ways they would typically be characterized through the lens of neoliberal stigma.

Chapter four shifts from those in need of food to those providing it, specifically the "good white women" (p. 97) who volunteer at one of the food pantries. De Souza shows the ways in which these individuals, despite their good intentions, perpetuate stigma. The volunteers judge and police pantry clients, valuing those who demonstrate shame and do not look as if they need to use a pantry. Meanwhile, they are suspicious of the regular clients who, in their eyes, do not demonstrate responsibility for themselves and their families. The process of dividing the worthy from the unworthy is even more institutionalized in the pantry described in chapter five. Here, clients make a US$20 donation in return for a basket of hundreds of pounds of food. The ability to pay marks these individuals as responsible and hard-working—worthy of help and dignity—as defined against the "others" who live for free on charity and the government.

Chapters six and seven return to the voices of those using the pantries, exploring the ways in which they have internalized neoliberal values and use them to judge themselves as well as others. Some food pantry clients offer evidence for themselves as hard-working and responsible citizens who take only what they absolutely need, while criticizing others in similar situations (chapter six). Many also try to perform as proper neoliberal citizens by making what are considered to be responsible diet choices, despite their constrained circumstances (chapter seven).

De Souza concludes by offering suggestions for pantries to improve their own practices and encourage broader changes in the food system (chapter eight). They should begin this work by providing more opportunities for clients to tell their stories, as a way to reframe the narrative around hunger and the hungry. Pantries should also take steps to explicitly address their blind spots around racial equity and to change how they act and talk with regard to the work of ending hunger. Instead of providing charity, which ultimately only props up the conventional food system, pantries should become explicitly political spaces where volunteers, clients, donors, and other citizens come together to advocate for the fulfillment of the right to food via alternative food systems and increased government entitlements.

For de Souza, central to this work is changing conceptions of who the poor are. She concludes that she "never found people who did not want to work" (p. 220), and thus conventional narratives of the poor as lazy and irresponsible are wrong. However, this conclusion does not challenge neoliberal values as the rubric on which we judge deservingness, and the reader (or food pantry) is left to think through what a true right to food means in practice and how radically our narratives of deservingness might need to change.

Sparking change is clearly de Souza's goal for the book: each chapter concludes with a brief sec-

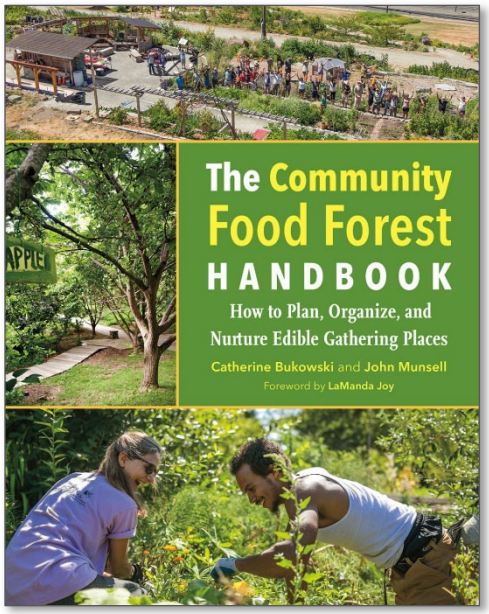
tion on policy and practice implications. The clear writing style and engaging voices from her fieldwork should make the book accessible to practitioners in the food assistance system, as well as advanced undergraduate or graduate students, especially those studying food insecurity and/or policy.

Ultimately, de Souza offers a grimly realistic picture of the contemporary American food assistance system. However, she also includes reason for hope, largely from the resilient voices of those most oppressed by the system. Discussions of food insecurity too rarely include these perspectives, making this text a valuable contribution. And while she implicates many of us in the racist and neoliberal ideologies that prop up our food system, she also leaves us with the hope that even small institutions like food pantries can make change, and that by noticing and pushing back against neoliberal stigma we may help shift what appear to be intractable systems and discourses.

