Journal of Agriculture, Food Systems, and Community Development

Volume 8, Supplement 3
January 2019

Economics of Local Food Systems: Utilization of USDA AMS Toolkit Principles

JAFSCD special issue sponsored by Colorado State University Food Systems with support from the USDA Agricultural Marketing Service

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FoodSystemsJournal.org
ISSN 2152-0801 (online only)

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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 (an affiliate of Cornell University). Journal office: 295 Hook Place, Ithaca, NY 14850 USA.

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Permanent link for this entire issue: https://doi.org/10.5304/jafscd.2019.08C.014

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

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On our cover: Well-crafted economic impact studies that incorporate strong community engagement can be valuable in supporting local food system development. This special issue, "Economics of Local Food Systems: Utilization of USDA AMS Toolkit Principles," looks at uses of the USDA AMS's Toolkit and economic impact assessments.

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Special issue sponsored by Colorado State University Food Systems, with support from the U.S. Department of Agriculture's Agricultural Marketing Service.

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continued

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

IN THIS ISSUE

What is a 'multiplier' anyway? Assessing the Economics of Local Food Systems Toolkit

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Special JAFSCD Issue
Economics of Local Food Systems: Utilization of USDA AMS Toolkit Principles
Sponsored by
FOOD SYSTEMS COLORADO STATE UNIVERSITY
USDA

Submitted December 19, 2018 / Published online January 30, 2019

Citation: Jablonski, B. B. R., & Thilmany McFadden, D. (2019). What is a 'multiplier' anyway? Assessing the local foods economic impacts toolkit. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3), 1–8. https://doi.org/10.5304/jafscd.2019.08C.013

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Introduction

This special issue examines the effectiveness of organizing and conducting formal impact assessments in measuring the economic impacts and opportunity costs associated with local food system policies, programming, and investment. It features 11 articles by a diverse range of academic researchers and community stakeholders who have used the publication, the *Economics of Local Food Systems: A Toolkit to Guide Community Discussions, Assessments and Choices*[1] (which we refer to as "the Toolkit" hereafter) to initialize, frame, and carry out economic impact assessments of local and regional food system activity. Many of the case studies featured in this special issue are directly connected to the over 30 technical assistance workshops provided by the Toolkit's authors and other partners between 2015 and 2018 following the Toolkit's release. Our intention in compiling these papers is to gauge whether practitioners and researchers find the Toolkit useful in demonstrating compelling evidence of the economic impacts of food system development strategies, and when they do, to demonstrate its utility and share best practices.

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The views expressed herein do not necessarily reflect the views of the Agricultural Marketing Service or the U.S. Department of Agriculture.

[1] See the Toolkit online at https://www.ams.usda.gov/publications/content/economics-local-food-systems-toolkit-guide-community-discussions-assessments

Several overarching principles guided the development of the Toolkit. Codifying these principles here enables readers to evaluate the extent to which the Toolkit achieved its objectives. These principles include:

- Inclusiveness: Encouraging community engagement and collaborative partnerships in local food systems planning;
- Practical Guidance: Supporting realistic action steps that take advantage of available assets and respect resource constraints;
- Empowerment: Helping local stakeholders feel a sense of ownership in setting local food system priorities and ensuring that issues of greatest community concern are addressed;
- Improved Measurement Accuracy: Allowing practitioners to comprehend and interpret the results of impact-output analysis and other basic economic research methods, so that they learn to incorporate best practices into their economic analysis and modeling activities;
- Flexibility: Providing multiple points of entry for users at different levels of expertise and capacity, so Toolkit users can use the most cost-effective and scale-appropriate methods. The Toolkit authors recognized at the outset that some of the Toolkit's advanced analytic activities—e.g., gathering financial data from producers, using customized input-output analysis to produce economic impact estimates of local food investments—may often exceed the capacity of interested stakeholder groups (Conner, Becot, & Imrie, 2016).

Why Devote Attention to Economic Impact Assessment of Local Food Investments?

Enhancing local food systems is purported to be an economic development strategy in the United States through import substitution (Jablonski & Schmit, 2016; Thilmany McFadden et al., 2016). Despite substantial advances in the availability of primary and secondary data about the local foods sector, explored further in Tropp (2018), few national resources existed prior to the Toolkit to help the growing number of interested stakeholders estimate the economic impact potential of targeted local food investments. Specific challenges confronting practitioners identified in O'Hara and Pirog (2013) included:

- A lack of clarity about recommended best practices for local food economic impact assessments,
- A lack of transparency about methodologies used in existing local food economic impact assessments, especially in non–peer-reviewed studies,
- The limited scope used in the handful of relevant studies, making them difficult to generalize elsewhere,[2] and
- The inadequacy of efforts to engage and educate interested stakeholders about appropriate economic impact assessment techniques, causing a failure to meet the rising demand for such services.

To address these gaps, the Marketing Services Division of the U.S. Department of Agriculture's (USDA) Agricultural Marketing Service (AMS) commissioned the development of an "economic impact assessment Toolkit" through a cooperative research agreement managed by Dr. Dawn Thilmany McFadden of Colorado State University's (CSU) Department of Agriculture and Resource Economics. The project was innovative and ambitious because AMS worked with CSU to recruit many of the best researchers in the U.S. working to understand the economic impacts of local food system initiatives with the charge they agree upon best practices. The Toolkit authors included more than a dozen leading researchers and consultants who represent six land-grant universities and a major consulting firm. Thus, aligning and incorporating the collective wisdom of the project team was intended to provide clarity on current best practices in local food economic

[2] Angelo, Jablonski, and Thilmany (2016) note that the widespread absence of compatible financial data fields in the existing literature has severely circumscribed the ability of researchers to calculate accurate economic multipliers.

impact studies. USDA AMS published the Toolkit in March 2016.

The Toolkit's features include:

- An accessible overview of the latest academic research pertaining to economic impact assessments of local food system investments, policies, and programs;
- Proven methods and case-study examples that can help community members guide the direction and framework of their assessment plans;
- Insight into available data that can support economic impact assessment, including how to find and use available secondary data, as well as understand and determine when primary data collection is a necessary method;
- Guidance on how to structure an economic impact study so that it best reflects a community's priorities and needs; and,
- An explanation of the strengths and weaknesses of input-output analysis for evaluating economic impact, including an emphasis on the need to measure net rather than gross impacts.

Modules 1 through 4 cover the preliminary stages of an economic impact assessment. These topics include framing and setting the parameters of the assessment, identifying relevant economic activities, and collecting and analyzing primary and secondary data. Modules 5 through 7 provide an overview of economic multiplier concepts, including the benefits and limitations of using input-output (I-O) software such as IMPLAN to produce direct, indirect, and induced cost estimates associated with local food system investments.

How Was the Toolkit Disseminated to the Public?

An extensive outreach effort throughout the United States accompanied the roll-out of the Toolkit (Jablonski, O'Hara, McFadden, & Tropp, 2016). A national webinar held in April 2016 attracted nearly 800 participants. Between 2015 and 2018, contributors to the Toolkit carried out nearly 30 training workshops across the country, attracting over 2,500 participants. While some workshops were offered at academic and food system professional conferences, the support of AMS and American Farmland Trust enabled Toolkit training and outreach events to support less traditional stakeholders. By making the Toolkit concepts and methods more accessible, the team hoped to equip a broader constituency of community stakeholders with a basic understanding of economic concepts and the tools needed to investigate the economic case for investing in local food systems. Subsequently, AMS, CSU, and the broader Toolkit team worked together to create and populate an electronic portal and virtual "community of practice" on the economics of local food systems.[3] The website is intended to stimulate further discussion and information sharing among interested peers.

To better understand the usefulness of the Toolkit, in 2018 AMS surveyed past attendees of Toolkit webinars and training workshops. These training attendees came from a wide array of backgrounds and professions, including specialists in economic development, planning, farmers markets, farm-to-institution marketing, food access, and food production. Of the 144 individuals who responded to the survey, 80% agreed that the webinars and/or trainings improved their understanding of how to evaluate economic impacts, and 45% reported that they used information from the Toolkit to support their ongoing work. These observations are similar to feedback obtained from a similar study undertaken by Conner, Becot, and Imrie (2017), which revealed the widespread application of Toolkit principles in community-level food system planning efforts around the country.

Why the Special Issue?

To provide some additional perspectives about the value and applicability of Toolkit principles and methods under real-world conditions, as well as to enhance understanding for other stakeholders about how the Toolkit might be employed, AMS and CSU partnered with the *Journal of Agriculture,*

[3] The community of practice is located at https://www.localfoodeconomics.com

Food Systems, and Community Development (JAFSCD) to commission a special issue focused on best practices for assessing and measuring the economic impacts associated with local food system investment. JAFSCD solicited papers from organizations and agencies that had used the Toolkit or its principles explicitly to guide their economic assessments of local food system initiatives on a community, regional, or national basis. In the call for papers, JAFSCD suggested that authors focus on the following topics:

- Generating primary data,
- Analyzing primary and secondary data,
- Engaging community partners and decision-makers with data-driven evidence and examples,
- Estimating the economic impacts of local food system policies and projects through input-output analysis,
- Incorporating opportunity costs into multiplier effects associated with local food programming and investments, and
- Tailoring input-output economic modeling software to estimate local food system impacts more accurately.

The editorial process was managed by JAFSCD, which allowed contributors to be entirely candid in their assessments of the strengths and weaknesses of the Toolkit. Although CSU and AMS identified the theme of the special issue and developed the initial call for papers, they did not serve as formal reviewers on the drafts of any submitted papers. Accordingly, all papers in this special issue went through an independent double-blind peer-review process and were copy-edited to assure that the lessons shared and learned from communities were communicated effectively to JAFSCD's audience.

Summary of Themes Addressed in Special Issue Articles

The essays provided in the JAFSCD special issue coalesce around the following questions:

What market-level resources are available for implementing or refining data-collection methods?

Wolnik, Cheek, and Weaver (2019) represent the Farmers Market Coalition (FMC), which is the primary national-level association for the U.S. farmers market sector. They note that few farmers market organizations to date have participated regularly in market-level economic assessments. In recent years, however, a growing number of market organizations have asked FMC for technical assistance regarding federal grant reporting requirements, as funders are increasingly demanding quantitative measures of grant impact. To increase the capacity of market organizations to collect market-level data, FMC piloted a program at a few farmers markets that tracked a small number of key market performance indicators. FMC assisted limited-capacity markets with integrating these outcome measures with graphic and data visualization applications to help convey the impact of grant investments in communication and promotional material. This is a practice encouraged in Module 4 of the Toolkit.

How can adjustments in standard production functions enhance measurement accuracy?

Two studies focus on best practices associated with measuring production functions, a metric that accounts for how farm and food businesses operate and impact local business expenditures.[4] Pesch and Tuck (2018) collected detailed farm financial data from 11 vegetable operators on small farms in rural, central Minnesota. The study was motivated by a food hub seeking to document the economic impact of its members. By collecting and analyzing farm financial data and supply purchase locations, Pesch and Tuck found that small-scale, direct-to-consumer vegetable farms had a greater positive economic impact on the regional economy, per dollar value of output, than larger-scale, direct-to-wholesale operations. This result, along with previous research, suggests the importance of customizing the production function in IMPLAN to more closely reflect actual conditions when modeling local food supply chains. This is outlined in

[4] Every input into production represents some fraction of total industry payments for intermediate inputs or to factors of production (land, labor, or capital). The array of an industry's production function can be considered its production "recipe."

Module 7 of the Toolkit. The study also illustrates how the collaboration of a multidisciplinary project team (local production specialists, farm-business management specialists, and an economic impact analyst) can work together to modify analyses and improve the accuracy of results.

Schmit, Severson, Strzok, and Barros (2019) explore some of the lessons learned and difficulties encountered when attempting to collect primary data from farmers and intermediate suppliers for a specific commodity. To develop a production function for New York apples, the authors used both secondary and primary data sources. The researchers documented how relying on a composite of primary and secondary data sources specific to New York state apples yielded more net positive economic multiplier effects—especially indirect and induced output effects—than IMPLAN's default production function for fruit. However, they also found that the job creation effects were not as robust, so the local food sectors may have nuanced differences from the IMPLAN default data.

How should analyses of farm-to-school (F2S) programs be undertaken?

Two studies in the special issue explore methods for evaluating the economic impact of F2S programs. Duval, Bickel, and Frisvold (2019) undertake an economic impact assessment of farm-to-school initiatives in Arizona. They explicitly consider opportunity costs by modeling the net economic impacts from increased vegetable production at the expense of more water-intensive crops like alfalfa and cotton. Without properly accounting for countervailing effects, such as export substitution, opportunity costs, and resource constraints, Duval et al. (2019) observe that the net positive effect of local food purchases by school systems can easily be overestimated.

Christensen, Jablonski, Stephens, and Joshi (2019) take note of the unique characteristics of F2S supply chains in modeling economic impacts of local food purchases in the Minneapolis School District and the state of Georgia. Their model assumes that 50% of new F2S sales in the Minneapolis School District and 45% of new F2S sales in Georgia are obtained from a distributor rather than directly from a producer, since the use of intermediaries for local food purchases in both study locations is common. In short, the use of different local food marketing channels is an important element in customizing economic impacts.

Are economic assessments effective for generating local food system support from policymakers?

Four studies focus on how policymakers respond to economic impact messaging related to local food system investments. Rahe, Van Dis, and Gwin (2019) examine the effectiveness of a communications strategy around an economic impact report that included a factsheet, presentation, press releases, and in-person meetings. They find that local leaders and service providers in central Oregon are more supportive of developing local food systems after being informed of study findings. Bauman, DePhelps, and Thilmany McFadden (2019) discuss how the Palouse-Clearwater Food Coalition in Washington and Idaho used the Toolkit to justify, guide, and develop more systematic data collection efforts. Using the collected data, the Coalition subsequently conducted an economic impact assessment of the Moscow, Idaho, farmers market and presented the results of that study to members of the city council and Moscow Farmers Market Commission. Persuaded by the report that the Moscow farmers market was making an important contribution to the local economy, city officials decided to move administration of the market out of the city's Arts Department and created a salaried position for a full-time community events and farmers market coordinator.

Kraus (2019) describes the usefulness of the Toolkit in offering a food supply chain framework for planning a comprehensive economic contribution study of a regional food system. She believes it compares favorably to most standard municipal, regional, and economic planning methodologies that tend to underestimate the relative importance of the food sector. Her organization—the Berkeley, California, based nonprofit organization Sustainable Agriculture Education (SAGE)—found that the Toolkit provides a clear and helpful methodology for conducting assessments of the local food economy, notably the recommendations for creating study parameters, obtaining relevant primary and secondary data, and engaging community members in food system discussions. One of the studies conducted by SAGE, focused on San Jose, California, Food Works, was so well received by San Jose city officials that they directed SAGE to carry out two additional studies. These future studies are expected to guide future food business development strategies in the region.

Christensen and Limbach (2019) describe how San Juan County in Washington state used Toolkit principles of community engagement to achieve consensus on a workable definition of "agricultural viability." The definition was needed for measuring progress toward fulfilling requirements of the state's Voluntary Stewardship Program (VSP), adopted in 2011. The VSP offers financial incentives to encourage the adoption of agricultural practices that "protect critical areas, promote viable agriculture, and encourage cooperation among diverse stakeholders" (Christensen & Limbach, pp. 7, 9) Its enforcement is based on a collaborative planning process that relies on county-level work groups to create their own definition of agricultural viability and appropriate benchmarks that represent progress toward that goal. Guided by the community engagement and planning recommendations outlined in the Toolkit, stakeholders who represented the entire food supply chain came together to create a common definition of agricultural viability. They also developed a set of metrics that could be used to evaluate the success of individual VSP-related activities, as well as the collective impact of the VSP at the county level.

What options exist for resource-constrained communities in measuring the economic impact of local food systems?

Goldenberg and Meter (2019) and Shideler and Watson (2019) provide two alternative options that communities can follow if they seek to better understand their local food economy but do not have the capacity to undertake a rigorous and detailed I-O study. Goldenberg and Meter (2019) argue against the use of I-O techniques in community-level economic impact assessments. They claim that the cost of acquiring accurate data for I-O modeling is generally too high relative to the scale of existing local food projects. Further, they claim that I-O methods are not accessible to most stakeholders. As an alternative, they argue in favor of providing communities with technical assistance in undertaking social network analysis (SNA), as highlighted in Module 4 of the Toolkit. SNA makes community linkages more visible to local stakeholders and decisionmakers and demonstrates the economic value associated with building and reinforcing these connections.

In contrast, Shideler and Watson (2019) construct a local food impact "calculator" that seeks to reduce the burden of producing economic impact analyses by providing simple, yet methodologically sound, economic multipliers for communities. To do so, they use a set of assumptions from available federal data that reflect some of the distinctive characteristics of local food market transactions. To provide even greater accuracy in measurement, the calculator provides options for generating economic multipliers for a variety of demographic scenarios and geographic boundaries. Furthermore, the article outlines best practices for using the calculator and documents several rules of thumb that can be used to assess whether the actual economic multiplier is likely to be higher or lower than the reported estimate.

Conclusion

Before the publication of the Toolkit, practitioners and community stakeholders working in the local food sector sought guidance on how to accurately convey the economic contribution of local food systems and the expected economic impact of local food system investments (O'Hara & Pirog, 2013). What we have witnessed in the wake of the Toolkit's release is a resounding validation that strong demand exists for lay-friendly, accessible, and well-documented guidance on economic impact assessment for local food systems. The collective feedback we have received indicates that the Toolkit has helped to fill this void. Furthermore, the concepts and principles outlined in the Toolkit have provided a foundation for an even more basic community planning principle: the importance of building representative teams with a shared vision of what an initiative, like local foods, means to the community and framing those outcomes before even commencing on any analytical work. In short, the Toolkit appeared to achieve its vision of making economic assessments easier to adopt and incorporate as a standard component of local and regional food systems planning.

What are some of the specific takeaways that the articles in the special issue tell us? First, well-crafted economic impact studies can be valuable in educating and influencing the decisions of policymakers. Such studies have especially strong impact when they incorporate insights from community engagement and are designed to address the priority needs of local stakeholders. Second, multiple articles confirm that considerable gains in accuracy can be achieved when using customized data that is specific to the farms and food supply chains in a region. This is outlined in several Toolkit modules that describe primary data collection methods, secondary data sources, and I-O methodological issues.

Third, the special issue articles indicate that the costs of undertaking a comprehensive economic impact study—in terms of time, expertise, and data requirements—may exceed the capacity of many food system practitioners. Iterative improvements to the Toolkit have led to proxies that can be used for back-of-the-envelope calculations of economic impacts and guidance for communities seeking to undertake social impact analysis. While the cost/benefit tradeoff of using any particular methodological approach is unique to each community or region, the Toolkit and the articles in this special issue offer a variety of alternatives for food system practitioners to pursue, and, we hope, make impact assessment techniques more accessible to all stakeholders.

In addition, Reno's (2019) review of a recent book, *Harvesting Opportunity: The Power of Regional Food System Investments to Transform Communities* (edited by Dumont, Davis, Wascalus, Cheeks Wilson, Barham, and Tropp) summarizes its contributions to framing the role of food in discussions as diverse as social equity, economic development, environmental degradation, and the current political climate. This book calls for just the types of community-based actions highlighted in this special issue's case studies—and recognizes the challenges they all share.

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

Designing an effective, scalable data collection tool to measure farmers market impacts

Special JAFSCD Issue
Economics of Local Food Systems: Utilization of USDA AMS Toolkit Principles
Sponsored by
FOOD SYSTEMS COLORADO STATE UNIVERSITY
USDA

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Submitted April 6, 2018 / Revised July 13 and August 23, 2018 / Accepted September 20, 2018 / Published online December 15, 2018

Citation: Wolnik, D., Cheek, J., & Weaver, M. (2019). Designing an effective, scalable data collection tool to measure farmers market impacts. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3), 9–25. https://doi.org/10.5304/jafscd.2019.08C.003

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Abstract
The need for an updated framework for all types of farmers markets and the varied levels of capacity to share the impacts of their work led to the development of the Farmers Market Metrics (Metrics) program at the Farmers Market Coalition (FMC), a nonprofit working to strengthen farmers markets across the country. This essay provides a timeline of the steps and partnerships that led to the creation of this program, including the exploration of existing data collection systems suitable for grassroots markets, observations from markets engaged in evaluation, feedback by pilot users of the Metrics system, and best practices and recommendations uncovered during the development of Metrics.

Keywords
Metrics, Farmers Markets, Measurement, Retail, Farmers, Direct Marketing, Economy, Indicators, Food System Analysis, Data, Market Vendors, Local Foods Toolkit, Ecology, Methodology, Data Collection

Introduction
Collecting data at farmers markets is not a new endeavor; reports on the impacts of farmers markets stretch back decades (Brown, 2002). However, in most instances the resulting reports were designed for use by stakeholders interested more in the market's role in the larger food system or in measuring one type of project impact within a market (McGuirt, 2011; Minaker, 2014; Racine,

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Disclosures
This commentary was written during paid staff time at the Farmers Market Coalition. Author Wolnik also engages in paid consulting using these methods of evaluation.

Vaughn, & Laditka, 2010; Oberholtzer, 2016; Sadler, 2013; Slocum, Ellsworth, Zerbib, & Saldanha, 2009). In reviewing research conducted at farmers markets since 2004,[1] FMC found that the market organizations rarely participated in the choice of data to be used or joined in the collection of the data. Yet in the last half decade, markets have consistently requested technical assistance from FMC in collecting and using market-level and network-level data. At the network level, state associations of farmers markets have reported frustration during FMC's State and Network Leader monthly calls on the lack of data available, which significantly reduces their ability to advocate for those markets at the state or the federal level. Also notable was the change to the request for applications for the Farmers Market and Local Food Promotion Program (FMLFPP) grant by the U.S. Department of Agriculture (USDA) Agricultural Marketing Service (AMS) in 2014, which now requires the collection of data for specific indicators for each grantee, including sales, customer, and business metrics. It also requires grantees to specify how they plan to collect this data.

Beginning in 2011, FMC began to identify common characteristics and impacts of programs at markets in order to provide technical assistance with the Center for Disease Control and Prevention's Communities Putting Prevention to Work program (CPPW) grantees. FMC's analysis at the end of this subcontract indicated a need for more research into evaluation resources and tools that could be used easily by understaffed market operators.

The multiyear, multi-partner process to develop Metrics was meant to address these needs and to advance existing methodologies while building standardized, appropriate tools that allow even low-capacity farmers markets to collect and use data to improve market operations, share data with aligned research entities, and communicate market impacts to stakeholders.

Previous Data Collection Systems Suitable for Grassroots Markets

A range of farmers market–focused data collection methodologies have been used since the late 1990s, each adding to the effort for market organizations to measure their internal and external impacts in a consistent, comparable manner. At least three were designed expressly with farmers markets in mind: Rapid Market Assessment (RMA), Sticky Economic Evaluation Device (SEED), and FM Tracks. Each of these systems greatly expanded the potential for data collection within market organizations by adding new collection, entry, or reporting functions. However, the limited use of these tools by markets over the past decade (as evinced by the continued requests for technical assistance around evaluation and the lack of reports from markets using this data) was noted by FMC and its research partners. In response, FMC added evaluation functions beyond what each current tool listed below had already offered, as outlined Table 1 and described in the next sections. The functionality that Metrics added to each approach is in a bulleted subsection.

Rapid Market Assessment

In 1998, Larry Lev, Linda Brewer, and Garry Stephenson devised a grassroots collection toolkit using three methods of data collection under the name Rapid Market Assessment (RMA), which has since been updated (Lev, Brewer, & Stephenson, 2008). The first two methods—Attendance Counts and Dot Surveys—could be completed by markets with a small amount of preparation and a minimum of staff training time. The third method is a qualitative method called Constructive Comments and Observations (CCO) to observe three main components of the market:

1. Physical characteristics of the site: Access, flow of people and traffic, liability issues, and organization;

[1] The year 2004 was chosen because that year the USDA listed 3,706 farmers markets, slightly double the number of listed markets in 1994 and about half the number listed in 2012. Also, in 2004 markets began to expand their programming by adding the first wireless card processing machines in Philadelphia, Pennsylvania; Prescott, Arizona; and Lewiston, Maine. This made it a milestone year for the farmers market field in terms of numbers and programming. Thus more of the reports written after that year remain relevant to the structure and goals of markets today, allowing FMC to refine its search for reports to those written after that date.

Table 1. Farmers Market Evaluation Tools Functions and Challenges

Tool	Main functions	Unmet challenges	FMC response to those challenges in design of Metrics
Rapid Market Assessment	Collection methodology designed expressly for farmers markets to collect market day data and include market characteristics.	No data management or analysis component.	Added online data management and training materials on analysis.
SEED	Collection and database system including preformed survey questions including embedded calculations. Market characteristics are included in report.	Calculations not visible; metrics cannot be chosen at outset. Report not editable.	Metrics chosen by market, calculations editable (offline). Report editable.
FM Tracks	Collection and database system including preformed survey questions and embedded calculations. Dynamic dashboards of data, app-based data entry.	Lacks detailed market characteristics collection, or vendor level data management system.	Market summary reports and individual metrics able to be printed or posted immediately. Training resources developed. Vendor level data can be collected and managed by vendors or by markets.

2. Vendors and products: Product mix, product quality, signage, display, and customer service;
3. Market atmosphere: The "feel" of the market, shopper demographics, interactions and conversations, and educational and community activities.

The resources available for RMA include instructions for devising the team and collecting the data.

The Metrics adaptation of the RMA approach

- The Dot Survey can offer markets a rich tapestry of data when gathering qualitative, discrete (yes/no) type questions, but when asking a series of detailed questions of a single respondent, the method is difficult. Metrics allows for the collection and entry of a series of data points for a single respondent, which allows for deeper analysis of types of shoppers (such as weekly versus monthly shoppers).
- Markets often use only the Dot Survey without conducting attendance counts, which means the number of responses for the Dot Survey cannot be known to be representative of the market visitor population. Metrics includes training on the importance of conducting both analyses and resources to calculate the responses needed to ensure that the number and sample of responses are representative.
- Without the CCO, the analysis lacks the contextual details of the market's physical space and organizing intention in relation to the data collected. Metrics requires the addition of profile data for each market whose data is being uploaded.
- In terms of data management, the main drawback to the use of Dot Surveys is the time and skill necessary to transfer the answers to a spreadsheet or online form for analysis. The lack of preformed questions also adds more work for the market to refine questions suitable for coding. Metrics includes preformed survey questions refined by FMC's research partners and the ability to add answers directly into the online account using a smartphone or tablet.

Sticky Economics Evaluation Device (SEED)

In 2002, Richard McCarthy, executive director at the Economics Institute at Loyola University in New Orleans (now organized as Market Umbrella) created an online data storage, data calculator, and report generator for market organizations named the Sticky Economic Evaluation Device (SEED) (McCarthy, 2007). SEED used survey responses from market visitors to offer a snapshot of a market's economic contributions in a PDF report. Market organizations uploaded their raw data into their online SEED account, where it was run through an economic multiplier and formatted into standard reports with text and tables. The reports covered core market statistics, market visitation, market economic impact on vendors and on nearby businesses, and total combined economic impact.

The Metrics adaptation of the SEED approach

- Markets using SEED reported that they were frustrated with the inability to delete certain questions or to add others. Metrics allows for the addition or deletion of the survey questions.
- In discussion with researchers during the development of Metrics, many reported that they were uncomfortable with the multiplier and seasonal calculations in SEED not being visible or editable. For now, Metrics data can be downloaded into Microsoft Excel spreadsheets for the market and its partners to calculate direct, indirect, and induced effects based on local multipliers and other economic calculations.
- The SEED final report is only available in a PDF format, which requires a separate design phase in order to use the individual pieces of data on social media or in graphic form. Metrics offers a graphic format of the data either collected on a one-page summary report or printed or shared as individual metrics.

FM Tracks

For those markets using a centralized SNAP/EBT[2] system to process cards at the market booth, daily data is often required by the partner or funder of the matching SNAP incentive or other coupon program. FM Tracks was created to meet that need with development was led by Dr. Darcy Freedman through a partnership between Case Western Reserve University, the Prevention Research Center for Healthy Neighborhoods, and Wholesome Wave. FM Tracks includes an iOS application and website that work together to track data by market managers operating one or more markets and for healthy food incentive networks. This includes sales data, customer data, and market day information.

By engaging with SNAP customers at the market organization's booth, the shopper can be asked to complete a short survey while their card is processed and tokens are counted out. FM Tracks also gathers data from the transaction summary available through the processing system at the end of each market day, calculating metrics such as total dollars spent on SNAP, average dollar amount of the transaction, number of transactions, and through a unique FM Tracks I.D. number, even tracking which shopper had used their card previously at the market. Once entered into the FM Tracks app, a visual dashboard of the data is made available to both the market and the network.

The Metrics adaptation of the FM Tracks approach

- The FM Tracks tool was already in a later development stage during the early pilot testing of Metrics, and the two teams engaged in direct communication, which led to Metrics survey questions being included in FM Tracks and Metrics using nutrition program questions from FM Tracks. Still, the availability of two systems that track much of the same information has been a source of concern for users, so Metrics prioritized developing protocols for uploading data collected via FM Tracks into a Metrics account in batches.
- The visual dashboard of data present in FM Tracks also influenced the addition of a data dashboard into Metrics. However, the FM Tracks tool does not offer detailed market-level reporting of the data collected, resources to aid markets in collecting other data, or resources for using data once it is verified. Metrics includes those as well as visual, dynamic dashboards of the data at the market level.
- FM Tracks is most often used for collecting program data on nutrition incentives and is

[2] SNAP is the Supplemental Nutrition Assistance Program (SNAP), formerly called food stamps. SNAP benefits are provided monthly via an electronic benefits transfer card (EBT), which works like a debit card.

focused on aggregating that data for market networks and partners. As a result, the data collection and reporting functionality for market- or vendor-level analysis is still limited. Metrics is designed primarily for markets' use of the data, with markets as owners of the data, such that they are able to edit the reports and share specific data points with vendors or networks as needed.

- For markets that are not managing a centralized processing system (i.e., where vendors process transactions directly or a partner manages the transactions on behalf of the market), FM Tracks is not as useful in gathering surveys. Metrics surveys and tools are designed to be useful at many different points during the market shopper's visit.

Other Added Functions of Metrics

- None of the systems allowed for vendor-level data to be included, even though most markets collect vendor demographic and production data via their annual application or renewal form. In response, Metrics added demographic questions that can be added easily to the annual renewal form, which are then uploaded into each vendor profile. Once in the system, that vendor can be added to other, separately managed markets, although the accompanying transaction data for each market day is accessed *only* by that market and the vendor. This solves the issue of multiple markets entering the same vendor more than once, which could lead to double counting any vendor-level data when aggregated across markets.
- The lack of accompanying training materials on basic data-collection methods in all the existing systems was identified as an issue by network leaders. Also identified were the lack of resources for aiding markets and networks of markets with building an evaluation plan, including the steps on finding volunteers, picking metrics, and h using the data. FMC has added resources to its site to respond to these needs, as well as offering monthly calls with Metrics users.
- Dynamic network-level directories that offer current locations, hours, and other profile information were also identified as vital by market stakeholders as more shoppers use online resources to seek out food and entertainment and app developers search for up-to-date directories to link to their search function. Metrics now includes this function.

Timeline of the Development of Farmers Market Metrics

To assist in identifying the most useful metrics, FMC began to compile a list of metrics in 2011 from published reports on markets impacts. Those collected metrics (around 130) became the basis of the metric selection over the next iterations of FMC's evaluation work with markets and researchers. In 2014, FMC began work on two components of the Metrics research: refining the collection methodologies and prototyping summary reports that would result from the data collected. In 2017, FMC tested the online site and automatic reporting functions now included in Metrics.

Pilot: Prototyping Reports

The value of a graphic summary report to incentivize data collection was tested through a 6-month Knight Prototype Fund project that included three steps: choosing 10 to 15 metrics from the list that could be pulled from past seasons' records (e.g., number of vendors, acreage in production) and would be of interest to current markets stakeholders; designing templates for recording and displaying the metrics in one-page reports with infographics; and piloting the metrics and templates during the 2014 spring market season. Test markets were selected from those that volunteered after a national webinar shared the project requirements. The markets were selected based on their size, age, location, and their plans for using the reports with different stakeholders. The pilot markets were:

1. Mississippi Farmers Market, Jackson Mississippi (MS)
2. Countryside Conservancy Market at Howe Meadow, Akron, and Peninsula, Ohio (OH)
3. Carrboro Farmers Market, Carrboro, North Carolina (NC)

4. Oregon City Farmers Market, Oregon City, Oregon (OR)
5. Winooski Farmers Market, Winooski, Vermont (VT)
6. Upper Eastside Farmers Market, Miami, Florida (FL)
7. Southwest Community Farmers Market, Miami, FL
8. Fondy Farmers Market, Milwaukee, Wisconsin (WI)

Using 2013 data, summary reports were created,[3] with the pilot markets sharing them through their existing communication channels. Six of the eight markets used reports in their social media channels and within their market community (see an example in Figure 1). The other two did not use the data, reporting capacity challenges in entering and verifying the data. Once the project was completed, a survey was conducted to ask for feedback from the markets. The market representatives felt that sharing the summaries helped to strengthen their relationships with partners and funders and also encouraged customer loyalty. They reported that some vendors noted that seeing first-hand how that information would be used and its potential for increasing customer counts and sales helped them better understand the request for data.

Pilot: Refining Data Collection Methodology

In 2014, FMC partnered with Dr. Alfonso Morales, professor of urban planning at University of Wisconsin-Madison (UW), on the 4-year Indicators for Impact project funded by the USDA National Institute of Food and Agriculture's Agriculture and Food Research Initiative to test and refine methodologies to be used by market organizations during specific collection phases.

In selecting the participating markets for this pilot, the Indicators for Impacts project team focused on three regions: Mid-Atlantic (Maryland [MD], Virginia [VA], and Washington DC area), Central Appalachia (West Virginia [WV], Ohio [OH]), and the Gulf Coast (Louisiana [LA], Mississippi [MS]). Those regions were selected at the outset of the grant based on the existence of agricultural and market partners in each, the presence of rural, suburban, and urban markets in each, and the proximity to FMC staff working on the project. The participating markets included Athens Farmers Market, Athens, OH; Chillicothe Farmers Market, Chillicothe, OH; Crossroads Farmers Market, Takoma Park, MD; Hernando Farmers Market, Hernando, MS; Oxford City Market, Oxford, MS; Ruston Farmers Market, Ruston, LA; Spotsylvania Farmers Market, Spotsylvania, VA; Williamson Farmers Market, Williamson, WV; and Williamsburg Farmers Market, Williamsburg, VA. The markets chosen varied in their age, length of season, number of vendors, setting (rural, suburban, urban), and staff size, as noted in Table 2.

Figure 1. The Mississippi Farmers Market *Graphic*

During the pilot project, the Mississippi Farmers Market used this graphic of its mileage calculation in print media to highlight the regional impact of its vendors.

[3] See the summary reports at https://farmersmarketcoalition.org/farmers-market-metrics-prototype-released/

During the project, the markets participating in the indicator project offered feedback via monthly calls and emails on the process of collecting data using the resources developed by the project team. As the markets all had different levels of experience in collecting data, the feedback was extremely helpful in prototyping collection resources for a wide range of markets.[4]

The participating markets were required to have operated for a full season, to name a specific contact person to participate in online and in-person meetings, to collect the data as instructed, and to collect the same four metrics (as well as the choice to collect others, too):

- Number of visitors
- Number of vendors
- Acreage in production
- Miles traveled (from production to market)

These four metrics were deemed most useful for aggregation and to be of greatest interest to current market audiences across the U.S. By requiring only four metrics, each market was able to add two to four more unique metrics for their unique needs. The decision to encourage the markets to collect around six metrics was made by the UW/FMC team based on the findings from the earlier FMC Prototype Report project, which indicated that markets that were prone to selecting a long list of metrics often had difficulty in completing all the collection necessary.

The metrics chosen for this pilot were narrowed down to 37 by asking these questions:

- Which current audiences want and will use the data: a municipality, a partner organization, or the market itself in an annual report?
- Which group(s) within its market community does the market want to measure its impact upon: the farmers, shoppers, or the larger community?
- What type of benefit is added to the market community: economic, social, intellectual, or ecological capital?
- Can it be collected by low-capacity markets using one of three methods: (1) review of existing documents used by the market (such as card processing transaction summary reports), (2) conducting surveys, or (3) conducting tallies?

These methods were chosen by the project

Table 2. Indicators for Impacts Market Sites

Market, State	Year Opened	Number of Vendors (avg.)	Setting	Paid Staff [a]
Athens Farmers Market, OH	1972	40 vendors	Rural	1 PT
Chillicothe Farmers Market, OH	2002	50 vendors	Rural	1 PT
Crossroads Farmers Market, MD	2007	15 vendors	Suburban	2 FT
Hernando Farmers Market, MS	2008	50 vendors	Suburban	1 PT
Oxford City Market, MS	2013	10 vendors	Rural	1 PT
Ruston Farmers Market, LA	2008	25 vendors	Rural	1 PT
Spotsylvania Farmers Market, VA	1998	50 vendors	Suburban	2 PT
Williamsburg Farmers Market, VA	2002	40 vendors	Suburban	1 FT, 2PT
Williamson Farmers Market, WV	2011	10 vendors	Rural	1 PT

[a] PT=part-time staff; FT=full-time staff

[4] From the 2016 Indicators for Impact Project progress report: "Throughout the year, regular monthly calls were held with the project team and pilot markets to discuss issues, successes pertaining to data collection and entry. This feedback, as well as other feedback received through emails and individual phone calls was compiled into a master spreadsheet. All the feedback was reviewed and analyzed so that changes to the metrics, methods and data entry system could be completed" (Padilla, 2016, p. 1).

team by conducting a literature review of existing methodologies[5] (Jeong, Morales, & Roubal, 2015) during this project.

The markets were given their own specific set of collection protocols based on the metrics chosen (Suerth, 2015) and an annual stipend to use as needed for data collection staff or to pay for staff time to do data entry and to attend meetings. All chose to enlist volunteers to collect the data, and only one (Ruston) used part of the stipend to hire a lead person, although some did supply incentives for their volunteers such as market t-shirts, free drinks or food, or market gift certificates. One market (Hernando) used an organization that recruited corporate volunteers while another (Spotsylvania) enlisted a Boy Scout troop for some of the data collection and gave a donation to the troop in return. Two others drafted university students to serve as their data collectors. Three of the nine markets had trouble amassing enough volunteers on all of the selected days, requiring another day to be selected.

The data entry phase was problematic for almost all of the markets, with most unable to complete all of the data entry deadlines set by the project team. The reasons offered for these data entry challenges were reported by the markets as lack of time set aside for the market leader to complete this part of the process, issues with the data entry portal, or issues due to assigning a volunteer who did not complete tasks or made multiple mistakes in the data entry.[6]

Vendor Response to Data Collection Pilot

During the Indicators project, current market vendors were generally supportive of the data collection project. Those who offered strong support were often current or past board members of the market organization and therefore were aware of the market's need for data to fundraise or to secure support from stakeholders. Even with that support, the markets that had not previously collected any data from vendors reported resistance during the project. Sales data was reported as the most difficult to collect, but markets also struggled with collecting complete demographic data. The main barrier to completing demographic information was reported as lack of time allotted for the market staff to collect and enter that data for each vendor.

In many markets across the U.S., collecting sales data from vendors is still seen as unlikely or even "impossible." For those that do collect it, it is often based on a stall payment system where vendors report daily sales to the market and a percentage of those sales[7] are calculated for the market fee. Other markets use either a flat fee system per market day or a single annual fee. Since four markets in this pilot already gathered weekly sales data, the markets that did not already collect this data had access to best practices and support by the early adopter markets. As those collecting it only for reporting purposes did not need individual vendor calculations, the project team introduced a system in use at other U.S. markets: a daily anonymous vendor slip. The slip is handed out at the beginning of each market, and once completed is either handed back to a market team member, who then checks that vendor's name off a list, or dropped into a canister at an unstaffed table and the vendor checks off their own name from the list. Having the vendors name checked off a list allows markets to remind those who have not submitted their slip, raising the response rate. Although not entirely anonymous, since the data is not entered next to any business name or vendor category and only the aggregate total for the day is used, most vendors are willing to submit this data. The market could tailor the slip to their own data needs, deleting fields that are not being collected at their market or adding fields such as the amount donated by that business to gleaning programs. One market had

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[5] See the report at https://farmersmarketcoalition.org/wp-content/uploads/2015/08/JFDRS_FMC-UW-Literature-Review-on-Farmers-Markets_Finaldraft_10082015.pdf

[6] As a result of this feedback, FMC developed training materials with support from the USDA AMS Farmers Market Promotion Program, which included some tips for gathering the team needed for collection and entry.

[7] It is not currently known how many markets in the U.S. use the percentage system, but the practice seems to cluster around early adopters (such as Seattle Neighborhood Farmers Markets and District of Columbia's Fresh Farm), with other markets adopting the same payment method.

only one vendor refuse; another market found passive resistance to the collection (no outright refusals, but sales slips were promised and yet not turned in regularly); two other markets expected more resistance and so delayed asking for weekly sales until later in the season, which affected the completion since many vendors could not retrieve all the weekly data at that later time (Wolnik, 2016).

Data Use Process and Challenges in Data Collection Pilot

The markets in the Indicator pilot were then encouraged to share the data using graphics designed in the FMC's previous prototype pilot. The markets used the data in social media postings, emails, and website postings in the same manner and at the roughly the same rate as the Prototype Report pilot. Usage tended to cluster at the end of the season or the calendar year. The graphics were used during annual vendor meetings, usually held at the start of the next year. Many markets reported during the data usage phase that some of the metrics were not as useful as they had hoped and again offered an indication to FMC that helping markets with selecting the right number of metrics at the outset of the process is vital.

Pilot: Markets and Networks Test of Metrics Site

In 2017, FMC worked with 70 markets to beta test the Metrics resources and website; 58 of those were collecting data in a shared project. These shared projects were labeled as "networks" and offered a key update to the underlying data structure of the Metrics system; as projects shared across market organizations have become more common, the need to share aggregated data with a variety of partners has increased. In response, an account network category was created and defined in Metrics as organizations that need to aggregate data among a group of markets but are not engaged in the operation of the markets themselves. The participating networks included the Michigan Farmers Market Association (MIFMA) and the Virginia Farmers Market Association (VAFMA). Twelve markets in the 2017 pilot used Metrics to collect data for a single organization's use.

Process and Challenges Among Sample of Participants in the 2017 Pilot

The 12 individual markets who elected to use Metrics during the 2017 pilot had all collected data in the past, had specific ideas about what data they wanted to collect, were willing to offer input to the development of Metrics, and found out about the pilot via a national webinar.

The experiences of two of the participating markets and two networks who used Metrics in 2017 are highlighted below. The Countryside Farmers' Market at Howe Meadow Market in Peninsula, OH, and the Charlottesville, VA, market represent different market types and reasons for collecting data. MIFMA used Metrics to collect data on the economic impact of a program implemented at 15 market sites and to increase the comfort level with collecting data across all member markets. VAFMA chose seven markets in the Richmond area to aggregate data, with the goal of generating a data-driven social media marketing campaign in collaboration with bloggers and food writers.