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Growing ecologies: Growing communities

Review by Matthew Potteiger, College of Environmental Science and Forestry, State University of New York *



Review of *The Community Food Forest Handbook: How to Plan, Organize, and Nurture Edible Gathering Places,* by Catherine Bukowski and John Munsell. (2018). Chelsea Green Publishing. Available in paperback and Kindle; 272 pages. Publisher's website: https://www.chelseagreen.com/product/the-community-food-forest-handbook/

Submitted November 22, 2019 / Published online March 6, 2020

Citation: Potteiger, M. (2020). Growing ecologies: Growing communities [Book review]. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 283–285. https://doi.org/10.5304/jafscd.2020.092.022

The contemporary community gardening and urban agriculture movements have transformed the fundamental notion of the city, challenging the urban/rural dichotomy and applying an agronomic model to remake urban spaces as productive systems. Recently, another model has emerged, that of the food forest, which is based on the form and function of forest ecosystems for producing food. Much like the early innovative efforts of urban agriculture, community supported agriculture operations (CSAs), and other alternative food system projects, the emergence of food forests across the country has been a grassroots effort informed by a few key references and with little coordination across individual efforts.

The Community Food Forest Handbook: How to Plan, Organize, and Nurture Edible Gathering Places provides a very timely and thorough overview of this new type of productive landscape. Of the 30 food forest projects that form the basis of the

* Matthew Potteiger is a professor of landscape architecture at SUNY-ESF, where the focus of his teaching, research, and public service is on the design of food and landscape systems. His interdisciplinary food system studio has worked with diverse communities on projects for urban agriculture, markets, and other public spaces in the food system. He is a co-founder of Syracuse Grows, a resource networking and advocacy organization, and the Salt City Harvest Farm, a 50-acre (20-hectare) community farm in collaboration with New American refugees. Following an interest in foraging has led him to explore the design of large-scale productive ecologies. He can be reached at the Department of Landscape Architecture, College of Environmental Science and Forestry, State University of New York; 1 Forestry Drive; Syracuse, NY 13210 USA; mpotteig@syr.edu

book, only one has been in existence for more than 10 years. The authors, Catherine Bukowski, a Ph.D. candidate at Virginia Tech, and John Munsell, professor in the College of Natural Resources and the Environment at Virginia Tech, each with extensive experience in agroforestry, summarize the lessons learned from a systematic analysis of these examples to develop a guide for groups involved with or intending to develop their own community food forest. This handbook effectively documents the state of the art of this emerging practice.

The introduction takes the reader, addressed as "you," on a discovery tour that reveals the enigmatic qualities of a community food forest—a seemingly wild arrangement of diverse plant communities with an open invitation to harvest or forage. The authors then parse the various elements that distinguish a community food forest from that of a natural forest or community garden. As a small-scale representation, food forests mimic the spatial patterns and functions of a forest ecology with three or more vertical layers of edible plants. They are also open and accessible to a broad public with intentional community participation.

This community aspect is also the critical dimension and primary emphasis of the book. While there are guides for establishing the biological components of food forests, such as the two-volume set, *Edible Forest Gardens*, by Dave Jacke and Eric Toensmeier, this handbook expands the discourse beyond recommendations for soil preparation or plant selection to address all the social considerations of how a food forest can be integrated into a community. It provides both the conceptual framework on social systems as well as practical tools for how to work with diverse stakeholders, engage communities, raise funds, assess leadership, and a range of other effective practices.

The book is organized into four sections. The first part, "Understanding Community Food Forests," provides background on the movement, and conceptual frameworks of systems thinking and the diverse set of capitals (social, human, natural, etc.) necessary to create and sustain a project. By presenting this framework, the handbook's structure allows readers to then choose relevant sections rather than follow a linear sequence. Readers interested in getting grounded in agroecology, for instance, may want to skip to that chapter in Part 3, which also includes a discussion of the importance of public space and a comprehensive overview of the various allies such as landscape architects and urban foresters who can contribute to the multiple values of a community food forest. Part 2, which begins with a chapter on planning fundamentals, is perhaps the most useful section for anyone starting a community food forest, as it lays out the phases of project planning and management, including potential pitfalls to avoid. The final section, "Reflecting on Community," emphasizes the critical assessment of the community relationships, who the project is for, types of engagement, and especially, the power dynamics involved in a community-based project.