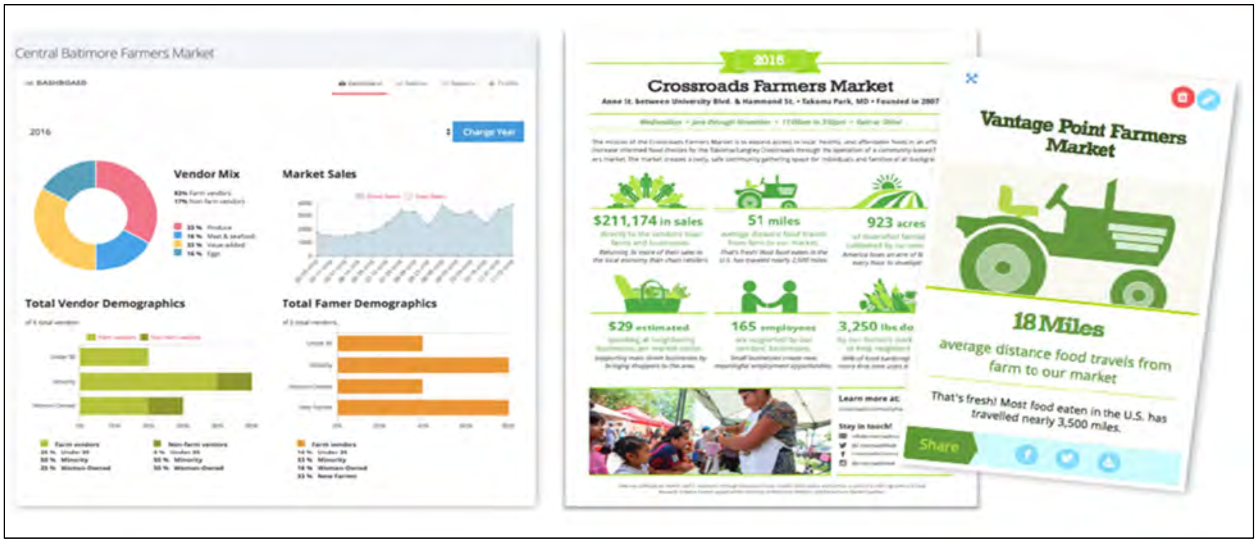
The Countryside Farmers' Market at Howe Meadow

The Countryside Farmers' Market at Howe Meadow was founded in 2004 to provide a direct-to-consumer outlet for farmers in the growing Countryside Initiative program as well as regionally. The Countryside Initiative is an innovative land-use program created via a partnership between Countryside Conservancy and Cuyahoga Valley National Park to revive the agricultural heritage of the Cuyahoga Valley.

Process and challenges during the 2017 pilot

Countryside already collected the vendor sales and visitor count data that Metrics captures and shares aggregate weekly sales data directly with its vendors, comparing the previous year's data for the same week with vendors via email (as shown in Figure 2). The market did not previously collect or compile any vendor demographic data and focused their work with Metrics on adding that data. No significant challenges were uncovered by this market during the pilot, as the market had participated in data collection on its own. The market did request some additional technical assistance in the

Figure 2. Example of Reporting from the Farmers Market Metrics 2017 Pilot, Including a Dashboard, One-page Summary, and Widget Export



data entry phase from Metrics Program Manager Marian Weaver and participated in phone calls on the reporting phase with Darlene Wolnik, FMC's Senior Advisor.

Data use

The market organization wanted to use its data for advocacy, as their food and farming businesses largely have been overlooked as possible participants of incubator programs throughout Northeast Ohio. Having the combination of vendor sales, vendor demographics, and visitor count data, the market feels better equipped to encourage these programs to view markets and market vendors as critical components of the economic system.

Metrics collected included:

- Total number of vendors on each market day
- Total number of farm vendors on each market day
- Total market sales
- Number of visitors
- Vendor demographics

Another of Countryside's reasons for using the Metrics program was the ability to create a communication package that could be customized to specific audiences to demonstrate the market's value to each audience's specific interests (Figure 3).

Since Metrics allows for individual metrics to be printed, the data can be easily added to a single email, social media post, or funder's report. Like most markets, Countryside has many stakeholders it wishes to communicate with, including its vendors and shoppers, Extension offices, public health partners, and municipal and regional governments.

Charlottesville City Market

Charlottesville City Market was founded in 1973 by local farmers, the Cason brothers, as a street-side farm stand. The market is now managed and operated by the city of Charlottesville and hosts over 100 farmers, bakers, and artisans on Saturday mornings.

The market needed a snapshot over a wide swath of activity at the current downtown market in preparation for the city's long-term planning process to determine the market's new location. The market itself collected data using Metrics to calculate all vendor- and market-level sales, examples of which are shown in Figure 3. The market was also supported with data collection by a group of students under the supervision of Dr. Paul Freedman, associate professor at the University of Virginia (UVA) and founding member of the UVA Food Collaborative. Freedman was an early supporter of the Metrics project and helped refine training exercises for Metrics during UVA's 2012

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ISSN: 2152-0801 online
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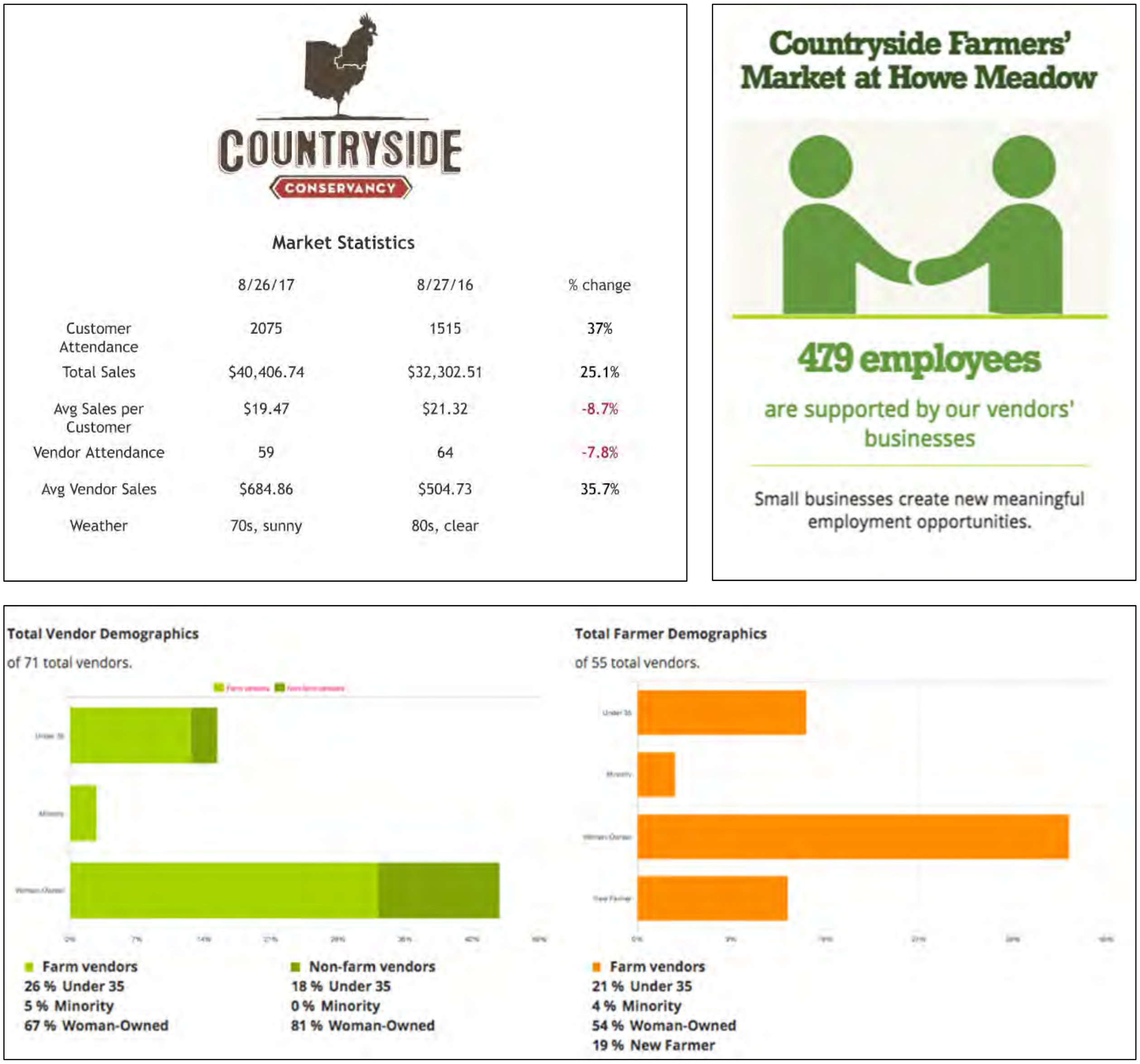
Figure 3. Data Reports from the Countryside Farmers' Market's 2017 Season



	8/26/17	8/27/16	% change
Customer Attendance	2075	1515	37%
Total Sales	$40,406.74	$32,302.51	25.1%
Avg Sales per Customer	$19.47	$21.32	-8.7%
Vendor Attendance	59	64	-7.8%
Avg Vendor Sales	$684.86	$504.73	35.7%
Weather	70s, sunny	80s, clear	

Morven Summer Institute course on farmers markets. Having researchers already familiar with Metrics collecting data using the same survey questions and methodology means more data can be managed by that market within Metrics.

Metrics collected included:

- Total number of vendors on each market day
- Total number of farm vendors on each market day
- Total market sales
- SNAP sales
- Incentives spent
- Number of SNAP transactions
- Number of visitors

Process and challenges during the 2017 pilot

This market was one of the first individual markets to enter all its vendor data (over 100 accounts) into the Metrics system. That level of data entry uncovered functional changes to the Metrics site that were communicated to the Metrics team by the market leadership during the data entry phase. Since this use of the Metrics system in Year 1 happened during one of the major development phases of Metrics, the market did not have access to the automatically generated reports until the late spring of 2018. In response, FMC volunteered to individually design the reports as needed and assist with finalizing the data that had been entered.

Data use

The data on the number of visitors and market sales have proven most useful to the Charlottesville City Market. Market Manager Justin McKenzie said, "The fact that we bring an average of 4,000-5,000 people to the area is astounding in a city with a population of just under 50,000." Visitor attendance was shared with and favorably received by staff at the departments of parks and recreation and economic development, the city manager's office, and market vendors at their 2018 annual meeting. Tracking vendor demographics (Figure 4) and sales proved particularly useful this past year, as the city of Charlottesville experienced a traumatic event on August 12, 2017, when a white nationalist group precipitated a riot that descended on the downtown area just a block from the farmers market. That data offered a window into one indicator of recovery as the city struggled to recuperate from the tragedy.

McKenzie reported to the FMC project team, "We shared our sales numbers with the City Manager's Office and they were surprised and delighted to hear that our markets were performing well after the events of August 12th when many of the downtown businesses saw steep declines in revenue."

Michigan Farmers Market Association Network

The Michigan Farmers Market Metrics program was designed to capture and evaluate economic contributions and market impacts to further the understanding of market outcomes. The program was intended to generate data for MIFMA to build advocacy messaging on behalf of Michigan markets. The association chose the metrics to be collected at fifteen participating sites through consultation with its Economic Impact Advisory Committee in partnership with Steve Miller, an economist at Michigan State University. Miller served as an advisor throughout the project and assisted with

Figure 4. Data Reports from the Charlottesville City Market's 2017 Season

selecting metrics, identifying survey questions and collection methodology, and analyzing the data. Since vendor-level data proved difficult to obtain for some of the markets, total market sales were calculated instead based on visitor survey responses. The project team aided the markets with direct data collection and hosted monthly calls to ensure that the entry deadlines were being met. At the end of the season, summary reports were created for each market using the Metrics template, although MIFMA changed the design and layout slightly.

Participating markets for this data collection project included Allen Farmers Market, Bath Township Farmers Market, Downtown DeWitt Farmers Market, East Lansing Farmers Market, Farmers Markets at the Capitol, M&M Farmers Market, Downtown Marquette Farmers Market, Menominee Historic Downtown Farmers' Market, Saline Farmers Market, Sara Hardy Farmers Market, Southeast Area Farmer's Market, St. Louis Farmers Market, Texas Township Farmers' Market, and Ypsilanti Farmers Markets. Aggregate metrics for the 15 participating MIFMA markets included:

- Estimated market sales (as reported by visitors): US$480,302.14
- Average sale per person at the market: US$23 per visitor
- Percentage of market visitors spending money at neighboring businesses: 53%
- Estimated sales at neighboring businesses by market visitors: US$418,243.32
- Average sales at neighboring businesses per market visitor: US$39 per visitor

Process and challenges during the 2017 pilot

MIFMA expected resistance from the markets on collecting vendor sales data and so did not require those metrics during this project, instead using visitor surveys to capture economic impacts. The MIFMA advisory team also wanted the added functionality of calculations for data across the network, which is not yet included in Metrics, so those calculations were completed by the MIFMA team separately. MIFMA also supplied on-site staff to individual markets as needed to complete collection responsibilities.

Data use

MIFMA reported that the summary reports were posted on its website, and it shared the reports with each participating market manager and with state agencies such as the Michigan Department of Agriculture and Rural Development.

Virginia Farmers Market Association

Established in 2011, VAFMA's mission is to support farmers markets through education initiatives while building opportunities for collaboration, networking, advocacy, and innovation that support the growth and sustainability of farmers markets statewide. The association needed data to help demonstrate the positive impact Virginia farmers markets have on their communities, so they joined FMC and the District of Columbia market network in a three-year grant to use the Metrics automated reporting features to share data with public officials, potential funding partners, members of the press, and other influencers.

VAFMA chose to focus its efforts in the first year of the project on markets in the Richmond area. The VAFMA Metrics coordinator hired by VAFMA to oversee the project was located in Richmond and was already actively involved with Capital Area Farmers Market Association (CAFMA), which had been meeting regularly for several years. VAFMA selected the CAFMA markets based on location stability, years in business, interest in data collection, and to include a variety of market types. The participating markets were Birdhouse Farmers Market, Carytown Farmers Market, Chesterfield County Farmers Market, Goochland Fairgrounds Farmers Market, Lakeside Farmers' Market, and the Manakin Market.

The markets were asked to collect visitor attendance, number of vendors, miles to market, and acres in production, the same metrics that were required by FMC and UW during the Indicators project that were deemed most useful to a wide set of audiences and easily collected and aggregated. Based on FMC's earlier pilots with Metrics, VAFMA was encouraged to move more slowly in requiring sales data to be collected in Year 1 and also to work individually with each market organization to choose the number of metrics most likely to be used at the end of the season.

Process and challenges during the 2017 pilot

During the conference calls held by FMC and VAFMA with the markets at the beginning of this project, the issue of the data being visible to a network-level account was brought up by one of the markets. As the board of VAFMA includes market managers, some of the CAFMA pilot sites questioned the ability of those leaders to access others' individual data. FMC assured the markets that the network accounts do not allow access to individual vendor data and do not allow the network account to edit the market-level data. FMC added a privacy agreement for networks for this reason, which resolved the issue.

Near the end of the first year of this project, the Metrics site was updated to incorporate more vendor data as requested by many of the pilot markets across the system. As a result, the individual data collected and already entered by the VAFMA markets became incomplete, which was a source of frustration for VAFMA. The Metrics program manager resolved the problem, but that resolution was delayed until late spring 2018, pushing the data-use phase back at least one season. In 2018, markets across the state were allowed to join the pilot; more than a dozen markets were added. Meeting the needs of a larger number of markets across a wider geographical area has been a challenge for the VAFMA coordinator, as she was close to the 2017 market pilot sites and had participated in their monthly in-person meetings where the leaders discussed issues and shared strategies. The markets added in 2018 were self-selected, and the coordinator did not have previous relationships with their leaders. The self-selecting process also meant that the new markets have varied levels of comfort and experience with data collection, which has meant the need for more one-on-one training and calls with markets from FMC and the VAFMA coordinator.

Data use

The network-level calculation and use of the 2017 data are underway as of the writing of this paper, with some market leaders already reporting they used the data on social media posts and at events when presenting with other food and farming advocates (see Figure 5). VAFMA plans to share the data with food bloggers and writers to add meaningful data to posts and articles centered on local food and farming.

Observations from FMC's 2014–2017 Pilots

- Market leaders are endlessly curious about ways to measure and understand their markets, but have a list of tasks that often push that curiosity aside—especially in the summer. In response, FMC recommends creating assigned roles for the data collection team and choosing training materials for seasonal volunteers and interns to assist in setting expectations. It also recommends identifying suitable volunteers and presenting webinars and training for network leaders in the winter or early spring.
- The pilot markets and network leaders reported a wide spectrum of reasons for collecting primary data, including producing annual reports, reporting program outcomes, and sharing shopper data with market vendors to propel more product development.
- Collecting and managing a data collection team is a time-consuming process and cannot start in the busy part of the market or farming season, nor be built from scratch each year.
- The skill level of the individual market leaders in using an online system to understand, plan, and use data is varied and has required FMC to offer more basic computer tutorials during calls with market staff.
- During the 2017 season, many market staff began to request an integrated database for managing vendor applications, with that data feeding directly into their Metrics account. In response, FMC partnered with the online vendor management platform Farmspread to offer integration with vendor applications, thus cutting out the need for users to survey vendors for demographic data. In 2018, an additional subscription to Farmspread is available to all users, although it is not required to use Metrics.
- The automatically generated graphics within Metrics have been found to be extremely appealing to markets and to network leaders, with both groups requesting more functionality in reporting visitor data and more vendor data

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

in future iterations of the reports.

- The graphics have been used primarily on social media or to meet the requirements of project reporting. In many cases, the individual metrics have been reported as more useful than the entire summary report, as many of the markets felt the final data was compelling only in some instances.
- While many of the networks using the Metrics program in 2017 saw value in using Metrics in collaboration with an academic partner, none of the individual markets have yet reported sharing any of the collected data with researchers to receive further analysis. That lack of sharing indicates the need to create more resources and partnerships to facilitate markets and researchers working together to analyze and use the data collected by markets.
- While understanding the value in aggregating data for regional impacts, market staff remained concerned about how the sharing of data with networks that included nearby markets could lead to misuse, such as poaching of vendors. As a result, they are often less eager to engage in projects that include other nearby markets.
- Documentation that explicitly laid out the ways data were shared and the limitations to that sharing did not always assuage market staff at networks or vendors at markets. This may indicate the need for networks to move more slowly in requiring sensitive data from their markets or be aided by examples of data use by networks to build support for markets.
- To add more usability to the reports, in 2017 a series of citations from other reports (FMC, 2018) were added that offered relevance to the data point collected. Those citations have been shared across many social media postings by markets including those not yet using Metrics.

Figure 5. Virginia Farmers Market Association (VAFMA) Graphic of Seven Richmond-area Farmers Markets Using 2017 Data Collected in Metrics

Conclusion

The primary goal of FMC's Farmers Market Metrics is to foster an appropriate and responsive culture of data collection that encourages markets to employ easily understandable metrics, devise a clear collection strategy, and share the data among vendors and partners. The iterative process of testing the site with markets eager to solve their data collection dilemmas has helped FMC in this process, but has also led to frustration among early adopters, who were hoping for one complete tool that serves all their data management and reporting needs. Aiding those markets in becoming skilled evaluators of their many impacts will require more pilots, more resource development, ongoing customer service training, and "train the trainer" resources for network leaders and project partners.

It is also clear that gaining vendors' trust in sharing sensitive data remains the largest hurdle in implementing standard data collection methodologies across markets and regions. The rise of vendor management software, data structures that safeguard individual data, and technical assistance for vendors to compare their data to market numbers are the current development focuses of Metrics through its partnership with Farmspread. In many cases, the market manager position is already evolving to prioritize data collection and use, leaving market-day logistics to newer staff, trained volunteers, or interns. To support that evolution, funders should prioritize staffing support to allow market leaders more time to oversee data collection.

Funders and network leaders must also exercise patience and support for each market's level of capacity and comfort with data collection, and assist them analyzing and using the data. Continuing to advance tools and training that help markets choose the right (and the right number of) metrics that speak to many audiences will assist markets in limiting their choice of data points at the outset, which will reduce "survey fatigue" and encourage more disciplined data collection.

Aiding that process, the emergence of analysis tools such as the USDA's Local Foods Economic Toolkit, coupled with consistent support from academic partners will encourage market leaders to delve more deeply into economic data and to feel more confident sharing results. Once enough data is collected in standardized methods across market seasons, other toolkits that can measure metrics that show ecological, intellectual, or social capital benefits may follow. This is likely to add new metrics to the Farmers Market Metrics program.

Finally, even though the goal of a dynamic evaluation process being led by market organizations is closer to reality, it is only in the early stages of widespread acceptance. This conclusion, offered by farmers market founder and SEED developer Richard McCarthy in 2012, illustrates the situation then and now:

> If the farmers market field was mature, I would have an extensive roster of measurement tools to share with you. It is not mature. Rather, an unexpected and unorganized generation of actors in civil society are [sic] taking social entrepreneurial risks to reinvent the ancient mechanism of farmers markets as agents of social change in communities half-starved for products, people and place. The food revolution has only just begun. I am hopeful that measurement will follow shortly.

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

Developing a production function for small-scale farm operations in Central Minnesota

Special JAFSCD Issue

Economics of Local Food Systems:

Utilization of USDA AMS Toolkit Principles

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Submitted March 30, 2018 / Revised June 29, September 7, and October 12, 2018 / Accepted October 14, 2018 / Published online January 11, 2019

Citation: Pesch, R., & Tuck, B. (2019). Developing a production function for small-scale farm operations in Central Minnesota. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3), 27–36. https://doi.org/10.5304/jafscd.2019.08C.006

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Abstract

Local food advocates promote direct-to-consumer food sales, arguing that such sales yield a variety of positive effects, including that smaller, direct-to-consumer producers have a greater economic impact compared to larger producers selling via wholesale channels. In this research study, we examine this claim by exploring the relative economic contribution of small-scale, direct-to-consumer vegetable operations versus larger-scale, direct-to-wholesale vegetable operations in Central Minnesota. In this article, we detail the methods used to define the project, gather primary data, and construct the two production functions following the methods developed for the U.S. Department of Agriculture Agricultural Marketing Service's Economics of Local Foods Systems Toolkit. In our analysis, we constructed two production functions for vegetables. The first was the default production function of vegetable operations from the input-output model IMPLAN. The second production function was constructed from detailed farm financial data on the purchasing patterns of 11 small vegetable operators in a 13-county area of Central Minnesota. Our results illuminate variations in relative impacts, but also in specific aspects of operational expenditures.