The challenge for any handbook is how to provide a comprehensive scope and practical guide with enough depth, rigor, and critical thought to make a meaningful contribution to readers with specific knowledge and expertise in related areas. This book effectively navigates the spectrum between these two objectives. Since community food forests are by definition hybrid spaces, the handbook brings together diverse knowledge sets, albeit at an introductory level. The tone is clearly aimed at the general reader and for that reason it would be difficult to use it as a main reference for academic purposes. However, its very effective grounding in systems thinking and theories of change and its models of different types of capital investments make this more than just a practical how-to guide. Its core strength throughout is the well-researched examples. These examples are embedded in each chapter to illustrate the concepts, and each section ends with a full chapter devoted to a specific case study.

The concluding chapter summarizes the extensive examples, concepts, and detailed guides into 10 themes presented as recommended actions, such as "Flexibility is Key," "Keep Adding Layers," or " Create a Governance Structure Early." Recognizing the early stage of development of the community food forest as a new typology and practice, the authors also identify critical needs for more urban food forestry research and developing networks for sharing information, expertise, and

support across different projects. The primary contribution of the book is the sustained attention to the community aspect of food forests. Just as ecological design for food forests is based on ecosystem concepts of redundancy and multi-functionality, this handbook provides extensive guidance for how to initiate and sustain the social systems.

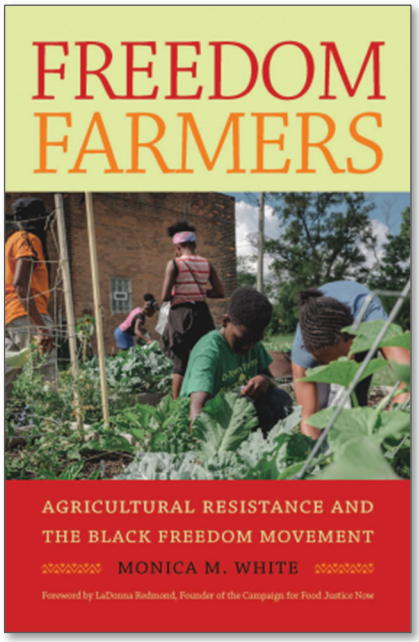
References

Jacke, D., & Toensmeier, D. (2005). *Edible forest gardens, Vol. 1, Ecological vision and theory for temperate climate permaculture.* White River Junction, Vermont: Chelsea Green.

Jacke, D., & Toensmeier, D. (2005). *Edible forest gardens, Vol. 2, Ecological design and practice for temperate climate permaculture.* White River Junction, Vermont: Chelsea Green.

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Resistance and the Black freedom movement: Reflections on White's *Freedom Farmers*



Introduction by Garrett Graddy-Lovelace, American University

Reflections by:
Priscilla McCutcheon, University of Kentucky
Ashanté M. Reese, University of Maryland, Baltimore County
Angela Babb, Indiana University
Jonathan C. Hall, West Virginia University
Eric Sarmiento, Texas State University
Bradley Wilson, West Virginia University

Reviews of *Freedom Farmers: Agricultural Resistance and the Black Freedom Movement,* by Monica M. White. (2019). University of North Carolina Press. Available as hardcover and ebook; 208 pages. Publisher's website: https://uncpress.org/book/9781469643694/freedom-farmers/

Submitted September 5, 2019 / Published online March 6, 2020

Citation: Graddy-Lovelace, G., McCutcheon, P., Reese, A. M., Babb, A., Hall, J. C., Sarmiento, E., & Wilson, B. (2020). Resistance and the Black freedom movement: Reflections on White's *Freedom Farmers* [Book review]. *Journal of Agriculture, Food Systems, and Community Development, 9*(2), 287–295. https://doi.org/10.5304/jafscd.2020.092.020

Introduction

Garrett Graddy-Lovelace, American University *

> Landmark: 1. An object or feature of a landscape . . . that is easily seen and recognized from a distance, especially one that enables someone to establish their location. Synonyms: mark, indicator, guiding light, signal, beacon, lodestar. 2. An event or discovery marking an important stage or turning point in something. Synonyms: milestone, watershed . . . major achievement. ("Landmark," n.d., para. 1 & 4)

Dr. Monica White's *Freedom Farmers: Agricultural Resistance and the Black Freedom Movement* stands literally as a landmark, ushering in a new era of community-based scholarship with and for agrarian justice. From here on out, scholars, activists, practitioners have a lodestar from which to research, practice, and advocate for food, farm, and racial justice: Dr. White's framework of "collective agency and community resilience" (CACR). Food studies scholars from across and beyond academic disciplines are in strong consensus as to the importance of this pivotal

* Dr. Graddy-Lovelace coordinated this set of reflections. She is Associate Professor, School of International Service, American University; graddy@american.edu

book—a manuscript that draws upon and advances rural sociology, history, agri-food studies, Black history, cooperative economics, and more. In this set of reflections on *Freedom Farmers,* McCutcheon lauds how the work is a "love letter" to past, present, and future Black farmers, and the powerful pedagogical potential of such celebration. Reese recounts how the book excavates the erased histories of Black women leaders and farmers, showing us how to "re/see the world" through this powerful lens. Babb calls the text a gift that "flips the script" to provide informative and inspirational narratives of food justice and food sovereignty in action. Hall commends how the book "pushes us to participate in the remaking of our communities with honesty, resilience, solidarity, and love." Sarmiento notes how, even as the book critiques structural racism, it offers a generous, affirmative vision of resistance and agency. Wilson concurs that the book opens radical possibilities for hope, particularly in the classroom. I would also point readers to Cynthia Greenlee's (2018) Civil Eats interview with Dr. White, which highlights how the book sheds light on the overlooked role of Black farmers in the Civil Rights movement, resurgence of Black agriculture and scholarship on it, and the ongoing necessity of affirming collective agency in the fight against racism at large.

This book serves, temporally, as a turning point in community-based scholarship: what comes after benefits from its milestone clarity and content and commitment. Spatially, it stands as a beacon: scholars from across and beyond the disciplines can better find each other in relation to this book's central messages. I research geographies and political ecologies of agrobiodiversity—realms rich with collective agency and community resilience. Dr. White's framework helps me see this—and recount it. It also helps me connect with other scholar-activists discerning these truths in their respective areas of study and movement-building.

Dr. White self-describes as a *garden griot*. As the Black Farmers' Historian, she learns and recounts African-diaspora agricultural knowledges across the southern and rural United States—so as to pass it along. As in the West African *griot* tradition, she braids histories and geographies into a narrative of what the youth Need to Know—what is worth remembering and transmitting to the next generation. She has meticulously recovered the valuable, systemically overlooked stories of Black farming resistance—the practices, traditions, and efforts. Even though white supremacy blocked them—*because* white supremacy blocked them—it is all the more important to remember and remind each other of these crucial, courageous, creative Black-led agricultural projects. Here, they are researched, gathered, and written up with clarity and care—ready to be read, learned, and passed further along. Ready to inspire a whole new generation of Black-led agrarian liberation. This book promises to go far, spatially and temporally—and it already has. Dr. White has been invited to speak on the book's findings across the country. A wave of students are picking up and applying the CACR framework, which already serves as a clarifying theoretical beacon.

The methods section begins with *Sankofa*, "studying the past to understand the present, and from that, to forge a future of our own making" (p. 19). In studying this largely as-of-yet-unwritten past, Professor White finds and transmits to us examples of CACR, and in this she summarizes that which came before and that which will lead us forward. In these stories, we learn that resistance is necessarily composed of commons. We see that freedom from oppression necessitates layers of praxis, prefigurative politics, and economic autonomy. We see glimpses of the long, erased history of Black women leadership in agriculture and food sovereignty.

This analysis—so deceptively simple, yet so critical—helps move us beyond the farce of individualized agency and resilience, illusions laden with patriarchy and racism, and yet undergirding academia—and academic analysis. Food studies, among other disciplines, has a milestone here. Scholarship from here on out can reference this book and build upon its insights moving forward. Community-level work requires community-level thinking and doing. Liberation requires economic autonomy along with food and land sovereignty, but this unfolds as a process: iterative, historical, ancestral. Freedom emerges not as an object, but as a practice—thwarted but ultimately unstoppable. And land, agrarian land,

allows the space and place to prefigure and thus practice freedom. In short: this book, a landmark of community-based scholarship, connects us and guides us forward.