The production function for the sampled farms predicted a higher per dollar economic impact than the default IMPLAN production function. Our findings indicate that the small-scale, direct-to-consumer vegetable operations may have a greater positive impact on regional businesses than larger-scale, direct-to-wholesale operations, per dollar of output. Our results inform both farm business planning and economic development decision-making in rural regions.

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Disclosures

Funding for this effort came from an 'issue area' grant internal to the University of Minnesota Extension for the express purpose of developing interdisciplinary teams and projects.
Ryan Pesch is also a commercial vegetable operator who farms in the study area and knew some of the farmer participants as fellow growers at the time of the research.

Keywords
Economic Impact, Input-Output Model, Local Food, Opportunity Cost, Small Farm, Specialty Crop Enterprises, Local Food Systems Toolkit

Introduction and Literature Review

Measuring the economic contribution of locally sourced food has grown in importance as community leaders recognize the potential of local foods for business development and regional economic growth, particularly in rural areas (Thilmany McFadden et al., 2016). Many analysts use input-output modeling to demonstrate the economic value of local foods, an approach that relies on a set of theories and assumptions (Miller & Blair, 2009). While input-output modeling software can be relatively straightforward to run, designing an accurate theoretical model requires a careful study design and choice of assumption to best represent the sector being modeled. As the number of studies on the economic contribution of local foods has increased, some researchers have called for greater rigor and standardized methods in study design, data collection, model building, and reporting to ensure that economic impact studies in this area are both accurate and accessible (Hughes & Boys, 2015; O'Hara & Pirog, 2013). In response, the U.S. Department of Agriculture's economics of local food systems toolkit[1] (Thilmany McFadden et al., 2016) provides analysts with a blueprint for completing an economic contribution study.

Our study implements best practices from the toolkit. We demonstrate a method for using advanced data collection and modeling to enhance a local foods economic contribution study. Ensuring proper study design is critical for any economic contribution study. Three key considerations for study design are a clearly defined study area, clarity about the scope, and using appropriate data in the model construction. This literature review summarizes research related to these three key areas.

Good study design includes clearly identifying a study area. The geographic extent of an economic impact analysis can strongly influence the overall effects (Crompton, 1995). Because input-output models only capture effects within the study area, all expenditures occurring outside the study area are leakages and do not create additional economic activity in the study area. Therefore, a larger study area, in all likelihood, will capture more spending, thus increasing the overall effect. In regional studies, the study area can, in certain cases, also decrease the overall effect. This is because businesses and operations near the edges of the study area may have a higher proportion of expenditures outside the study area, thus muting their contribution.

Likewise, clearly defining a project's scope is also important. A number of recent economic impact studies of local foods have been focused on one portion of the local foods market, specifically the farm-to-institution marketing channel (Becot, Conner, Imrie, & Ettman, 2016) or farmers markets (Henneberry, Whitacre, & Agustini, 2009; Hughes, Brown, Miller, & McConnell, 2008). While understanding the value of a single component of the local foods market is valuable, such a study, by design, cannot generate a comprehensive measure of local foods in the region. Clearly articulating the project scope prior to analysis provides for a more proper interpretation of the results.

The use of appropriate and relevant data is also crucial to designing an economic contribution study. This is particularly relevant to studies related to local foods. Since local food economies constitute niche markets and tend to be poorly reflected in secondary data, primary data collection is critical (Thilmany McFadden et al., 2016). However, collecting detailed farm financial data, especially from local food operations, presents its own set of challenges. Since the local food movement is growing, operators may not yet have implemented record-keeping practices and still need training on these systems and other business planning tools (Benson, Niewolny, & Rudd, 2014). The lack of record-keeping may affect their ability and willingness to share their data. The current lack of benchmarking data may also hamper their willingness to share. While many agricultural sectors have crop budgets which reflect industry standards for spending on inputs, the local foods sector currently has

[1] The toolkit is online at https://localfoodeconomics.com/toolkit

relatively few resources of that nature and less uniformity in its production systems.

The lack of accurate data on local food operations also affects the model building process. Creators of input-output models rely on national, state, and local data sources to create production functions. In recent years, many universities across the United States have explored options for improving production functions to more adequately reflect small-scale farming operations. Lazarus, Platas, Morse, and Guess-Murphy (2002) were some of the first researchers to document the differences between small-scale and large-scale swine operations. In the context of local foods, their analysis showed the importance of collecting farm finance data to revise the production function in IMPLAN (Schmit, Jablonski, & Mansury, 2013; Schmit, Jablonski, & Mansury, 2016). Their research established that small- and medium-scale farming operations have different expenditure profiles and economic impacts. A gap in research, however, is determining how those impacts differ by commodity.

A final challenge for economic contribution studies related to local foods is reporting and sharing results. The inconsistent presentation of study results can result in diverging interpretations. The presentation of opportunity costs and the miscommunication of traditional economic impact measurements such as multipliers are major sources of inconsistency (O'Hara & Pirog, 2013). These issues partially stem from distinguishing the difference between economic contribution and economic impact (Watson, Wilson, Thilmany, & Winter, 2007). Economic contribution estimates the gross change in the economy due to an industry. The primary focus of an economic contribution study is determining the linkages between industries. Economic impact, however, measures the net change in the economy. The primary focus of an economic impact study is determining the marginal change that occurs due to an industry. To accurately measure economic impact, an analyst must examine the trade-offs happening due to an industry. In the case of local food studies, economic impact studies must account for the substitution effect. If the assumption is that food consumption does not increase and consumers buy from local food channels rather than traditional ones (e.g., wholesale, grocery), then the analysis must account for losses to the wholesale or retail channels.

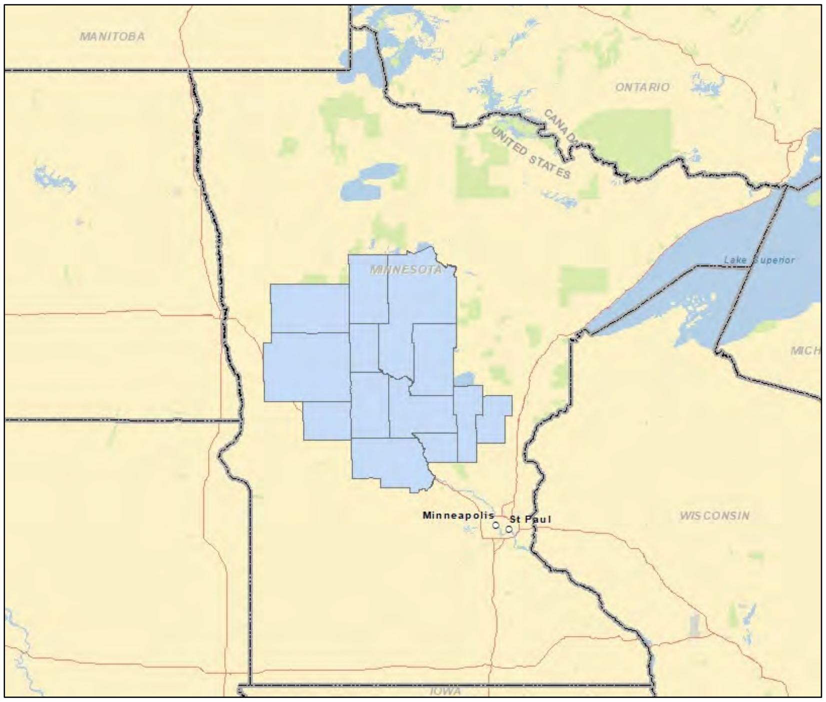
Studies have accounted for substitution effects in a myriad of ways. Conner, Knudson, Hamm, and Peterson (2008) assumed that Michigan consumers would eat more fruits and vegetables if they were produced locally, thus negating the need to measure substitution effects. Becot et al. (2016) accounted for the substitution effect via the wholesale margin. That is, they calculated the wholesale margin and modeled it as an opportunity cost. Tuck, Haynes, King, and Pesch (2010) found differences in pricing between wholesale and locally produced foods, depending on the type of food. They modeled an increase in local food production based on the local foods market price and a decrease in wholesale purchases based on the wholesale market price.

Background and Approach

In 2015, a cross-disciplinary team of University of Minnesota Extension educators and community partners began a project to assist small-scale vegetable growers in Central Minnesota. The project had several goals, including assisting growers with business planning. Another goal was to demonstrate how to modify input-output production functions to measure the economic contribution of small-scale, direct-to-consumer operations to the regional economy. The project originated via a request from a regional food hub operating in the study area. The food hub had been working with growers and wanted to support their business development. The food hub also wanted to promote the farm operations' economic contribution to regional partners and funders.

The 13-county study area (see Figure 1) is primarily rural; only six of 13 counties contain a municipality of more than 5,000 people. Because of their distance from the Minneapolis–St. Paul metropolitan area (where half of the state's population lives), most growers in this study area are limited to serving local, rural markets. In fact, none of the 11 study participants sold farm products outside of the study area. Similar to other states in the Upper Midwest, while agriculture is a driver of the state's economy, commercial

Figure 1. Central Minnesota Study Area (in blue)



vegetable production has traditionally not been a significant component of the agricultural industry. According to the 2012 Census of Agriculture, vegetable production accounted for only 0.87% of the state's 2.5 million harvested acres (1.0 million hectares). Within the region, only 2.2% of all 12,687 farms with harvested acres reported growing vegetables.

To implement the project, Extension staff worked with a steering committee comprised of representatives from the food hub and from three not-for-profit farm support organizations. The steering committee helped define the scope of the project, assisted with recruitment, and finalized the data collection tools and processes. Extension's team included three county-based educators focused on horticulture, one farm business management educator, two community economic development educators, and one statewide specialist in economic impact analysis. The project began in 2015 with a first round of data collection. The project continued through 2017 with a second round of data collection and analysis focused on marketing costs. The results presented in this article focus on 2014 data collected in 2015.

Applied Research Methods

Most studies rely on input-output models to measure the economic contribution of local foods. Input-output models trace the flow of goods and services throughout an economy. This is done by creating a transactions table, which shows all the transactions between sectors in an economy. The transactions in the table must be balanced; thus, the total output of an industry must equal total input. Inputs generally include raw goods, services, labor, taxes, rents, royalties, dividends, and profits. The transactions table only measures output and expenses in the year in which they occur. This differs from accounting practices, where depreciation is often applied and can affect results. If a farmer purchases a new tractor, for example, the expenditure is only recorded in the year of the tractor purchase because that is when the transaction occurred.

Once the flow is established, it is possible to measure how a change in one sector of the economy affects other sectors of the economy. This is accomplished by first creating a direct requirements table. The direct requirements table shows the fraction of total expenditures by sector for each of its inputs (otherwise known as the production function). Using matrix algebra, the direct requirements table is then transformed into the total requirements table, which details the total effect of a change in one sector of the economy.

The initial change in the economy is the direct effect. The direct effect is applied to the total requirements table to determine the indirect and induced effects. Indirect effects are those associated with the sector's supply chain. Induced effects are associated with changes in household spending due to the changes in the sector. The direct, indirect, and induced effects together are the total (or overall) effect (Hastings & Brucker, 1993).

There are several input-output modeling software choices available. The analysis reported here uses the IMPLAN software version 3.0, the type SAM multipliers, and the 2015 dataset for the counties in the study area. IMPLAN was selected over other models because of its availability at the county level and the fact that it allows users to modify the production functions.

To refine the production function in IMPLAN and conduct an economic contribution analysis, the research team collected detailed primary data, following methods detailed by Thilmany McFadden et al. (2016). In particular, Extension gathered three types of detailed farm financial data during in-person interviews with commercial vegetable growers in the region. The interviews typically lasted one to two hours and addressed the following:

- Farm financial data. Extension collected records related to the whole farm (including non-vegetable enterprises, such as dairy or crops) and the farm's vegetable enterprise in particular. The team gathered necessary financial data to complete both beginning and ending balance sheets, as well as income statements. These included revenue by enterprise, expenses by consistent categories, and all farm asset and liability values. This information was then entered into FINPACK, the University of Minnesota's farm financial software program, for subsequent analysis and for producing a financial report for each farm participant. The financial reports included balance sheets, income statements, and enterprise analyses for mixed vegetable production. Farm operators commonly supplied their Schedule F from their tax filing as a starting point; however, this form was insufficient for the purposes of calculating returns to the vegetable enterprise and generating a complete farm financial analysis.
- Supply purchase locations. Since our analysis specifically covered Central Minnesota, the team asked study participants which proportion of inputs was purchased within the defined boundaries of the 13-county study area.
- Primary goals and challenges. Since one project objective was to coach farm operators on the next possible steps for their operation based on the averages or financial benchmarks for the study group, understanding the current status and concerns of each operator was paramount. Qualitative individual information provided insight into the motivations of farm operators; this insight was helpful in subsequent on-farm coaching sessions regarding farm financials.

The team targeted small-scale commercial vegetable operations in the 13-county study area. The project focus was on small-scale, direct-to-consumer operations. Thus, to be eligible for the projects, operations had to have fewer than 12 acres[2] of vegetable production. In addition, to be included, the farm operation had to engage in some type of formal, direct-to-consumer marketing process, such as vending at farmers markets, doing community supported agriculture (CSA), or selling direct to schools. Supplier lists from the regional food hub, the state's local foods marketing program, and the University of Minnesota's local foods directory provided contacts for 65 commercial vegetable operations in the region. The team then identified 62 operations that met the study criteria. Operators meeting the required criteria were asked to participate by an initial email (where available), a mailed letter one week later, and a subsequent reminder letter or email (those without an email address, such as Amish growers, had all correspondence sent via mail). The email and letter explained the research purpose, selection criteria, voluntary nature of the study, confidentiality of the data, and expectations for participation. Our correspondence also offered a US$75 honorarium for participation. The regional food hub operator, a member of the advisory team, reached out to all 25 food hub vegetable suppliers via phone, email, and in-person communications after the recruitment materials were sent to personally invite potential participants. One member of the project team followed up by phone with participants who expressed interest and arranged for meeting times

[2] 1 acre=.44 hectare

with farmer operators willing to participate.

Eleven operations completed the full interviews, representing an 18% response rate. Only one participant derived their sole income from farming, whereas all other participants had some type of off-farm income. Income measures alone, however, disguise the full-time nature of these operations in season. Participants reported spending on average 1,664 hours annually on vegetable-related production and marketing (these hours do not include time spent on other farm enterprises). Overall farm size ranged between five and 160 acres; participants dedicated between a quarter acre and six acres to vegetable production. Apart from one retired couple—for whom vegetable production was a part-time endeavor—participating operations typically had one member of the farm household dedicated to full-time farm work in season who was supported by other part-time family labor. Generally, operator households mixed income from a wide variety of sources to support family living expenses, including full-time, off-farm employment, off-season part-time work, independent contracting, and other farm-related income, such as land rent.

Economic Impact Method

The project used two production functions for vegetable operations in the Central Minnesota region. The first production function was the default production function from the IMPLAN model. The default production function reflects the sum of transactions for the entire vegetable industry and includes farms of all sizes and marketing channels. The second production function was for small-scale (less than 12 acres [4.9 ha]) and direct-to-consumer farms.

Following the methods of Schmit, Jablonski, and Mansury (2013; 2016), we built a model in IMPLAN relying on the default production function and ratios of local spending. A second model was also built using the data collected for a small-scale vegetable farm and associated ratios of local spending.

Once the two models were built, they could be used for comparison. To compare, the analyst applied an equal change of US$1 million in sales to both the default and modified production functions. Thus, the US$1 million was selected for ease of comparison and because the figure is large enough to easily identify detailed differences between the results.

This analysis included both a positive increase in demand (sales) in the local foods sector and a corresponding decrease in demand (sales) in the wholesale sector to account for the substitution effect. Accounting for the substitution effect is critical because most consumers do not purchase more vegetables when buying directly from the grower. Rather, they are substituting purchases from a grocery store or supermarket. Thus, the modeling process must include an accounting of lost grocery or supermarket sales. Many local food analyses use a dollar for dollar substitution ratio, assuming that one dollar spent with a local grower equates to one dollar of lost grocery store sales This, however, does not account for the price differential between local foods and wholesale products. Based on the work of Tuck et al. (2010), we assumed local foods would have a 25% greater value than wholesale prices and modeled the wholesale loss accordingly.

Results

The 11 operations in this study grossed an average of US$9,335 per acre in vegetable sales and retained an average of US$4,192 per acre, after deducting annual cash expenses. Their average net return, after considering depreciation, was US$2,199 per acre. The lion's share of vegetable sales (75%) came from direct marketing channels, such as farmers markets, farm stands, and CSA arrangements. Wholesale marketing channels, however, accounted for 25% of total vegetable sales.

An analysis of the whole farm financial measurements, encompassing all enterprises (not only mixed vegetable production), showed a significant split between farms that made efficient use of their assets to realize returns and those that made a meager income for the size and extent of their operations. The operating farm profit of the top five operations was over 20%, whereas the bottom six had negative operating profits. The mix of farm income explains much of the difference; that is, the top performers had more farm-related income sources and managed a wider mix of enterprises than bottom performers. Generally, the group as a whole was not overleveraged and had reasonable debt to farm ratios; all saw positive increases in net worth during 2014. Farm income, however, was not enough, in most cases, to cover family living expenses. Study participants garnered an average non-farm income of nearly US$39,000 to support farm and family financial needs.

Economic Impact

The results indicate that the production function for the represented operations does differ from the default IMPLAN production function for vegetable production. Production function expenditures are divided into two main categories: intermediate purchases and value-added purchases. Intermediate purchases are for the supplies that go into the production process. Value-added purchases include employee compensation, proprietor income, indirect business taxes, rents, royalties, and dividends. In the IMPLAN model, total output equals the sum of intermediate purchases plus value-added purchases. This is due to the requirement that the transaction table be balanced, as explained earlier.

To highlight the relative differences between the two production functions, the authors used one dollar of sales in each scenario. For every one dollar of output generated, the producers represented in the study spent 63 cents on intermediate inputs and 37 cents on value-added inputs. Primary intermediate input expenses included purchases from other agricultural producers and wholesale trade. The primary value-added expenditure was for labor income. Vegetable producers in IMPLAN's default production function spent 61 cents on intermediate inputs and 39 cents on value-added inputs. A key difference was in labor income, with the default agricultural producers spending 36 cents on labor versus 34 cents for the represented sample. This difference may be the result of many of the represented sample producers reporting that they did not pay themselves a salary for the time they invested.

Comparing intermediate input expenditures, there are clear differences between the study's production function and the default production function for vegetables in IMPLAN (see Table 1).

Table 1. Purchases per Dollar of Sales, Sample Production Function vs. Default Production Function for Central Region of Minnesota

	Sample production function (US$)	Default IMPLAN for vegetable production function (US$)
Intermediate Inputs	$0.625	$0.608
Agriculture, Forestry, Fishing, and Support Services	$0.219	$0.194
Utilities	$0.016	$0.011
Manufacturing	$0.037	$0.242
Wholesale Trade	$0.112	$0.048
Transportation and Warehousing	$0.076	$0.024
Finance and Insurance	$0.060	$0.025
Real Estate and Rental	$0.003	$0.036
Professional Services	$0.041	$0.007
Educational Services	$0.006	$0.001
Other Services	$0.055	$0.003
All Other Industries	$0.000	$0.017
Value Added	$0.376	$0.394
Labor Income	$0.344	$0.358
Indirect Business Taxes	$0.032	$0.001
Other Property Type Income	$0.000	$0.035
Total	**$1.00**	**$1.00**

Sources: U of M Extension calculations (sample production functions); and IMPLAN default production function for vegetables.

The primary difference between the production function of the sample operations and the default IMPLAN production function included the following:

- **Agriculture, forestry, fishing, and support services.** Central Minnesota sample farmers spent, on average, about 2.5 cents more per dollar on purchases from other agricultural producers.
- **Manufacturing and wholesale trade.** Sample farmers made a significantly lower percentage of purchases from the manufacturing industry than the wholesale trade industry. This may be partially explained by differences in classifications by the analyst—e.g., what IMPLAN views as a manufacturing purchase may be categorized as a wholesale trade purchase by the modeler. Another likely explanation is that the IMPLAN default operations made more investments in expensive equipment, which would be categorized as a purchase from the machinery manufacturing sector.
- **Transportation and warehousing.** On a per-dollar basis, the sample farmers spent three times as much on transportation and warehousing costs than the default IMPLAN production function.
- **Real estate and land rental.** Sample operators spent noticeably less on real estate rental. Sample farmers typically owned the land used in production. The IMPLAN production function, however, included more farmers active in renting additional land for production.
- **Services.** On average, the sample operators also spent more on services. A fraction of this difference may be attributed to the advertising costs for small-scale producers to reach their target audience.

Measuring Economic Contribution Using a Modified Production Function

Using the modified production function, the model estimates that one million dollars in sales by the sample farmers will generate US$1.6 million in the regional economy (the 13-county study area) (Table 2). The same US$1 million in sales will support US$568,600 of labor income and 100 jobs. It should be noted, however, that the input-output model counts any job (even part-time) as one job. Study participants employed, on average, 2.7 people, all of whom worked part-time. Comparatively, using the default IMPLAN production function, US$1 million in sales will generate US$1.4 million in the local economy, support US$506,600 of labor income, and support nine jobs.

Table 2. Economic Contribution of US$1 Million in Sales, Sample Operations versus Default IMPLAN Production Function, in the 13-county Region

	Sample production function (US$)	Default IMPLAN production function for vegetables (US$)
Output		
Direct	$1,000,000	$1,000,000
Indirect and Induced	$608,000	$375,450
Total	$1,608,000	$1,375,450
Employment		
Direct	95	6
Indirect and Induced	5	3
Total	100	9
Labor Income		
Direct	$376,000	$394,000
Indirect and Induced	$192,600	$112,600
Total	$568,600	$506,600

Estimates by University of Minnesota Extension.

Discussion

The modified production function predicted a higher per-dollar economic impact than the default IMPLAN production function. This indicates that the small-scale, direct-to-consumer vegetable operations may have a greater impact on regional businesses than larger-scale, direct-to-wholesale operations, per dollar of output.

However, the quality of any economic impact analysis depends on the primary data that modifies or reflects the "ground truth" of an input-output model. The greatest difficulty in conducting this study was recruitment. In a 13-county area with an estimated 65 commercial vegetable producers, 11 agreed to participate. Even with the incentive of receiving a US$75 honorarium, business coaching, and custom data analysis for their farm, operators shied away, most often citing privacy issues. Researchers trying to collect valid and robust data are left to balance the trade-offs of personal interviews versus written or online surveys. While interviews, with both parties examining financial records together, may yield more accurate and detailed data from participants, they may seem too intrusive for some participants; further, interviews require a considerable investment of resources for researchers. A written or online survey may be viewed as more accessible and less intrusive, but given the complexity of farm financial data, may not yield the highest level of accuracy and detail.

The value of this research, despite the limited sample size, is two-fold. First, it demonstrates that changes to the production function to reflect local conditions can indeed affect relative impacts. The results appear to indicate that small-scale, direct-to-consumer vegetable operators spend differently for inputs and spend more locally compared to the model default. These findings were consistent with those from Cornell's study (Schmit et al., 2013; 2016). By following their recommendations for future research—namely a micro-level approach on a single production sector—our study reinforced their findings. Collecting the necessary data and incorporating them into an input-output model may help local food advocates better state their case that local food producers have significant and differential economic impact in their regions.

Second, this research project demonstrates how the fundamentals of the local food economics toolkit can be implemented in a region or sub-region of a state. It also shows how the collaboration of a project team (local production specialists, farm-business management specialists, and an economic impact analyst) can modify the analysis to improve accuracy.

Acknowledgments

The authors would like to thank the full Extension team, farmer study participants, and advisory team which contributed to the research and made the project a success. The Extension team included Beth Berlin, Merritt Bussiere, Rob Holcomb, Randy Nelson, and our editor, Elyse Paxton. The advisory team included Lisa Baker, Arlene Jones, Kathy Zeman, and Molly Zins. Per our research agreement on confidentiality, farmer participants shall remain nameless, but you know who you are, and your contributions were greatest of all.

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

Improving economic contribution analyses of local agricultural systems: Lessons from a study of the New York apple industry

Special JAFSCD Issue
Economics of Local Food Systems: Utilization of USDA AMS Toolkit Principles
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Submitted March 26, 2018 / Revised October 3, October 28, and November 7, 2018 / Accepted November 8, 2018 / Published online January 16, 2019

Citation: Schmit, T. M., Severson, R. M., Strzok, J., & Barros, J. (2019). Improving economic contribution analyses of local agricultural systems: Lessons from a study of the New York apple industry. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3), 37–51. https://doi.org/10.5304/jafscd.2019.08C.009

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Abstract
Policymakers and economic development professionals are often confronted with fundamental questions about the efficacy of agriculture-based economic development initiatives in enhancing the economic vitality of communities relative to other forms of development. By better understanding the relationships of agricultural industries within local economies, community educators, industry leaders, and public officials can make more informed choices to enhance economic activity and impact. We illustrate a framework for conducting multi-industry economic contribution analyses to inform practitioners on what it is, when it should be used,

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Funding Disclosure and Acknowledgements
This work was supported by a grant from the New York Apple Association (NYAA). We are thankful for their assistance in data collection, member communications, and review of prior versions of this manuscript. Additional support was provided by Matt Wells (Lake Ontario Fruit Program), Lindsey Pashow (Harvest NY), Cornell Cooperative Extension; Jenn Smith (New York Cider Association); and Frederick C. Tamarkin (Cornell University). The authors have no financial interest or benefit from the direct application of this research. The views expressed are the authors' and do not necessarily represent the policies or views of any sponsoring firms or agencies. All errors remain our sole responsibility.

and what information it can provide. As these types of analyses are popular among industry and public agencies alike, promoting a replicable framework improves the compatibility and comparison of analyses across industries, geographies, and time. In addition, we describe the costs and rewards of primary data collection to support more refined and locally-specific impact estimates and illustrate its use to the apple industry in New York State. Finally, we describe how backward industry linkages lead to commonly referenced multipliers. In doing so, practitioners can better understand the local supplying industries that are most important to the industry of inquiry and the supplying sectors most influenced by industry expansion efforts.

Keywords

Agricultural Development, Input-Output Analysis, Multi-Industry Economic Contribution, Economic Multipliers, Local Food Systems Toolkit

Introduction and Literature Review

Policymakers and economic development professionals are often confronted with fundamental questions about the efficacy of agriculture-based economic development initiatives in enhancing the economic vitality of communities relative to other forms of development. What are the economic impacts of alternative development options, how should the impacts be measured, and what matters most are common questions. If the economic impacts of agriculture-based development are comparable to or exceed non-agriculture-based efforts, it makes sense that they be 'at the table' when evaluating alternative opportunities. That said, a careful understanding and interpretation of economic impacts are required for informed decision-making.

Take, for example, a policy decision directed towards the expansion of alternative manufacturing industries. If policy foci center on targeting development efforts to industries with the largest multiplier effect on jobs, attention to the milk manufacturing and flour milling sectors in New York State (NYS) would be appropriate as both have similar and relatively high jobs multipliers of around six (IMPLAN, 2016). It is worth noting that NYS has a large dairy farming industry but a relatively small amount of wheat production. So why do the milk manufacturing and flour milling sectors have a similar jobs multiplier? A jobs multiplier of six implies that for every job created directly, an additional five jobs are created in backward linked local industries. However, the total number of jobs created is also dependent on the size of the industry expansion. Specific to NYS, 0.6 jobs are required in flour milling for every million dollars of output, while every million dollars of fluid milk sales requires 1.3 direct jobs (IMPLAN, 2016). In other words, to reach the same level of total job creation, the size of industry expansion in flour milling would need to be over twice that of fluid milk manufacturing.[1]

Furthermore, it is important to emphasize that the size of the multipliers says nothing about the likelihood or means by which the primary industries can be expanded. The likelihood of the expansion of a given sector depends on where markets are expanding and the extent to which these sectors are the ones in which the multipliers are large (Schmit & Boisvert, 2014). Indeed, an equivalent impact could be achieved by supporting the industries that supply those that are targeted for expansion thereby increasing local purchases and the size of the expanding industry's economic multipliers. In short, development alternatives need to consider the local generative effects, the availability and expansion potential of locally procured inputs, and the absolute size of the industry expansion.

Numerous agriculture-based economic contribution analyses can be found online and conducted by various academic, government, industry, and consulting agencies. Several Land Grant universities have estimated the economic contribution of agriculture for their states, albeit with varied definitions of agriculture and/or the analytical

[1] Given the numbers above, a US$10 million dollar expansion in flour milling will require 6 direct jobs, while a comparable expansion in fluid milk manufacturing will require 13. Multiplying the same jobs multiplier (6) to each number of new direct jobs created implies that 36 total jobs will be created in the economy as a result of the flour milling expansion versus 78 total jobs as a result of the fluid milk manufacturing expansion.

approaches employed (e.g., Econsult Solutions & Fox School of Business, 2018; Schmit, 2016; Deller, 2014; University of Arkansas, 2014; Fields, Guo, Hodges & Mohammad, 2013; Ferris & Lynch, 2013). Largely, such studies rely on existing secondary data and software regarding industry spending and sales patterns (often IMPLAN).[2] Some recent commodity-specific examples include the U.S. dairy industry (International Dairy Foods Association [IDFA], n.d.), the North American cranberry industry (Alston, Medellin-Azuara, & Saitone, 2014), and the Washington State apple industry (Globalwise, 2014)—again, primarily relying on existing secondary data.

Alternatively, Schilling, Sullivan, Komar, and Marxen (2011) analyze the agritourism industry in New Jersey, one that is not defined explicitly in the North American Industry Classification System (NAICS); thus, an analysis of this industry requires supplemental data collection to identify its spending and sales patterns.[3] Similarly, the economic contributions of cooperative businesses have been studied (e.g., Deller, Hoyt, Hueth, & Sundaram-Stukel, 2009; Karaphillis, Duguid, & Lake, 2017). Since cooperatives are not confined to any one industry, researchers need to either identify the industries for which they are located and apply those sales and spending patterns to the cooperative activity, or collect data from cooperatives to quantify them explicitly.

Increasing discussions of agriculture-based economic development opportunities have occurred in the context of how expanding local food systems benefit agricultural producers and the local communities from where they reside. Alternative impact analyses have been applied to a range of local food system activities—e.g., direct marketing (Schmit, Jablonski, & Mansury, 2016; Hughes & Isengildina-Massa, 2015; Henneberry, Whitacre, & Agustini, 2009; Hughes, Brown, Miller, & McConnell, 2008, Otto & Varner, 2005), food hubs (Jablonski, Schmit, & Kay, 2016; Schmit & Jablonski, 2017), farm-to-school (Gunter & Thilmany, 2012), and livestock processing (Swenson, 2011). Thilmany McFadden et al. (2017) provide a comprehensive examination of these types of analyses and present a guiding toolkit to assist communities assessing these issues.

By better understanding the relationships of agricultural industries within local economies, community educators, industry leaders, and public officials can make more informed choices to enhance economic activity and impact. However, precise answers to these types of questions are elusive, often due to a lack of data to address them sufficiently. Accordingly, the evaluation of the economic contributions of industries and/or industry expansion efforts requires careful consideration of the methodologies employed and data collected for their use.

We address these issues through three distinct yet inter-related contributions. First, the requirements and availability of appropriate data are of particular consequence to producing defensible economic impacts. Understanding where local primary data can supplement or replace secondary data is important in order to improve the precision of results. That said, primary data collection comes with a cost, in both time and dollars. Using the NYS apple industry as a case study, we describe the costs and rewards of primary data collection to support more refined and locally-specific impact estimates. We describe the nature of the financial data needed, highlight the costs of and potential barriers to collecting it, and compare economic contribution results based on the primary data we collected relative to the default data available in IMPLAN.

Second, we illustrate a framework for appropriately conducting multi-industry economic contribution analyses—specifically, where the outputs of some industries serve as inputs to others. For our case example of the apple industry, we go from farm input services, to farm production, to processing. Fruit production and processing are important agricultural industries in NYS, and apples represent a major component of these industries. However, our focus is less on the actual levels of

[2] The IMPLAN economic impact assessment software system and associated data bases are often used by practitioners to construct local models and assess economic impacts. For more information, go to https://www.implan.com
[3] For more information on NAICS industry categories go to https://www.census.gov/eos/www/naics/

impact, but rather on the process and what practitioners need to consider to appropriately estimate economic contributions, avoid double counting, and interpret the results.

Our final contribution emphasizes the distributional impacts associated with an industry's direct contributions. The indirect and induced changes in economic activity make up the multiplier effects via inter-industry purchases and supply chain linkages. The indirect impacts are in the form of purchases of a variety of goods and services in backward-linked industries; the induced impacts are in the form of the labor income generated by those businesses and spent by owners and employees for household goods and services. Multipliers are a useful way to sum up the total value of industry linkages; however, much can be learned from a closer examination of the individual components of those values.

We continue now with a description of our analytical approach, including an exposition of what types of data were collected (primary and secondary) for our case study example and how we quantified the direct effects. We then present the results to the three contributions identified above. We close with a summary discussion and conclusions.

Applied Research Methods

Particular to this special issue of the journal, our approach incorporates all of the modules from Thilmany McFadden et al. (2017). In particular, we received input from industry stakeholders (e.g., New York Apple Association (NYAA), NYS Cider Association) to frame our economic assessment (Module 1). We incorporated secondary data into our analysis from the U.S. Department of Agriculture (USDA), U.S. Department of the Treasury (USDT), and IMPLAN (Module 2).We developed and administered firm-level surveys for apple producers and intermediaries (Module 3) and engaged with additional stakeholders to supplement our primary data collection efforts (e.g., Cornell Cooperative Extension (CCE), the CCE Lake Ontario Fruit Team (LOFT), and Cornell University (Module 4). We constructed a customized state-level input-output (IO) model within IMPLAN. This model included a specific NYS apple farming industry extracted from the more aggregate fruit farming sector available in the software. We also accounted for product flows across industries to prevent double counting (Modules 5, 6, and 7).

IO models provide an insightful way to investigate the underlying processes that bind an economy together. Its strengths lie in a detailed representation of the primary and intermediate input requirements by production sector, the distribution of sales of individual industries throughout an economy, and the interrelationships among these industries and other economic sectors of an economy (Schmit & Boisvert, 2014). Our description of economic contributions follows three common economic measurements—output, labor income, and employment. Output is the value of industrial production in producer prices; for manufacturing sectors, it equals sales plus changes in inventory; for service sectors, it equals sales; and for wholesale and retail sectors, it equals the gross margin (i.e., sales less the cost of goods sold). Labor income is the sum of employee compensation (i.e., total payroll cost) and proprietor income (i.e., income to self-employed and unincorporated business owners). Employment is the average monthly number of jobs in a year, both full and part-time.

Contribution Analysis

In deference to an impact analysis that considers the change in new demand induced by policy or private initiatives, a contribution analysis for an industry (or collection of industries) describes that portion of an economy that can be attributed to the existing industry (or industries). For a contribution analysis, the existing total output provides the initial direct effects of the analysis. When compared to the entire economy, the results provide insight into the relative extent of the industry in the economy and the strength of its backward linkages. With respect to output, the direct effects represent sales by the industry or industries of interest, the indirect effects represent sales by the backward-linked industries, and the induced effects represent industry sales due to consumption out of labor income.

A collection of related agriculture-based industries represents a complex intersection of production inputs and services at the farm to produce a crop that is subsequently harvested, processed, and marketed to a series of downstream intermediaries (e.g., wholesalers and retailers) and institutions (e.g., governments and households). In a multi-industry analysis, it is important to understand where outputs in one industry represent inputs to another to avoid double counting. IMPLAN provides procedures to accommodate this within their software; further explanations are available in Schmit (2016) and Schmit, Severson, Strzok, and Barros (2018).[4]

Primary Data Collection

When conducting an economic impact or contribution analysis in IMPLAN, it is important to consider when the existing industry parameters that represent its spending activities are sufficient for analysis and when those parameters should be updated through supplemental data collection. Production functions in IMPLAN—i.e., the spending on intermediate inputs and outlays to value added per dollar of output—represent national industry averages. Accordingly, these averages more closely reflect firms that contribute a relatively large proportion of total output to a sector (i.e., typically large firms). For example, a large fruit farm in Washington would have an identical production function as a small fruit farm in NYS. Given differences in climate, soils, crop varieties, and production practices, this is a difficult assumption to defend.

In addition, industries of interest may not be reported explicitly in existing secondary sources. They may, instead, be included within larger industry aggregates. Specific to our example, apple farming is included within the *Fruit Farming* industry (industry 4) in IMPLAN. For NYS, other fruit farming primarily consists of grapes, but also some cherry and stone fruit production. The question of adequacy becomes even more acute in this case; i.e., is the national average production function for all fruit farming adequate for application to apple farming in NYS? Likely not.

To account for these problematic issues, we developed a financial survey for NYS apple producers and intermediaries (i.e., storage and distribution firms and apple processors) to collect localized data.[5] Collecting detailed financial data from firms is time-consuming and difficult, particularly when it is not done in a face-to-face format to address hesitations and when it asks for data not normally collected and/or recorded by firms (e.g., input purchases delineated by location). Accounting for input expenditures within IMPLAN also varies based on whether those purchases are from manufacturers, wholesalers, or retailers, therefore requiring a more complex financial survey. While we were able to adapt surveys from prior work, tailoring the surveys to match the industries of interest and mapping financial business categories to IMPLAN categories takes considerable time. Several weeks were required to develop the surveys, program them in online (Qualtrics) and written formats, and vet them with industry partners.

We worked with the NYAA to administer the surveys and reach out directly to firms through emails, web postings, social media, and in-person requests. Because survey respondents are busy, communicating any incentive for them to participate is critical. Notably, the farms and intermediaries in our case example contribute financially to NYAA through the state's apple marketing orders. Because the NYAA was planning to use the results for public and private marketing efforts, we thought this was a sufficient incentive to participate. It wasn't. Timing is also important. In hindsight, ours was poor; late summer to early fall was a busy time due to harvest preparation.

Several reminders were sent out and the survey deadline was extended, but with little result. Ultimately, our efforts were unsuccessful. Only 25 of the roughly 600 commercial apple growers in the state responded to the survey. Less than one-half of those reported sales data, one-fifth reported input purchases, and one-sixth reported local purchase percentages. Ultimately, only four surveys were of use for our analysis, insufficient to produce

[4] Instructions for doing a multi-industry contribution analysis within IMPLAN are available at https://implanhelp.zendesk.com/hc/en-us/articles/115009542247-Multi-Industry-Contribution-Analysis-In-IMPLAN-Pro

[5] Copies of the surveys and more detail on the apple industry in NYS are available in Schmit et al. (2018).

defensible financial profiles. By now months had passed.

We were extremely fortunate to discover additional resources. Routinely, the Lake Ontario Fruit Team (LOFT) collects financial data from apple farms they work with and summarizes it in the *Fruit Farm Business Summary* (*FFBS*) (LOFT, 2017). From this information, we created a representative apple farming production function for NYS. That said, the *FFBS* did not contain estimates of the percentage of input purchases made to firms within NYS. IMPLAN defines these percentages as "local purchase percentages" or "LPP." In our case, "local" was NYS. Accordingly, we needed to apply the LPP estimates within IMPLAN for the NYS study area.[6]

Given that the focus of our example was the apple industry in NYS and we believed the existing production function for fruit farming to be insufficient, we included the production function for apple farming as a separate industry in our IMPLAN model—i.e., by extracting apple farming from the preexisting fruit farming sector. Doing so implies that all sectors purchasing fruit from farmers must be edited to reflect a combination of apple fruit and non-apple fruit purchases. In our model example, 24 industries (of the 536 currently in IMPLAN) purchased fruit from farmers, as well as state and local governments and households. Disaggregating these purchases definitively across sectors would require surveying firms in all of the sectors that purchase fruit. This is a large task and one with an unnecessarily high cost to implement. Given that the total level of fruit purchases remained unchanged, changes in the allocation between apple fruit and non-apple fruit will have little effect on the overall model results. Accordingly, we allocated purchases of "fruit" to "apple fruit" and "non-apple fruit" based on their relative production values in the state.[7]

Responses by intermediaries to the financial survey were even poorer than for apple farms: only five surveys were returned. Very little financial data was reported and nothing of value was reported to adjust IMPLAN's default production function parameters. However, relative to apple farming, this was deemed less problematic. National average production functions were seen as sufficient as processors likely had similar production functions across geographic areas; further, the distribution of processors by size in NYS was similar to peer processing states. Since no apple-specific processing sectors are available within IMPLAN, we selected a set of fruit and vegetable processing sectors where apple-based products are prevalent.[8]

Defining Direct Effects

In addition to evaluating the adequateness of an industry's sales and spending patterns, quantifying the level of the direct industry activity is required in economic contribution analyses—i.e., the direct effects. Economic impact analyses are based on a particular expansion scenario where the direct effects are defined internally— e.g., a new manufacturing plant with an expected volume of sales or workers employed. For a contribution analysis, existing estimates of industry activity (e.g., output, jobs, and labor income) are used for the direct effect. IMPLAN carefully sources secondary data from a collection of federal, state, and local sources to compile their industry estimates. However, when an industry of interest is contained within a larger industry aggregate, additional effort is required of the researcher. Other secondary data sources or primary data collection may be appropriate, depending on the nature of the industry. In our example, seven industry sectors were included: (*i*) agricultural support services, (*ii*) nursery stock, (*iii*) farming, (*iv*) frozen, canned, and dehydrated processing, (*v*) hard cider and wine processing, (*vi*) industry marketing, and (*vii*) industry public research and extension.

[6] An example here may be useful. Consider two apple farms in NYS, Farm A and Farm B. They both purchase $0.10 of fertilizer to grow their crop for every dollar of apples sold. However, Farm A purchases the fertilizer from local supply store in NYS, while Farm B purchases the fertilizer from a supply store in Pennsylvania. Farm A's fertilizer purchases contribute to economic impacts in NYS, while Farm B's does not. In the latter case, this spending is referred to as leakage, as the spending leaves the defined local region, NYS in our example.

[7] Detailed instructions for creating a new sector in IMPLAN are available in Schmit & Jablonski (2017).

[8] For more details, see Schmit et al. (2018).

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
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Results

The results presented here represent both the intermediate and final results of our apple industry application. Through the discussion, our ambition is to help practitioners understand what an economic contribution analysis is, when it is used, and what it can tell you.

Quantified Direct Effects

The direct effects for output and employment for each apple industry are shown in Table 1. While the level of effects is of less interest in this paper, the table also highlights the data sources for each industry and where the production functions and LPPs are defined. To improve understanding of our empirical process for broader application to these types of studies, we summarize below the integration of data sources by industry and the IMPLAN industries to which they apply. Additional details are available in Schmit et al. (2018).

Agricultural Support Services: Support activities for apple farming fall under *Support Activities for Agriculture & Forestry* industry (19) in IMPLAN. The direct effect is computed as a proportion of total industry sales in (19) based on the ratio of apple farming to total farming output in NYS. Employment follows by applying IMPLAN's jobs to output ratio for (19). The production function for (19) and LPPs in IMPLAN were utilized.