References

Greenlee, C. (2018, December 20). *'Freedom Farmers' tells the history of Black farmers uniting against racism.* Civil Eats. Retrieved from https://civileats.com/2018/12/20/freedom-farmers-tells-the-history-of-black-farmers-uniting-against-racism/

Landmark. (n.d.). In *Lexico.* Retrieved March 4, 2020, from https://www.lexico.com/definition/landmark

---

Reflection #1

A "love letter" to Black farmers

Priscilla McCutcheon, University of Kentucky *

> There are times when writing is difficult, when the words are hard to retrieve, and the emotion is palpable. But to me the product feels like love, never easy but worth it. This book is a love letter. (White, 2018, p. 26).

Freedom Farmers strikes an emotional chord with me that few books do. Much of this emotion stems from Dr. Monica White's commitment to writing a "love letter." The intentionality that White must have had to make sure that love is evident in each word reflects how brilliant and remarkable her work is. In my estimation, the love that White has for the land, food, Black people, and Black communities is most evident in the nuance and attention to detail in this groundbreaking work. For these brief remarks, I focus on one example of such detail and how its inclusion reflects a commitment to expanding how we understand Black people's history and contributions to economic and cooperative development.

In *Freedom Farmers,* White meticulously examines cooperative development among Black people through historical examples like Fannie Lou Hamer's Freedom Farms and present-day examples like the Detroit Black Community Food Security Network. White details how DuBois's theories on "economic co-operations" (p. 53) guides her thinking and theorizing on cooperative development. DuBois understands cooperative development through institutions, like the black church, that Black people have developed and maintained in the midst of oppressive conditions. White says about DuBois's reading of black churches that they:

> served as a critical pathway to political organizations that led the way to economic self-determination … the pooling together of the tithes and offerings functioned as a form of economic cooperation that paved the way to beneficial and burial societies and that provided services for those who suffered from extreme conditions of poverty, especially under the oppressive conditions of plantation agriculture. (pp. 53–54)

The example and explanation of black churches as cooperative development might be a minor point to some, but it is an example of why *Freedom Farmers* is a love letter to Black people. White highlights the nuances of Black life that are lost on many by citing and exploring institutions that are rarely given proper treatment. White explains that these institutions are not accidentally impactful, but reflect Black people's commitment, passion, and planning. As food studies scholars and practitioners, recognizing nuance in institutions like the Black church forces us to readjust how we look at spaces we oftentimes organize in. Simply, the

* Priscilla McCutcheon, Assistant Professor, Department of Geography, University of Kentucky, priscilla.mccutcheon@uky.edu

buildings or adjacent plots that we enact our food justice initiatives on are not passive sites. Instead, the plans for effective organizing already exist in these structures that have planned, built, and survived since their inception.

Through *Freedom Farmers,* White celebrates the nuance of Black people and Black communities in ways that are awe-inspiring. As a Black academic, it is rare that I see Black history in all of its beauty and complexities reflected so clearly on the pages of a monograph. For her love letter, I am grateful.

Reflection #2
Sankofa

Ashanté Reese, University of Maryland, Baltimore County *

In *Freedom Farmers,* Dr. Monica White writes, "in researching this book, I have sought to embody the African principle of *sankofa:* studying the past to understand the present, and from that, to forge a future of our making" (White, 2018, p. 19). In the embodying of this principle, however, she does more than study the past to understand the present. *Freedom Farmers* evokes two other meanings of sankofa: to go back and get it, and the literal translation, "it is not taboo to fetch what is at risk of being left behind" (Berea College, n.d., para. 1). *Freedom Farmers* is a rigorously researched and beautifully written book that reorients us to see how farming, food, race, and economics intersect, and what Black leaders across time and space have done with those intersections. When I am talking to audiences about our food system, many mention cooperatives as a solution and point to recently formed cooperatives, mostly in California. The South is rarely, if ever, mentioned. In its effort to study the past to understand the present, *Freedom Farmers* offers a model of cooperatives with Black farmers at the center.

One might ask: how does this shape or alter our understanding of cooperative models? White makes it clear that farmers were not solely focused on production or providing food. Instead, she shows that their understanding of economic and food justice were deeply intertwined with questions of racial justice and, to some extent, gender justice. In doing so, White provides a radically different starting point from which to theorize "food justice," powerfully demonstrating that organizing around food has always been or had the potential to be about more than consumption.