Nursery Stock Suppliers: Economic activity associated with nursery stock suppliers is included in *Greenhouse, Nursery, & Floriculture* industry (6) in IMPLAN. The LOFT provided an estimate of one million trees produced per year at a value of US$7/tree. The production function for (6) and LPPs in IMPLAN were utilized.

Apple farming: The USDA's value of production for apple farming in NYS was used as the measure of output (USDA National Agricultural Statistics Service [USDA NASS], 2017). Employee compensation from *FFBS* (LOFT, 2017) was combined with IMPLAN's compensation per worker for the fruit farming industry (4) to estimate total jobs. IMPLAN's LPPs were utilized for the industry's input purchases.

Frozen, Canned, & Dehydrated Processing: Most NYS processed apple products (e.g., frozen concentrate, juices, jellies, slices) fall under IMPLAN's *Fruit & Vegetable Frozen, Canned, & Dehydrated Products Manufacturing* industries (79, 81,

Table 1. Level of Direct Effects and Sources of Data, New York Apple Industry, 2016 Dollars

Industry (Relevant IMPLAN Industry Code)	Direct Employment (jobs)	Direct Output (US$ million)	Sources for:		
			Direct Effect	Production Function	Local Purchase Percentages
Apple agricultural support services (19)	265	11.9	IMPLAN	IMPLAN	IMPLAN
Apple nursery stock (6)	81	7.1	LOFT	IMPLAN	IMPLAN
Apple farming (7)	5,605	317.0	USDA	LOFT	IMPLAN
Apple processing: frozen, canned, & dehydrated (79, 81, & 83)	1,635	838.8	IMPLAN USDA	IMPLAN	IMPLAN
Apple processing: apple wine & hard cider (109)	425	129.8	NCGA USDT	IMPLAN	IMPLAN
Apple industry marketing (457)	6	3.1	NYAA	IMPLAN	IMPLAN
Apple public research & extension (456)	16	2.2	CU CCE	IMPLAN	IMPLAN
Total	8,033	1,309.9			

Source: Schmit, et al (2018). LOFT = Lake Ontario Fruit Team, Cornell Cooperative Extension, USDA = United States Department of Agriculture, NCGA = Nielsen Commercial Grocers Association (Brager and Crompton, 2017), USDT = United States Department of the Treasury, Alcohol and Tobacco Tax and Trade Bureau, NYAA = New York Apple Association, CU = Cornell University, Office of Sponsored Programs, CCE = Cornell Cooperative Extension.

and 83, respectively).[9] We estimated output and employment as 45% of the totals contained in these industries (Schmit et al., 2018). IMPLAN production functions and LPPs were utilized.

Hard Cider and Apple Wine Processing: Hard (alcoholic) cider, applejack, and apple wines fall under *Wineries* industry (109) in IMPLAN. Retail cider prices from Nielsen CGA (Brager & Crompton, 2017) were used in concert with Alcohol and Tobacco Tax and Trade Bureau cider volume data to estimate the value of total output (USDT, 2018). The production function for (109) and LPPs in IMPLAN were utilized.

Industry Marketing: Industry marketing is conducted by the NYAA. They provided income, expense, and employment data to us; however, the expense categories were too aggregated and thus could not be mapped to IMPLAN and LPPs. Their activity falls under *Advertising, Public Relations & Related Services* industry (457) in IMPLAN. The production function for (457) and LPPs in IMPLAN were utilized.

Industry Public Research & Extension: Cornell University's Office for Sponsored Programs (OSP) provided data on outside grants awarded over the previous five years related to apple industry research. Average annual funding was computed. In addition, CCE provided data on expenditures and employment for apple industry extension efforts. Both activities fall within the *Scientific Research & Development Services* industry (456) in IMPLAN. The production function for (456) and LPPs in IMPLAN were utilized.

Comparing Production Functions

Our NYS apple farming production function was constructed to include 24 input purchase and four value added categories. For ease of exposition, we provide a summary of those results in Table 2 and

Table 2. Apple Farming Production Function in New York State Compared to Fruit Farming Production Function in IMPLAN

Industry/Value Added Aggregate	Fruit Farming (IMPLAN)[a]	Apple Farming (NYS)[a]	Difference[a]	Percent Difference
Ag & ag support services	0.0552	0.0353	–0.0199	–36%
Utilities	0.0037	0.0054	0.0017	47%
Construction	0.0032	0.0131	0.0099	310%
Manufacturing	0.0256	0.1094	0.0838	327%
Wholesale trade	0.0042	0.0790	0.0748	1776%
Retail trade	0.0001	0.0042	0.0042	5200%
Transportation & warehousing	0.0020	0.0240	0.0220	1123%
Information	0.0003	0.0027	0.0024	841%
Finance & insurance	0.0063	0.0282	0.0219	347%
Real estate & rental	0.0026	0.0309	0.0284	1103%
Professional services (non-ag)	0.0022	0.0641	0.0619	2833%
Total intermediate inputs	0.10524	0.3962	0.2909	276%
Employee compensation	0.2975	0.3266	0.0292	10%
Proprietor Income	0.2616	0.1806	–0.0810	–31%
Other property type income	0.3216	0.0876	–0.2340	–73%
Taxes on production & imports	0.0141	0.0090	–0.0051	–36%
Total value added	0.8948	0.6038	–0.2909	–33%

Sources: IMPLAN (2016) and author calculations.
[a] Dollars of expenditure or outlay per dollar of output.

[9] For detailed information on commodities produced within IMPLAN industries, see https://implanhelp.zendesk.com/hc/en-us/articles/115009674428-IMPLAN-Sectoring-NAICS-Correspondences

compare them to the default estimates provided in IMPLAN for fruit farming (4).[10] The parameters in the first three columns represent expenditures per dollar of output, while the final two columns represent the absolute and percentage differences for the apple farming estimates, respectively, relative to those within IMPLAN.

Looking first at the allocations between total intermediate inputs and total value added, it is clear that there are considerable differences between production functions. In fruit farming, around 10% of every dollar of output goes to purchase intermediate inputs, while 90% goes to one of four categories of value added. The comparable numbers for the apple farming industry we constructed are 40% and 60%, respectively. The absolute level of these aggregated category differences alone is strong support that the default production function in IMPLAN was inadequate for our analysis.

More intermediate inputs are required for apple farming in NYS. In terms of expenditures per dollar of output, this is particularly true for purchases from manufacturers (+0.084), wholesalers (+0.075), and non-ag (e.g., accounting, legal) professional services (+0.062). However, apple farms in NYS purchased less ag support services and products from other farmers (-0.020). The degree to which such differences affect the contribution results will depend on how different the supply industries are and the degree to which those industries are local.

Outlays per dollar of output for proprietor income (PI) and other property type income (OPTI, largely corporate profits) are much lower for the NYS apple farming industry estimates relative to IMPLAN's fruit farming industry estimates (i.e., –31% and –73%, respectively). While a lower outlay to PI will reduce economic contributions, since it is a component of labor income, a lower outlay to OPTI will not since it does not contribute to economic impact (e.g., we do not know if corporate profits are distributed locally). Because the reduction in proprietor income (-0.0810) is more than the increase in employee compensation (+0.0292), the contribution result from these two categories will be less than that in the default case.

To understand the overall difference in results by using localized data, we conducted single industry contribution analyses for apple farming using the default fruit farming production function in IMPLAN and the apple farming production function we constructed. Since IMPLAN's LPPs for inputs were used in each case, the only differences arising from the LPPs will come from the degree to which different supplying industries have different LPPs. We start with the same direct output effect in each case, US$317 million. The results are shown in Table 3. The change in total output was over 21% higher when using the production function we constructed (i.e., US$574.0 versus US$472.7 million). This was largely a consequence of the higher level of intermediate

Table 3. Economic Contributions for Apple Farming with Author-Constructed Production Function and IMPLAN's Fruit Farming Production Function

Impact Type	Employment (Jobs)	Labor Income (US$ Million)	Output (US$ Million)
NYS Apple Farming Production Function (Primary)			
Direct Effect	5,605	164.7	317.0
Indirect Effect	525	40.6	116.0
Induced Effect	886	52.1	141.0
Total Effect	7,016	257.4	574.0
IMPLAN Fruit Farming Production Function (Default)			
Direct Effect	6,388	181.6	317.0
Indirect Effect	244	9.9	23.3
Induced Effect	832	49.0	132.4
Total Effect	7,464	240.5	472.7
Percentage Change with Primary Data			
Total Effect	–6.01	+7.09	+21.41

Sources: IMPLAN (2016), Author calculations.
Note: Both models defined by the same direct effect for output (US$317.0 million).

[10] The fully detailed production function is found in Schmit et al. (2018), page 56.

input purchases. This is reflected explicitly in the difference in the levels of indirect effects (i.e., US$116.0 versus US$23.3 million).

The overall change in labor income was also positive, around 7% (i.e., US$257.4 versus US$240.5 million). This change was much lower than output since the initial direct effect in apple farming was lower to begin with (i.e., US$164.7 versus US$181.6 million). Recall, the combined change in employee compensation and proprietor income from Table 2 is negative. The overall gain is again due to the higher level of indirect effects for apple farming (i.e., US$40.6 versus US$9.9 million). The negative effect on total jobs is due solely to the lower number of initial direct jobs for our constructed industry—i.e., the indirect and induced effects on jobs are higher for apple farming.

Multi-Industry Economic Contribution

Table 4 presents the results of the multi-industry analysis. We include results for both the individual industries and the total across all industries. Individual industry contributions allow for a detailed accounting of their specific indirect and induced

Table 4. Economic Contribution of the Apple Industry in New York, by Sector, 2016

Category and Sector	Direct Effect[a]	Indirect Effect[b]	Induced Effect[c]	Total Effect	Contribution Multiplier[d]
Output (US$ million)					
Agricultural support services	11.9	1.6	5.7	19.2	1.62
Nursery stock suppliers	7.1	0.6	2.9	10.6	1.49
Farming	317.0	116.0	141.0	574.0	1.81
Processing (frozen canned, dehydrated)	838.8	318.5	149.8	1,307.1	1.56
Processing (hard cider, apple wine)	129.8	52.9	36.2	218.9	1.69
Industry marketing	3.1	0.8	1.2	5.2	1.65
Industry public research & extension	2.2	1.1	0.3	3.6	1.65
Total	1,309.9	441.3	314.3	2,065.5	1.58
Employment					
Agricultural support services	265	7	36	308	1.16
Nursery stock suppliers	81	5	18	104	1.28
Farming	5,605	525	886	7,016	1.25
Processing (frozen canned, dehydrated)	1,635	1,441	940	4,016	2.46
Processing (hard cider, apple wine)	425	252	228	905	2.13
Industry marketing	6	5	8	19	3.19
Industry public research & extension	16	6	2	24	1.49
Total	8,033	1,849	1,989	11,872	1.48
Labor Income (US$ million)					
Agricultural support services	7.7	0.5	2.1	10.4	1.34
Nursery stock suppliers	4.0	0.2	1.1	5.3	1.33
Farming	164.7	40.6	52.1	257.5	1.56
Processing (frozen canned, dehydrated)	106.9	113.8	55.4	276.0	2.58
Processing (hard cider, apple wine)	31.5	21.1	13.4	66.0	2.10
Industry marketing	1.5	0.3	0.5	2.3	1.52
Industry public research & extension	0.8	0.5	0.1	1.4	1.71
Total	317.2	154.8	115.9	587.9	1.85

Source: Schmit et al. (2018)
[a] Direct effects represent total activity (sales, employment, labor income, value added) by the respective industry.
[b] Indirect effects represent all activity by the backward-linked supply chain industries.
[c] Induced effects represent additional industry activity due to consumption out of labor income.
[d] The contribution multiplier is calculated as the total effect divided by the direct effect.

effects. They also reflect industry linkages with both non-apple industries and other apple industries. Separate contribution analyses in IMPLAN must be conducted for each industry category.

Total economic contributions (i.e., the direct, indirect, and induced effects) of the entire apple industry in NYS are US$2.1 billion in output, US$587.9 million in labor income, and 11,872 jobs. Computing contribution multipliers as the total effect divided by the direct effect, we find that for every dollar of output, dollar of labor income, and job in the apple industry in NYS, US$0.58 of output, US$0.48 of labor income, and 0.85 jobs are supported in non-apple industries in NYS.

Important to the interpretation in Table 4, the direct effects across industry sectors are additive (i.e., the seven individual values sum up to the total), but the indirect and induced effects across industry sectors are not. For example, when looking at the frozen, canned, and dehydrated processing sector output contributions, a portion of the US$318.5 million in indirect effects is the value of apple sales from farming through processor purchases of local apples. In other words, a portion of the indirect effects for processing is already included in the direct effects for farming. Summing the individual industry indirect and induced impacts would result in double counting. Indeed, part of the multiplier effects for each individual industry includes any other apple industries backward linked to them. The contribution multipliers for the aggregate industry, however, reflect only non-apple industry backward linkages.

Exploring Backward Linkages

In addition to understanding the total economic contributions of industries, it is useful to examine what industries contribute most heavily to those totals via backward industry linkages. Depending on the objectives of the research, examining the distribution of linkages for each industry, as well as for the aggregate, may be important. For ease of exposition, we focus our discussion on the aggregate industry results from our application.

Figure 1 displays the distribution of the total indirect and induced output effects from Table 4 (i.e., US$441.3 and US$314.3 million) generated by the apple industry's combined direct output effect (US$1,309.9 million). In other words, the sum of the height of each bar in Figure 1 will equal the total indirect and induced effects shown in Table 4 for the aggregate apple industry. For ease of exposition, the industries are aggregated to the 2-digit NAICS level. The figures present a visual form of how the indirect and induced effects accumulate and to which industries they accrue.

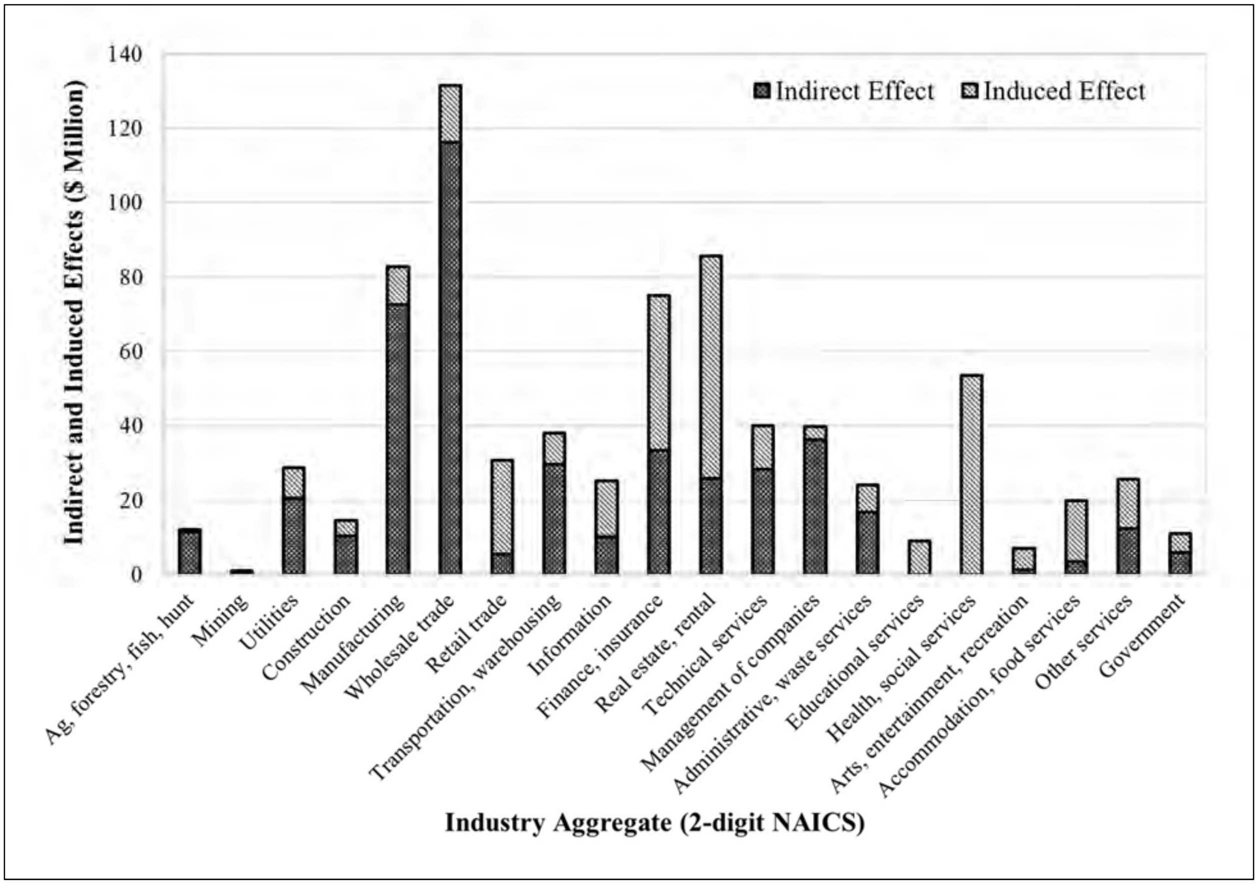
The indirect effects are shown in black, and the induced effects are shown in gray. Considering the indirect effects more closely is useful in understanding the business-to-business linkages originating from an industry's direct activities. In deference, industry activity incurred by spending out of labor income (i.e., the induced effect) is invariant to the industry of origin. Accordingly, the interpretation and discussion highlight the indirect industry effects.

In our example, wholesale trade has the strongest backward linkages for the apple industry—i.e., it has the highest bar in Figure 1. This makes intuitive sense as many input purchases by farms, processors, and other apple sectors are from local wholesale distributors, rather than from retail establishments. Not surprisingly, most of the impact to wholesale trade is derived from indirect effects—i.e., the black portion of the bar is larger than the gray portion of the bar. Manufacturing firms have the next highest level of linkages, almost entirely from local business-to-business (indirect) linkages.

As indicated by the first bar in Figure 1, apple industry firms purchase a relatively small volume of inputs from other (non-apple) farm production sectors. Their inputs are primarily non-apple fruits and vegetable purchases from farms and manufacturers for processing and/or resale. Other business support sectors, such as transportation and warehousing, finance and insurance, and contracted professional services make up the bulk of the remaining indirect effects.

The largest induced effects follow intuitively from major household budget allocations—i.e., insurance, real estate, healthcare, dining, and various retail purchases. Distributions of backward linkages by industry can be similarly constructed for employment and labor income if desired. While the general takeaways will be similar, the variation

Figure 1. Indirect and Induced Output Effects by Industry for New York State Apple Industry from the US$1,309.9 Million Direct Effect



across industries will vary due to differences in labor use by industry and/or employee compensation.

Discussion and Conclusions

Improving the understanding of intra- and inter-industry linkages within local economies is necessary for community educators, industry leaders, and public officials to make informed choices regarding agriculture-based economic development priorities and the projected impacts on economic growth and community goals. More recently, the focus has shifted to how improvements in or expansions of local and regional food systems can generate these desired impacts. A careful consideration of the methodologies to employ and data to collect are necessary to produce meaningful and defendable results.

In this paper, we highlight the application of best practices from Thilmany et al. (2017) to address agricultural industry interest in describing the nature of their economic contributions to local economies. In particular, we apply a multi-industry economic contribution analysis to the apple industry in NYS. We identify seven key individual industries within the broader apple industry collective and describe the process from inception to application to interpretation. As these types of analyses are popular, among industry and public agencies alike, promoting a replicable framework will improve the compatibility and comparison of analyses across industries, geographies, and time.

Our multi-industry application identified conditions where primary, localized data collection was needed relative to reliance on industry average parameters. With our specific application to the apple farming industry in NYS, we were able to document that relying on more aggregate industry relationships from secondary data sources biased downward total economic contributions (i.e., direct, indirect, and induced) for output and labor income, but biased upward total jobs. In all cases, however, reliance on pre-existing secondary estimates in our application biased downward the level of indirect and induced effects.

One cannot predict *a priori* whether future impact or contribution results will be higher or lower when collecting and utilizing primary data, but that's not the point. The point is that the results will be more accurate and defensible. In addition, constructing localized industry production functions provides specific information regarding the nature of the backward linkages and indirect industry effects, even before the IO model is constructed. That said, data collection comes with a cost and the efforts to plan and budget (in time and dollars) for such activities cannot be understated. When budgets are slim and/or time is tight, primary data collection may be infeasible, requiring the analysis to be done with existing resources and data. Depending on the objectives of a given study, using pre-existing resources may be sufficient. In any case, clearly documenting the inputs, assumptions, and analytical processes is key to a comprehensive analysis and to understanding the limitations of the results.

Often in multi-industry contribution analyses, outputs from some industries represent inputs to others. Practitioners need to adequately understand where supply chain linkages occur and how to account for them to avoid double counting. In this paper, we highlighted existing resources available to assist practitioners in these efforts and explained the processes advocated in them with our application to the apple industry. In doing so, the actual empirical results we present are less important than the process we used to get to them.

Multipliers, while useful, are often relied on too heavily in decision making and without an understanding of their construction, interpretation, and context. Our empirical application describes the construction of our contribution estimates and the multipliers accruing to them. In particular, we highlight the individual industry contributions that lead to a composite multiplier result. In doing so, particularly through the indirect effects, practitioners can better understand local supplying industries that are most important to the industry of inquiry and, therefore, most influenced by related industry expansions or contractions. Such an approach provides a useful way to describe economic contribution results and the composition of multiplier effects to a range of audiences.