In *Wayward Lives, Beautiful Experiments,* Saidiya Hartman (2019) take social scientists to task for how we have seen or not seen Black and poor people, and how we have often missed the beautiful, intricate lives they make. She is asking us to look for the places and ways that Black people, and women and girls especially, make spaces akin to freedom. *Freedom Farmers* does that. In this book, in a sankofa moment, it asks us to do more than remember. It pushes us to gather up pieces of history, stitch those pieces together, and re/see the world through a lens through which Black farmers, leaders, and activists are assets in the food world and not just problems to be solved.

References

Berea College. (n.d.). *The power of sankofa: Know history.* Retrieved September 2019 from the Carter G. Woodson Center, Berea College, website: https://www.berea.edu/cgwc/the-power-of-sankofa/

Hartman, S. (2019). *Wayward lives, beautiful experiments.* New York: W. W. Norton.

* Ashanté Reese, Assistant Professor, University of Maryland, Baltimore County, areese@umbc.edu

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Reflection #3

A gift of celebration

Angela Babb, Indiana University *

Freedom Farmers is a generous gift, a labor of love, and a beautiful demonstration of scholar activism from the wonderful Dr. Monica White. In this indispensable addition to the food studies canon, White mobilizes stories of power and resistance at the site of agriculture and resituates Black farmers in our historical imaginations. She breaks through the dominant narratives of exploitation and oppression with the narratives of courage and ingenuity that celebrate Black farmers of the past and will inspire generations of Black farmers to come.

Although the traumatic realities of our food system must be exposed and rectified, the stories of resistance and survival are critical to the healing process. *Freedom Farmers* contributes the stories we need to remain hopeful in the face of persistent trauma. White exposes the oppression while also emphasizing the resourcefulness of Black farmers during centuries of discrimination. For instance, White relieves and inspires us with the stories of Fannie Lou Hamer's courageous testimony before Congress, her use of spirituals to calm rioting activists, and her creation of the Freedom Farm Collective, an institution that provided housing, employment, education, healthcare, *and* food to Black communities in the U.S. South. Mentors and teachers can be excited to assign this book and likely to evoke the emotional paralysis often experienced by students learning about the food system. *Freedom Farmers* provides not only inspirational narratives of food justice but also a theoretical framework for the actualization of food sovereignty.

To this end, White demonstrates scholar activism and, in particular, how social scientists can use their skills and resources to uncover obscured truths and disrupt partial-yet-dominant narratives. By unearthing and sharing the triumphs of historically black colleges and universities, the Freedom Farm Collective and the Detroit Black Community Food Security Network, White exhibits the scholarship needed to amplify the food justice movement and to move the fields of social geography and agrarian studies forward. Moreover, White's theoretical framework of collective agency and community resilience (CACR) provides a strategy for researching power and the transformative potential of initiatives emerging from across the contemporary food movement.

Perhaps most importantly, *Freedom Farmers* is a celebration of Black farmers and of the power, autonomy, and community that comes with growing food together. We need this book right now, as farms decline in number and increasingly fewer of our youth plan to steward the land. The continuous devaluation of farming and agrarian livelihoods throughout our cultural, political, and educational institutions is actively discouraging the next generation of farmers and thus directly threatening the viability of American agriculture. White flips the script, so to speak, to celebrate the ways that farmers are courageous, noble, and central to community resilience. In this way, *Freedom Farmers* is a gift to past, existing, and prospective farmers, as well as the general population that relies on someone else to grow their food. *Freedom Farmers* is a milestone for social geographers, critical food scholars, and farmers alike, and it is truly a gift to us all, regardless of race, religion, income, or occupation.

* Angela Babb, Postdoctoral Fellow, Ostrom Workshop, Indiana University; ababb@iu.edu

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Reflection #4

A reflection on *Freedom Farmers*

Jonathan C. Hall, West Virginia University *

I immensely enjoyed and learned a tremendous amount from Dr. Monica M. White's book, *Freedom Farmers: Agricultural Resistance and the Black Freedom Movement.* Dr. White frames this ongoing movement brilliantly from its beginnings in the post-emancipation South, to contemporary movements that spring from, support, and empower Black communities in urban areas like Detroit, Michigan. One of the most meaningful elements of this work for me is how Dr. White positions the work of Black scholars, activists, and community members as always having existed at the foundation of progressive agriculture. Whether it is George Washington Carver's often overlooked contributions to the local, community-based agricultural movement, or the concept and practice of food cooperatives engineered by Fanny Lou Hamer, *Freedom Farmers* shares an important and overlooked narrative that is largely absent from mainstream progressive food discourse.