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

Farm-to-school programs' local foods activity in Southern Arizona: Local foods toolkit applications and lessons

Special JAFSCD Issue

Economics of Local Food Systems: Utilization of USDA AMS Toolkit Principles

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Submitted April 3, 2018 / Revised June 25 and July 19, 2018 / Accepted July 24, 2018 / Published online December 15, 2018

Citation: Duval, D., Bickel, A. K., & Frisvold, G. B. (2019). Farm-to-school programs' local foods activity in Southern Arizona: Local foods toolkit applications and lessons. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3), 53–72. https://doi.org/10.5304/jafscd.2019.08C.001

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Abstract

This analysis applies principles and methods from the U.S. Department of Agriculture (USDA) Local Foods Toolkit to demonstrate the moderating influence of countervailing effects on the economic impacts of local food purchases through farm-to-school programs in Southern Arizona using USDA Farm to School Census data. The analysis applies and expands upon recommendations in the Toolkit, introducing the concept of export substitution and exploring how water resource constraints create tradeoffs for farms through crop-shifting and cropping rotations. The analysis reveals that for fruit and vegetable exporting regions, export substitution can be a major countervailing effect. Furthermore, the analysis examines the usefulness of the Farm to School Census as a secondary data source for estimating the economic impacts of local food activities, allowing us to make recommendations for how the Census could be expanded and supplemented for regional economic applications.

Keywords

Farm to School, Local Foods, Economic Impact Analysis, IMPLAN, Farm to School Census, Local Foods Toolkit, Import Substitution, Export Substitution, Procurement

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Funding Disclosure

This research was funded in part by the University of Arizona, Eller School of Management, Economics and Business Research Center, Making Action Possible (MAP) Dashboard.

Introduction

The Agricultural Marketing Service of the U.S. Department of Agriculture (USDA, AMS) supported the development and publication of an economic impact assessment "Toolkit" (Thilmany McFadden et al., 2016) to assist researchers and community groups in evaluating the economic outcomes of local food initiatives. The Toolkit provides a review of key economic concepts, guidance on conducting analyses, and empirical examples from previous studies. The Toolkit is organized into seven modules that cover engagement with community partners and project planning, the use of secondary data, and the collection and use of primary data, as well as both basic and more sophisticated applications of economic input-output models relying on IMPLAN modeling software and data.

Aims and Scope

This study applies AMS Toolkit methods to assess the potential economic impacts of farm-to-school[1] (FTS) procurement of local foods in four Southern Arizona counties (Cochise, Pima, Santa Cruz, and Yuma) using USDA Farm to School Census data. It highlights and expands on issues considered in two Toolkit modules: (2) using secondary data and (6) addressing opportunity costs (specifically, accounting for supply-side resource constraints and demand-side countervailing effects).

Impact estimates of FTS local food procurement depend crucially on how one defines a counterfactual—what would have happened had the purchase of locally produced food not occurred. Our analysis applies and expands on Toolkit methods in two novel ways to develop counterfactual scenarios. First, we explicitly examine the implications of water resource constraints (often an important consideration in arid Western states). The Toolkit discusses in depth the implications of land constraints as well as applications for measuring land requirements for the production of local foods (e.g. Swenson, 2010; 2013); however, the Toolkit only mentions water constraints in passing. Second, we consider the effect of local food procurement causing export substitution rather than import substitution. The Toolkit identifies import substitution—replacing commodities imported from outside the region with commodities produced within the region—as "a key justification for local foods initiatives as it is a strategy that has the potential to both retain dollars within a region, and create a multiplier effect from new production" (p. 111). Yet such import substitution may not occur if the region is a major net exporter of certain food products. In this case, local procurement substitutes local consumption for consumption outside of the region (export substitution). This study is the first, to our knowledge, to explicitly account for export substitution effects in local food procurement.

The Toolkit also provides recommendations for the use of secondary and primary data. According to the Local Foods Toolkit, national-level data is usually not well suited to local analyses. Accuracy can be a concern and the data may not provide information that appropriately addresses the question at hand. Fortunately, for analyses focusing on local food in schools, the USDA conducts the Farm to School (FTS) Census, a nationwide survey that collects information from school food authorities (SFAs) regarding current and anticipated school participation in farm-to-school activities, procurement practices, products commonly purchased locally, and barriers to participation in farm-to-school activities, among other data (USDA, n.d.; USDA, 2015).[2] The FTS Census is one of the most comprehensive and accessible data sources on local food activity, in a subject area that generally lacks consistent data beyond the regional level (USDA, 2016a). While several studies have applied the methods discussed in the Toolkit to assess programs that encourage the procurement of local

[1] Farm to school programs are a three-pronged strategy working in kindergarten through twelfth grade (K-12) schools to (1) provide nutrition education, (2) develop school garden programs, and (3) encourage procurement of local foods by school foodservice departments (National Farm to School Network, n.d.). This third strategy, procurement, is the focus of our analysis.

[2] The FTS Census was first administered by the USDA for the 2011–12 school year (with results published in in 2013). The second FTS Census was conducted for 2013–14 (with results published in 2015) to provide data for assessment of program growth and outcomes. A third FTS Census based on the 2017–18 school year is planned for release in 2019.

foods by school foodservice departments (Christensen, Jablonski, Stephens, & Joshi, 2017; Bauman & Thilmany McFadden, 2017; Becot et al., 2017; Gunter 2011; Haynes, 2009; Kane, Kruse, Ratcliffe, Sobell, & Tessman, 2010; Kluson, 2012; Pesch, 2014; Roche, Becot, Kolodinsky, & Conner, 2016; Tuck, Haynes, King, & Pesch, 2010), few to our knowledge have made use of data available through the Farm to School Census. Moreover, the FTS Census is not mentioned as a secondary data source in the 2017 updated version of the Toolkit, even though the 2015 FTS Census (collecting data from the 2013–14 school year) was a large, national survey with 12,585 schools and school districts responding out of a national list frame of 18,104 schools and school districts (a 70% response rate).

Although the FTS Census is among the most comprehensive, accessible, low-cost, and consistently reported data sources on local food procurement by schools, it requires supplementation and cross-verification with other state and federal data to be used to carry out economic assessments. Our study examines the usefulness of the FTS Census as a secondary data source for estimating the economic impacts of local food activities, allowing us to make recommendations for how the FTS Census could be expanded and supplemented by other data to reliably assess the economic impact of a school's procurement decision.

This article is structured as follows. The first section describes the main Toolkit concepts explored in this analysis. Second, we characterize the Southern Arizona study area along with data available on the region through the FTS Census. We then develop multiple counterfactual scenarios that measure how gross impacts of local procurement are limited by supply-side resource constraints, demand-side countervailing effects, and export substitution effects, followed by a comparison of results. Finally, we conclude by discussing various implications and recommendations for practitioners making use of FTS Census data for local food economic impact assessments, as well as key considerations in general for local food efforts in regions strong in the production of specialty crops.

Applying AMS Toolkit Concepts

The economic impacts of local procurement occur primarily through "import substitution"—the act of replacing commodities imported from outside the region with commodities produced within the region (Thilmany McFadden et al., 2016). This means that a greater share of consumers' spending stays within the local economy. There are, however, a variety of factors that complicate and moderate this effect. The AMS Toolkit emphasizes two major considerations in assessing the economic impacts of local food procurement: the "no opportunity cost of spending" and "no resource constraints" assumptions (Thilmany McFadden et al., 2016).

The "no opportunity cost of spending" assumption applies to the local buyers of food products. When a consumer chooses to purchase locally sourced food over food imported from outside the region, there are actors in the local economy that lose out, such as wholesalers and retailers (depending upon the channel through which the consumer purchases that food). Assessing the net effects of that local purchase requires considering the negative impacts that may occur when a consumer's spending pattern shifts. In the case of FTS programs, schools are not necessarily purchasing more food overall as a result of participating in farm-to-school activities. Rather, they may be shifting some of their food budget toward locally procured items versus items imported from outside the region. Any shift in the marketing channel must be considered, whether that be buying directly from producers, buying from an intermediary such as a food hub (an aggregator of local food products for marketing), or buying through a traditional food service distributor. Low and Vogel (2011) find that intermediated marketing channels for local foods represented between 50% and 66% of the value of local food sales in 2008 at the national level. For the West Coast (i.e., California, Oregon, and Washington), that figure rises to 85%. When these shifts are considered, the regional economic impacts of FTS are moderated through "countervailing effects"—that is, reduced economic activity in the local wholesale and retail sectors (Becot et al., 2017).

One consideration not covered in the Toolkit, however, is the complexity of data-gathering requirements introduced into an analysis when intermediaries are involved. When local foods are channeled through intermediaries, information can be lost between the agricultural producer and the final consumer. Because intermediated marketing channels for local foods represent a significant proportion of the value of local food sales, the role of collecting data from intermediaries is an important one to consider. While the FTS Census provides information on the purchasing practices of SFAs, it does not provide information on the responses of local producers or intermediaries to the opportunity to sell to schools. Thus, additional information would be needed to supplement the Farm to School Census in order to reliably assess the economic impact of a school's procurement decision.

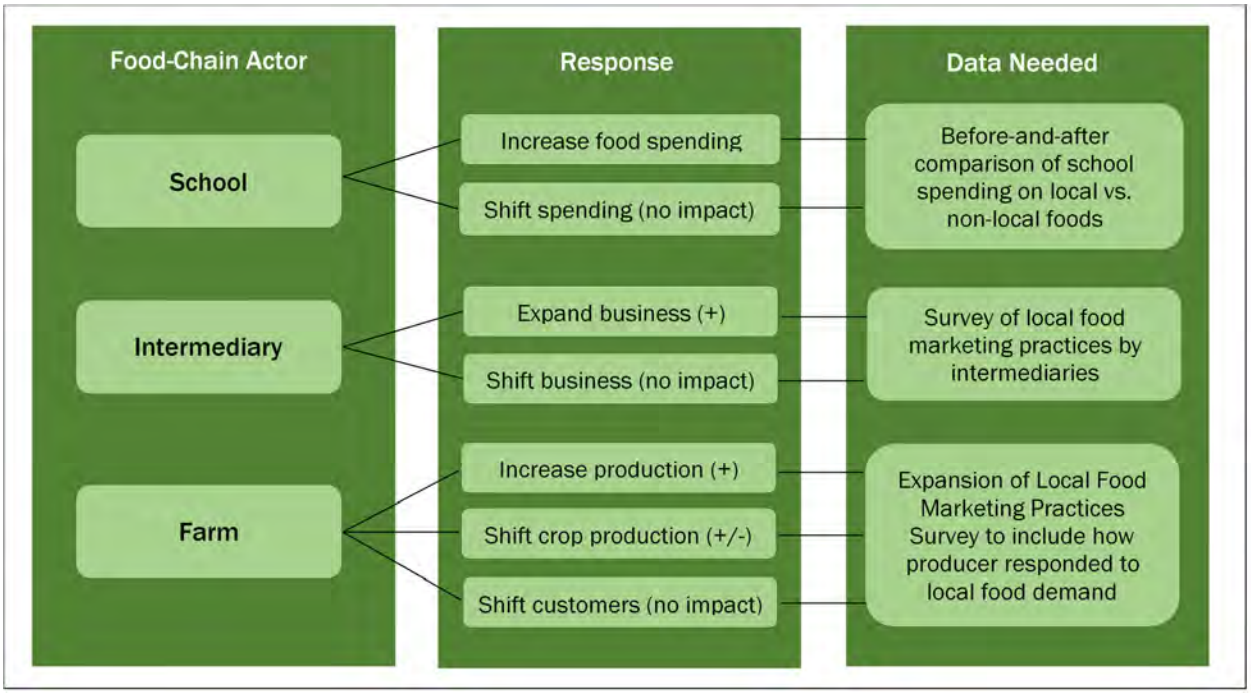
The second moderating effect is borne out of the "no resource constraints" assumption. The assumption of "no resource constraints" is that land, water, and other natural resources are in abundance, and agricultural production will increase to fulfill increased local demand for locally produced foods. While the Toolkit mentions water constraints, it devotes far more attention to land constraints; it states, "While there may be other supply side resource constraints, such as access to water, properly offsetting land demands is usually the most important factor to consider" (p. 87). However, it does caution, "In an era of unpredictable water availability, maximizing local production in certain parts of the country may not be realistic or optimal" (p. 90). The role of water constraints is especially pertinent in Arizona and other parts of the arid West. Several studies have measured the extent and effects of water quantity constraints in Western production systems (Fleck, 2013; Kanazawa, 1993; Moore & Dinar, 1995; Weinberg, 1997). Water constraints are particularly relevant in Southern Arizona, where many parts of the region are part of Active Management Areas (AMAs) or Irrigation Non-Expansion Areas (INAs) through the Groundwater Management Act. In such areas, the expansion of irrigated agriculture is not permitted (Jacobs & Holway, 2004). Water use in the Yuma, Arizona, area is strictly monitored and limited to meet the United States' treaty commitments for delivery of Colorado River water to Mexico (Frisvold, Sanchez, Gollehon, Megdal, & Brown, 2018). Therefore, major increases in the production of food at the local level would likely be achieved through reduced local production of other crops. While shifting from lower-value crops, such as cotton or alfalfa, to higher-value vegetable crops could generate some net positive effects to the economy, one must still account for the lost production of lower-valued crops.

In addition to these two countervailing effects, export substitution would have a different effect on local economies than would import substitution. If a region is a major producer and net exporter of specific commodities, it is already likely to procure that product locally, regardless of local food efforts. While technically this still counts as a local food, it only affects *from whom* local agricultural producers receive revenues, not the total revenues they earn, inputs they purchase, or workers they hire.

Countervailing effects can occur anywhere along the value chain, from the farm to the intermediary, to the final consumer. Independently, actions of one food-chain actor can produce a positive effect, while at the same time the actions of another can produce a negligible or negative effect. Figure 1 demonstrates the different actions food-chain actors can take in response to the demand for local foods. It also demonstrates the anticipated economic impact of those independent actions. Further, it illustrates various data gaps and the data needed to supplement the Farm to School Census in order to reliably assess the economic impact of a school's procurement decision. As seen in Figure 1, an increase in school food spending alone would be expected to generate a positive economic impact (+) to the region, as would the expansion of a food wholesale business or an increase in agricultural production. Shifting business from one product or customer to another is not anticipated to generate any economic impact (no impact) in isolation, unless another food-chain actor, at the same time, acts in a way that generates a positive or negative impact. Export substitution is an example of this effect. Shifting crop production alone produces countervailing effects (+/–), with an increase in sales of one crop and a decrease in sales of another. Depending on the crops shifted, this could have positive, negative, or even negligible effects in isolation.

Equation 1 summarizes the constituent parts of a net change in local economic activity resulting

Figure 1. Farm-to-School Food-Chain Actors and Decisions that Influence Economic Impacts



Equation 1. Net Change in Local Economic Activity Due to Farm-to-School Local Foods Purchases

$$
\begin{aligned}
Net\ \Delta\ Local\ Sales &= [\Delta\ Ag\ Production] + [\Delta\ Wholesale] + [Multiplier\ Effects] \\
&= [\Delta\ Local\ Food\ Crop\ Production + \Delta\ Crops\ Shifted\ Out\ of\ Production \\
&\quad + \Delta\ Rotational\ Crops] \\
&\quad + [\Delta\ Intermediary\ Sales + \Delta\ Traditional\ Wholesale\ Sales] \\
&\quad + [\ Multiplier\ Effects]
\end{aligned}
$$

from increases in local food purchases by farm-to-school programs, drawing from the potentially countervailing effects pictured in Figure 1.

As illustrated in Equation 1, the choices of any one actor along the food supply chain could counteract seemingly positive impacts due to the choices of another. Furthermore, multiplier effects of changes in the food supply (whether positive or negative) can also contribute to the net economic impacts of a change in demand. For that reason, we propose that analyses need to incorporate information on the responses of food-chain actors to changes in the demand[3] for local foods. This analysis explores potential scenarios in which the action of one food-chain actor could influence the regional economic outcomes of farm-to-school procurement.

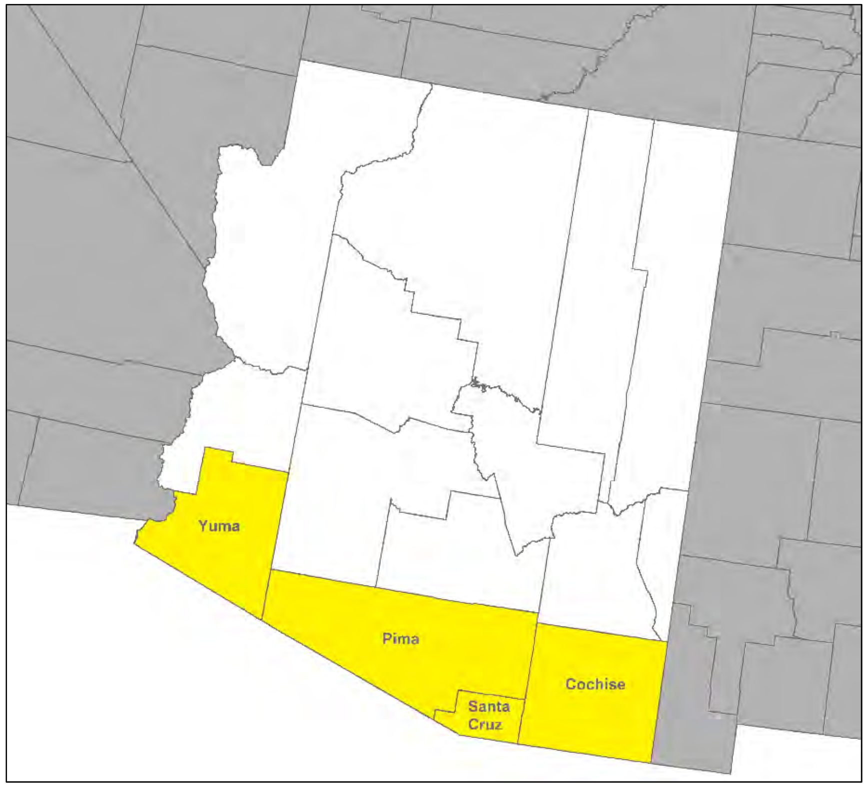
[3] One consideration not examined in this analysis is any potential price premium paid by institutional buyers for local foods. Existing literature (Burnett, Kuethe, & Price, 2011; Low et al., 2015; Low, et al., 2011; Valpiani, Wilde, Rogers, & Stewart, 2016) find evidence of higher consumer willingness to pay for local foods; however, little information exists on willingness to pay at an institutional level for wholesale quantities of local produce. This analysis does not consider price premiums for produce marketed as "local" purchased by institutional buyers and assumes that schools work to maximize the purchasing power of their foodservice budgets.

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

Southern Arizona Study Area and Farm-to-School Data

Our analysis focuses on schools and school districts in four Southern Arizona counties (Cochise, Pima, Santa Cruz, and Yuma) (Figure 2).

Figure 2. Pima, Cochise, Santa Cruz, and Yuma Counties — Analysis Area



Arizona is a leading producer of many agricultural commodities, ranking as the second-largest producing state for lettuce, spinach, broccoli, and cauliflower in 2014 (Bickel, Duval, & Frisvold, 2017). Not surprisingly, these are some of the most common purchases of local food by schools in Arizona. Yuma County is one of the largest producers of leafy green vegetables in the nation; in fact, "during the winter months, from the first week of December 2014 to the first week of March 2015, 82% of the nation's lettuce was shipped from Arizona, primarily Yuma County" (Kerna, Duval, & Frisvold, 2017). Arizona produces around a quarter of the national production of cantaloupe and honeydew melons. It is also a leading producer of other commodities, such as durum wheat and pecans. Whereas in most parts of the country fruit and vegetable production is not feasible during certain times of the year when school is in session, Arizona's production of fruits and vegetables peaks in winter months. Thus, opportunities exist for the in-state procurement of fruits, vegetables, and other foods.

Across the four most recent years in which the Census of Agriculture has taken place (1997, 2002, 2007, 2012), harvested cropland in Southern Arizona has been relatively stable, fluctuating between about 260,000 and 290,000 acres (105,218 and 117,359 hectares). Yuma County accounts for about two-thirds or more of this harvested acreage; Cochise County accounts for a fifth to a fourth; Pima County accounts for about a tenth; and Santa Cruz County accounts for less than one hundredth (USDA, 1999; 2004; 2009; 2014). Particularly in Yuma County, there has been a long-term trend of producers moving from lower-value crops such as alfalfa and cotton and adopting vegetable-small grain rotations, which have higher returns per acre-foot of water (Frisvold, 2015). While this rotation may not be suitable to all parts of Southern Arizona, it does illustrate the possibility that crop-shifting toward the production of vegetable and grain crops for local consumption potentially could produce positive regional economic impacts. This analysis considers crop-shifting among the scenarios modeled for assessing the economic impacts of local foods.

Of the 467 school districts in Arizona, 57% completed the 2015 Farm to School Census. For the four Arizona counties selected for this analysis (Figure 1), there were 44 respondents to the FTS Census, not all of which reported farm-to-school activities. Institutions responding to the FTS Census accounted for 61% of students in the region as a whole, with coverage ranging from a low of 38% for Santa Cruz County to a high of 87% for Yuma

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

Table 1. Southern Arizona Farm to School (FTS) Census Respondents by County

County	Respondents	Universe	% of Students in County Covered by FTS Census
Pima	17	96	55%
Cochise	14	29	64%
Santa Cruz	4	11	38%
Yuma	9	15	87%
TOTAL	44	151	61%

Sources: 2015 Farm to School Census (USDA, 2016a); National Center for Education Statistics (NCES), 2014.

Table 2. Southern Arizona School Food Authorities' (SFAs') Geographic Definition of "Local"

Definition of Local	Respondents
Produced within the state	7
Same city or county	2
Produced within a 200-mile radius	1
Other possible survey responses (produced within a 100-mile radius, within 50 miles, within a day's drive, within the region, other)	0

Note: 1 mile=1.6 km

County (Table 1). Of the 44 Southern Arizona SFAs that responded to the 2015 Farm to School Census, 11 reported conducting farm-to-school activities, and 10 had useable census responses.