An additional, important narrative woven throughout this book is the links between land ownership, food sovereignty, and freedom from oppression. I was particularly struck by how clearly Fanny Lou Hamer articulates the tactics of white supremacy to maintain control over Black people, through land disenfranchisement and starvation, and how she leads others to organize around nullifying these tactics through collective agency and community resilience. As Dr. White points out, reviews and analyses of the civil rights movement often omit the importance of Black farmers and agriculture in "feeding the movement" so that resistance could be sustained, and so that structural change within the white power structure could occur. That struggle continues today through Dr. White's analysis of the Detroit Black Community Food Security Network and this northern urban movement's roots in the Black agricultural traditions of the South. As is the case with modern-day structural white supremacy, structural oppression is maintained not so much through direct and obvious forms of violence against Black bodies, but through more indirect acts like divestment in Black communities. *Freedom Farmers* helps us understand this structural oppression throughout the course of American history. Despite this treachery, Dr. White amplifies a common thread of Black freedom struggle, outlining the process through which Black Detroit residents organize to persist through food sovereignty and land reclamation.

In the wake of this brilliant work, I am left wondering about the conversation between Black agricultural traditions and the ongoing struggle of Native/Indigenous people's sovereignty within the United States. Dr. White raises the profile of the ongoing work of Black people within this settler colonial state that I believe leads the reader into more broad moral and practical questions of land ownership, sovereignty, and healing among people who have and still endure systemic injustice. In addition to teaching readers about a history we all live but may misunderstand, I think *Freedom Farmers* pushes us to participate in the remaking of our communities with honesty, resilience, solidarity, and love. I am so thankful for this work and for Dr. White's powerful voice within and outside of the academy.

* Jonathan C. Hall, Assistant Professor of Geography, West Virginia University; Jonathan.Hall@mail.wvu.edu

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Reflection #5

Narratives of power, politics, and resistance

Eric Sarmiento, Texas State University *

Monica White's beautifully written account of Black agrarian and urban collectivist movements takes a significant step toward filling the void of writing about non-white food initiatives in 'alternative food' scholarship. The book's historical accounts of rural solidarity initiatives, such as the Freedom Farm Cooperative and the North Bolivar County Farm Cooperative, and its analysis of more contemporary community organizing through urban gardening in Detroit, are important not solely because they bring people of color into the story of remaking food systems along more just and sustainable lines (although this is a crucial contribution in its own right). These narratives also present understandings of power, politics, and resistance that differ in radical ways from those found in much critical food scholarship.

In place of a vision of totalizing, unified power structures (whether capitalism, white supremacy, global agribusiness, or neoliberal subjectivity) that in many critical accounts inevitably lead experiments in more just and sustainable food systems to co-optation, classed and racialized exclusivity, and failure, White's central theoretical construct—collective agency and community resilience (CACR)—seems to present a more pragmatist ontology of power and political action. Organizing each of her accounts around this concept, she tends to briefly acknowledge the structural forces from which these resistance movements emerged, and then move on to focus on the laborious and meticulous work involved in assembling collectivities that maintain livelihoods while stewarding land and building communities that can withstand and overcome structural racist violence and class oppression. Cooperative land ownership and democratic control, in all of their complexity and messiness, are at the heart of these movements, as they provide the basis for collective self-sufficiency and political economic power. Formal and vernacular knowledges about food production are shown as crucial components of assembling power and solidarity in these sites, and White details how the farsighted and sophisticated participants in these movements attended to essentials such as education, health care, child care, and so on. Following such a pragmatist approach, White is able to walk a line in her work between critique and creation: dominant power relations are neither ignored nor reified, and the impressive power and scope of Black agrarian socio-ecological experimentation are made visible in ways that have been almost entirely absent in critical food scholarship.

Moreover, White's subjects, while clearly working in opposition to oppressive structural conditions, are shown to eschew the dark allure of resentment, a politics that is so often corrosive for all involved. In Detroit, Sunflower County, and Mound Bayou, White portrays people primarily working *for* better worlds rather than being preoccupied with working *against* the worlds that they know all too well must be eclipsed in order for more just and sustainable lives to be possible for all. This affirming and active stance reveals the true power animating the resistance movements portrayed in the book, and indeed is also expressed in the tone of White's prose: in its moments of critique, the book always remains generous, and it is suffused throughout with love for its subjects and for the broader project of creating food systems and communities that propagate well-being for people and the more-than-human world.

* Eric Sarmiento, Assistant Professor, Department of Geography, Texas State University; ers89@txstate.edu

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://www.foodsystemsjournal.org

Reflection #6

Historicizing radical Black farming as creative, expansive self-actualization

Bradley Wilson, West Virginia University*

In her essay "Radical Black Subjectivity," bell hooks laid down a challenging question that resonates for teachers and scholars of agri-food movements: "How do we create an oppositional worldview, a consciousness, an identity, a standpoint that exists not only as that struggle which opposes dehumanization but as that movement which enables creative, expansive self-actualization?" (2014, p. 15). Dr. Monica White's new book, *Freedom Farmers: Agricultural Resistance and the Black Freedom Movement,* answers this question. Dr. White centers our attention on the powerful history of cooperative organizing by black farmers, from rural Mississippi in the 1960s through Detroit in the present. Dr. White not only responds to bell hooks' question with a historically rich account of black agricultural resistance and cooperation in the U.S. South, but also advances a novel theory of action—collective agency and community resilience (CACR)—that seeks to explain the creative, expansive self-actualization of black communities in the face of oppression. As she explains, black agricultural cooperative organizing was and is a means of community development and a pathway to "practice freedom" within "extreme conditions of financial, social and political oppression" (White, 2018, p. 5).

With *Freedom Farmers,* Dr. White has given the agri-food justice movement and critical educators everywhere a precious gift. I first encountered Dr. Monica White's written work in 2017 as I was preparing a fall seminar on food justice at West Virginia University (WVU). Searching for a new means of introducing students to the history, geography, and theory of agri-food movements in the United States, particularly the neglected regions of the U.S. South and Appalachia where I teach, I stumbled upon "'A Pig and a Garden': Fannie Lou Hamer and the Freedom Farms Cooperative" in the journal *Food and Foodways,* which was published in a different form as Chapter 2 of *Freedom Farmers.* So pivotal were the history and argument she put forward, so eloquent the prose, that I asked my students to read it with me before I even handed out the syllabus on the first day. We then watched a film on Fannie Lou Hamer and the civil rights movement. It was, without a doubt, one of the most moving learning moments I have ever experienced in a seminar room. Dr. White had shed light on Ms. Hamer—hailed as a civil rights crusader—now also as a visionary, farmer, cooperativist, and food justice activist.

Reframing Ms. Hamer's legacy and that of black farmers across the South, Dr. White launched us on a different genesis story for the agri-food justice movement, one rooted in the struggle for black freedom in the U.S. South. Now, with additional histories of the North Bolivar County Farm Cooperative, the Federation of Southern Cooperatives, and the Detroit Black Food Security Network, she extends these insights and accounts of collective agency and community resilience further.

In fall 2018, my staff in the WVU Food Justice Lab read *Freedom Farmers,* and I had the pleasure of engaging the full book with 14 students in our Appalachian Food Justice Institute in West Virginia last spring. The power of this text to educate, coalesce, and deepen our commitment to agri-food justice through her conceptualization of commons as praxis, prefigurative politics, and economic autonomy was powerful. I anticipate this book will become core reading in food and agrarian studies, and I urge my fellow teachers and researchers to center this text in their courses and build syllabi around it to further consider the standard-bearing

* Bradley Wilson, Associate Professor of Geography, and Director, Center for Resilient Communities, West Virginia University; Bradley.Wilson@mail.wvu.edu

contributions of black farmers to U.S. agriculture, cooperativism, community food security, urban farming, and global liberation movements that call for food system change.

Reference

hooks, b. (2014). *Yearning: Race, gender, and cultural politics* (2nd ed.). New York: Routledge.