One important consideration for farm-to-school programs is what constitutes "local" food. While there is no official definition, most Southern Arizona SFAs (seven out of 10) considered food produced within Arizona to be local (Table 2). Two SFAs considered food produced within the same city or county to be local, and one considered food produced within a 200-mile (322-km) radius to be local. Nationally, 24.6% of Farm to School Census respondents consider food produced within the same state to be local, followed by 20.4% that consider food produced within the same city or county to be local. More than 16% of respondents considered food produced within a 50-mile (80-km) radius as local, another 16% considered from within a 100-mile (161-km) radius as local, and the remaining 23% of respondents considered all other geographic definitions of local. Again, this contrasts with the two most common U.S. consumer definitions of local: originating from within a 50-mile radius (over 70%) when measured in terms of distance, and originating from within the same county when measured by political boundaries (over 40%) (Onozaka, Nurse, & Thilmany McFadden, 2010). Thilmany McFadden et al. (2016) include project scoping within the first module of the Local Foods Toolkit, which includes defining the geographic bounds of the study region. Since not all farm-to-school efforts are coordinated at a regional or state level, but rather occur at a school or school district level, definitions of local may vary even within the same region. As can be seen in Table 2, since seven out of 10 SFAs consider local to be in-state, a regional analysis may count some purchases from outside the region as local. For the two respondents who consider local to be from within the same city or county, such an analysis may undercount local food activity.

Total food expenditures by the 10 Southern Arizona SFAs that reported participating in farm-to-school activities totaled $3,653,300,[4] with responses ranging from $12,000 to $1.3 million, and with an average of $365,330 (Table 3). Expenditures on local foods, including fluid milk, ranged from $0 to $550,000 (0% to 100% of total costs), averaging $113,050 (27% of total costs). Excluding fluid milk, local food expenditures ranged from $0 to $450,000 (0% to 54% of total costs), and averaged $70,550 (10% of total costs). Respondents who reported spending $0 on local

[4] All currency is in US$.

Table 3. Total Food Expenditures and Local Food Expenditures Reported by Southern Arizona School Food Authorities (SFAs) (all currency in US$)

Category	Average	Minimum	Maximum
Total food expenditures	$365,330	$12,000	$1,300,000
Food expenditure (local foods), including milk	$113,050	$0	$550,000
Percent of food cost that was local, including fluid milk	26.6%	0%	100%
Food expenditure (local foods), not including milk	$70,550	$0	$450,000
Percent of food cost that was local, not including fluid milk	9.9%	0%	53.6%

Table 4. Southern Arizona School Food Authorities' (SFAs') Local Food Direct-Buying Practices

Direct Buying Channel	Responses
Obtains local food direct from food processors and manufacturers	3
Obtains local food via a community supported agriculture (CSA) model	2
Obtains local food direct from individual food producers (e.g., farmers, fishers, ranchers)	1
Obtains local food direct from farmer, rancher, or fisher cooperatives	0
Obtains local food direct from farmers markets	0

foods indicated that their schools engaged in farm-to-school activities through nutrition education or school gardens, but did not procure local foods as part of their programs.

Fluid milk is commonly sourced locally because it is highly perishable (Goldenberg, Meter, & Thompson, 2017). In assessing local food activity, sales of fluid milk were most likely a pre-existing local food purchase and must be accounted for in estimating the net effects of programs to promote the new use of local foods. In Arizona, it is typical for milk to come from large dairies in Pinal and Maricopa counties that border the study area to the north; this area produced 91% of Arizona's fluid milk in 2012 (USDA, 2014). By most definitions, this would be considered locally procured (A. Schimke, personal communication). Of the eight SFAs reporting local food purchases greater than $0, milk purchased locally ranged from 0% of local food purchases to 100% of local food purchases. Considering the local nature of milk supplies, it is unclear that this activity can be attributed to local food efforts. It is also likely that many SFAs that did not report local food activity make what could be considered as local purchases of milk, but do not track whether they are purchasing from in-state vendors.

Local food purchases occur in one of two ways. Purchases are made either directly from the producer or the manufacturer, or they are made through an intermediary buying channel such as a distributor, food hub, or program that aggregates local produce. Four out of ten Southern Arizona SFAs reporting farm-to-school activity used direct-buying channels, with some respondents using more than one (Table 4). The most common direct-buying channel was direct purchases from producers and manufacturers, with three SFAs. Two SFAs made purchases through a community supported agriculture (CSA) model.

Southern Arizona SFAs who report purchasing local foods for farm-to-school activities most commonly do so through intermediaries rather than directly from producers. Some schools purchase from intermediaries as well as directly from producers. Nine out of ten SFAs who indicated engaging in farm-to-school activities reported purchasing local foods through intermediary channels, with some respondents using more than one channel. The most commonly used type of intermediary is a food distributor, with six respondent SFAs, followed by federal school food and nutrition programs such as USDA foods (five respondents), and the Department of Defense Fresh Produce Program (four respondents) (Table 5).

An important driver of farm-to-school

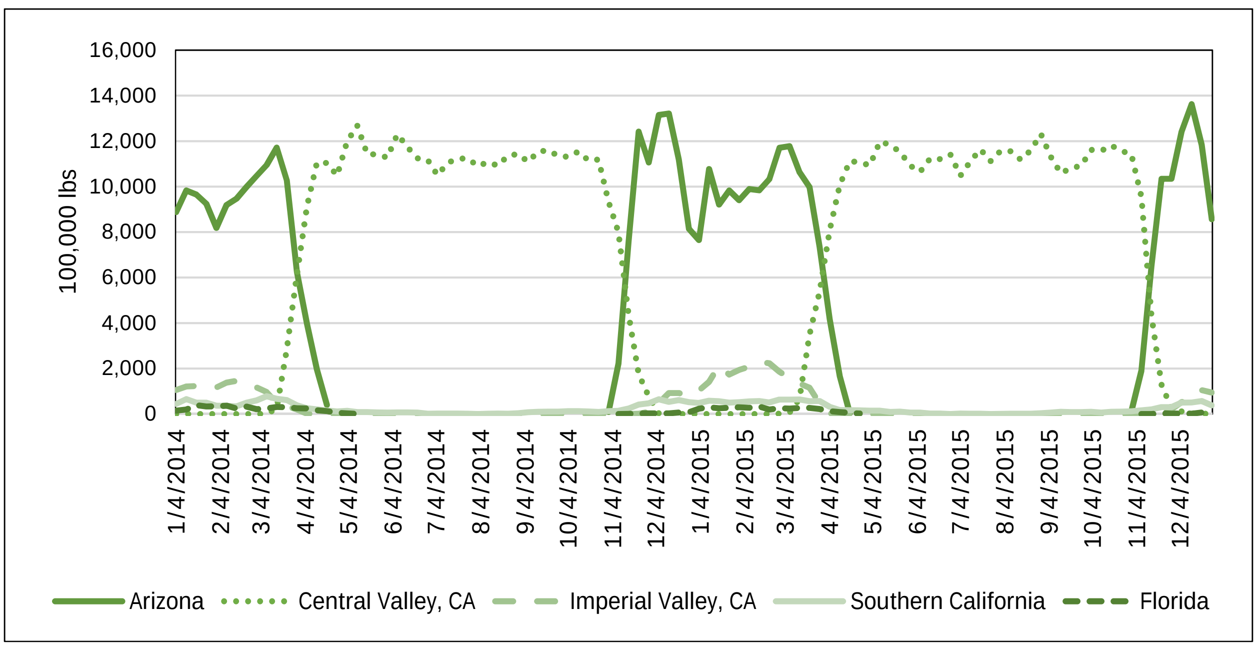
Table 5. Southern Arizona School Food Authorities' (SFAs') Local Food Intermediary Buying Practices

Intermediary Buying Channel: Obtains local food from...	Responses
...distributors	6
...USDA foods	5
...DoD Fresh Produce Program vendors	4
...food buying cooperative	1
...food hub	0
...foodservice management companies	0
...State Farm to School program office	0
...other intermediary source	0

procurement is the USDA Food and Nutrition Service Department of Defense Fresh Produce Program. This program funds the procurement of fresh produce for schools, with local procurement options identified as Arizona-grown. The DoD Fresh Produce Program provides up to 20% of entitlement funds to schools for the procurement of fresh produce, including local foods that are identified in their catalogue as such. According to the Arizona Department of Education, in the 2013 school year, statewide DoD program participants spent 11% of their program funding, or $501,000, on items designated as locally grown. Total DoD program spending for the four Southern Arizona counties for the 2013–2014 school year was roughly $903,000, of which $82,000 (9%) was local procurement. While only spending on fluid milk is reported separately from other local food purchases in Farm to School Census data, data on local food spending by commodity is available from the DoD Fresh Produce Program. Top fresh produce items purchased statewide in the 2013 school year were lettuce (41%), celery (39%), broccoli (15%), cauliflower (5%), and vegetable soup mix (5%) (Arizona Department of Education & Arizona Grown, 2014).

For Arizona, local sources of lettuce are virtually the only source of lettuce during winter months. Arizona supplies over 80% of the nation's lettuce between December and March, and that figure can reach as high as over 90% in individual weeks (Kerna et al., 2017). Throughout the course of the year, U.S. lettuce production shifts almost exclusively between Arizona and California's Central Valley (Figure 3).

Figure 3. Weekly Lettuce Movements by Production Region, 2014–2015



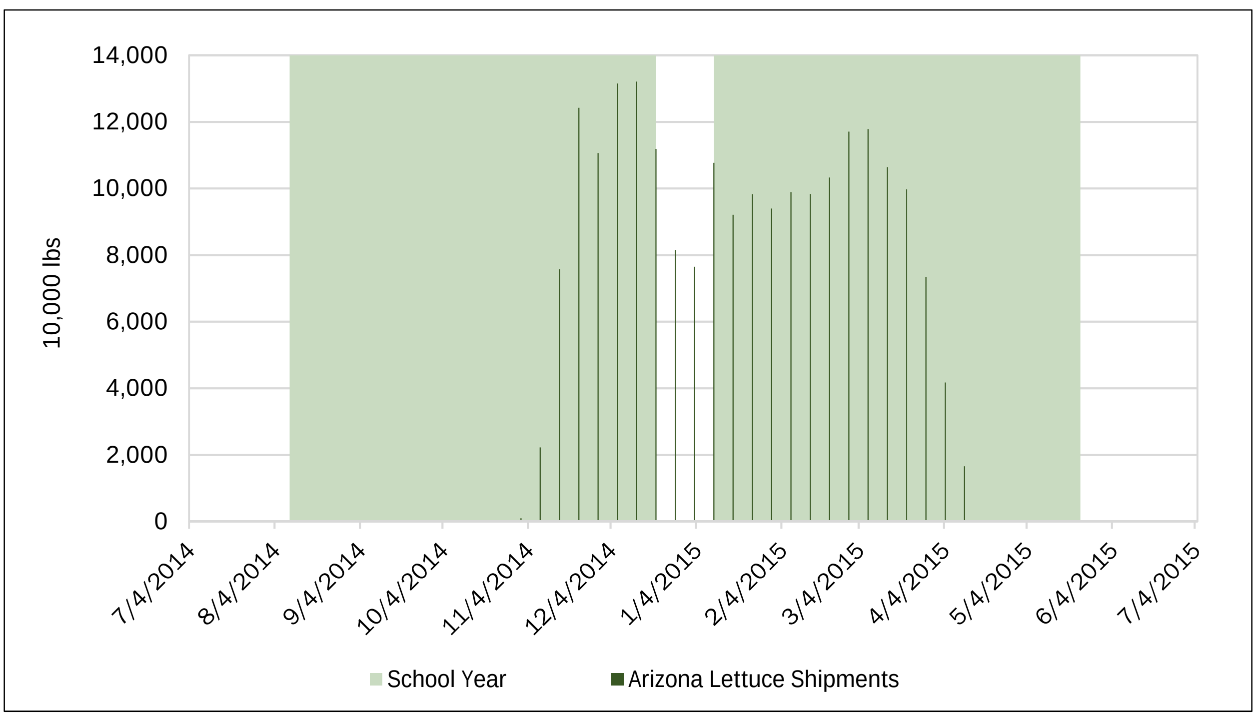
Note: 1 lb.= 0.45 kg
Source: Kerna, Duval, & Frisvold (2017).

This brings to light an important point for regions that are highly specialized net exporters (out of the local region) of specific commodities. The lack of non-local options and the limited feasibility of local production of certain crops should be considered in assessing the net impacts of local foods initiatives. Figure 4 overlays Arizona's lettuce shipments for the 2014-2015 growing season with the academic year for Tucson Unified School District. While there are times of the academic year when lettuce would be sourced from California, at least half of the school year falls during the time when Arizona is producing the bulk of the country's lettuce supply.

This raises two challenges for evaluating the economic impacts of farm-to-school procurement. For winter months, the procurement of lettuce would not represent import substitution—replacing imported lettuce with local production. Rather, it could represent export substitution—consuming lettuce locally rather than shipping it to consumers outside the region. Unlike import substitution, export substitution would not necessarily bring any additional sales revenue to the local economy. A critical empirical question then is, does the local procurement of lettuce through farm-to-school activities increase on-farm production or on-farm marketing? In other words, in the absence of farm-to-school activities, would FTS-procured lettuce not have been produced, or would it have otherwise been exported out of the local area? Only in the former case would this have a positive production expansion effect on the local economy, whereas changing where the goods are marketed simply represents export substitution.

Another challenge is that, for local lettuce procurement to have an import substitution effect, Arizona's season would need to be lengthened. This would force Arizona to compete with California's Central Valley at a time when Arizona's lettuce production faces less favorable weather and greater water requirements. Similar issues would also apply to broccoli and cauliflower, where winter production far exceeds per capita state consumption in the winter months. Lettuce, broccoli, and cauliflower are major expenditure items in Arizona farm-to-school procurement (Arizona Department of Education, 2013); thus export-

Figure 4. Arizona Weekly Lettuce Shipments and Academic Year



Note: 1 lb.= 0.45 kg
Sources: USDA AMS Specialty Crop Shipment Data & Tucson Unified School District academic calendar.

substitution effects need to be considered in economic impact analyses.

Methods

Given the data gaps inherent in the Farm to School Census, this analysis considers a series of scenarios that demonstrate countervailing effects that may be experienced in Southern Arizona. This analysis also considers the influence of certain assumptions about food-chain actor responses to changes in the demand for local food products.

This analysis draws on scenarios developed using data from the FTS Census presented in the previous sections, the 2013 NASS Annual Statistics Bulletin for Arizona (USDA NASS, 2013), and recommendations presented by Thilmany McFadden et al. (2016) in the Local Foods Toolkit. The economic impacts of net changes in local spending within the four-county Southern Arizona region are modeled using IMPLAN 3.1 (IMPLAN, 2014), an input-output model commonly used to estimate regional economic impacts. Agricultural production is modeled in IMPLAN using analysis-by-parts and customized industry spending patterns developed using data from the 2012 Census of Agriculture to capture agricultural production practices specific to the state of Arizona.[5]

Economic impacts consist of three components: direct effects, indirect multiplier effects, and induced multiplier effects (Miller & Blair, 2009). Direct effects measure the initial direct change in the economy in question—e.g., a net increase in spending on local food, whether that be through an increase in consumption or an increase in spending as a result of a higher willingness to pay for local foods. Indirect multiplier effects measure business-to-business transactions, such as when agricultural producers purchase inputs to production within the local economy, generating additional rounds of spending in the local economy. Those supplier businesses also require inputs to production, and so on. Any purchase sourced from outside the region is referred to as a "leakage" and represents the money escaping from the local economy. With each round of purchases, money leaks from the economy, and subsequent rounds of transactions dissipate in their magnitude. Industries have different buyer-supplier relationships within the local economy and, therefore, have different indirect multiplier effects. Induced multiplier effects represent the effects of individuals employed in the affected industries spending their earnings on household purchases such as rent, mortgage, groceries, or entertainment. As industries employ more people or pay higher wages, they have higher induced multiplier effects. Economic impacts via indirect and induced multiplier effects might occur when a school switches some of its purchases from conventional to local produce purchased through a food hub or directly from a producer. This shifts local economic activity away from wholesale and toward agricultural production and/or local intermediaries.

While the FTS Census provides information on the purchasing practices of SFAs, it does not provide information on their purchasing practices prior to engaging in farm-to-school activities. Neither does it provide information on the responses of local producers or intermediaries to the opportunity to sell to schools. This analysis, as a result, will look at the different scenarios in which farm-to-school programs could have non-zero economic impacts on the regional economy. An increase in local agricultural production of produce could occur in two ways: (1) through an increase in the scale of production, or (2) through crop-shifting from lower-value crops to higher-value crops. Additionally, we introduce further assumptions that account for export substitution. These factors will first be modeled separately, then in conjunction, and then compared with the baseline scenario of an increase in agricultural production of produce without accounting for constraints or countervailing effects.

- Case 1: A simple increase in local agricultural production of produce (no constraints)
- Case 2: An increase in local agricultural production of produce while accounting for the opportunity cost of spending at wholesale (accounting for opportunity costs due

[5] In Arizona, nearly all agriculture is irrigated, whereas nationwide there is a greater variety in production practices.

to import substitution)

- Case 3: An increase in local agricultural production of produce through crop-shifting from lower-value crops (accounting for resource constraints)
  - 3a: Shifting some production from alfalfa to a vegetable-wheat rotation
  - 3b: Shifting some production from cotton to a vegetable-wheat rotation
- Case 4: An increase in local agricultural production of produce other than lettuce, broccoli, and cauliflower (accounting for export substitution)
- Case 5: All effects combined (opportunity cost, resource constraints, and export substitution)
  - 5a: Crop-shifting alfalfa to a vegetable-wheat rotation
  - 5b: Crop-shifting cotton to a vegetable-wheat rotation

A simple increase in local agricultural production of produce is modeled as the full value of average farm-to-school produce sales ($70,550) going to vegetable and melon production. Fruits and vegetables are the most commonly procured local food items in Southern Arizona, according to the Farm to School Census. To account for the opportunity costs of spending at wholesale, we modeled a decrease in wholesale activity using IMPLAN's wholesale sector, margining the gross value of sales. We modeled crop-shifting as a decrease in the acreage of alfalfa or cotton production and a corresponding increase in (excluding lettuce, broccoli, and cauliflower) vegetable acreage. We calculated the magnitude of the shift using the amount of land and applied water necessary to produce $70,550 in vegetables (USDA, 2014; USDA, NASS, 2014b). Given the relatively high value per-unit of water generated through vegetable production, additional water is freed up through this crop-shifting. Therefore, we assume that the remainder of the water is used to cultivate wheat in rotation with vegetables, a common practice among vegetable producers in Arizona. This implies that additional sales are generated beyond the sales of vegetables, thus moderating the countervailing effect.

To account for export substitution, we use the share of Arizona schools' Department of Defense (DoD) program spending (39%) in 2013 on fruits and vegetables excluding lettuce, cauliflower, and broccoli, which account for 61% of program spending. These crops are commonly produced in Arizona and would likely be purchased locally even in the absence of local food promotion efforts; therefore, their share of spending is excluded to calculate the impacts net of export substitution. Changes in agricultural production are modeled using analysis-by-parts and a customized industry spending pattern developed using data on agricultural input costs by NAICS code[6] from the 2012 Census of Agriculture data for Arizona. Within IMPLAN, the model's geographic scope is set to include Pima, Cochise, Yuma, and Santa Cruz counties, aggregated. Economic impacts are reported in terms of sales for simplicity's sake and to accord with sales as the unit of measure for transactions between schools, producers, and intermediaries. For the purposes of this analysis, we will assume that schools and school districts are operating in such a way as to maximize the purchasing power of their foodservice budgets, and therefore it is assumed that local foods are not sold to school districts at a price premium.

Scenario Results

On average, farm-to-school programs in Southern Arizona reported spending $70,550 in FY2014 on local food procurement, not including milk. Milk is excluded from local spending as it is typically sourced locally. Most milk is produced in Maricopa and Pinal counties in Arizona, but outside of the Southern Arizona study area for this analysis.

Case 1: A simple increase in local agricultural production of produce (no constraints)

This is a simple increase in agricultural production of

[6] "The North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy" (U.S. Census Bureau, n.d., para. 1).

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
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produce generating sales of $70,550 to schools. It assumes no resource constraints and no opportunity cost of spending. This would result in a total estimated economic impact of $149,400 in sales on the regional economy. This includes multiplier effects generated by the increased demand for agricultural inputs and labor (Table 6). Producing an additional $70,550 worth of vegetables would require 34 acre-feet (41,938 m^3) of water and 11.5 acres (4.7 ha) of land.

Case 2: An increase in local agricultural production of produce while accounting for the opportunity cost of spending at wholesale (accounting for import substitution)

In the case that an increase in local agricultural production occurred to meet school demand for local produce, it is fair to assume that such a purchase would occur at the expense of the school purchasing non-local produce through a wholesaler. This is referred to as the "opportunity cost" of spending. Accounting for this corresponding decrease in sales at wholesale, the net direct sales effect of the local food purchase would be $58,980. Including multiplier effects, the total impact would be $129,990 in sales. Again, the additional production would require 34 acre-feet of water and 11.5 acres of additional land for cultivation.

Case 3: An increase in local agricultural production of produce through crop-shifting from lower-value crops (accounting for resource constraints)

Cases 3a and 3b examine the countervailing effects of natural resource constraints: water and, secondarily, land. We assume that in order for agricultural producers to grow vegetables, they must forego growing other crops because of water and land constraints. Southern Arizona growers frequently grow vegetable crops in rotation with wheat (Frisvold, 2015; Frisvold et al., 2018). Over the past 30 years, vegetable-wheat rotations have supplanted crops with a longer growing season such as alfalfa and cotton. In addition, growers apply less water per acre to vegetable crops (3.1 acre-feet per acre or 3,824 m^3) and wheat (3.4 acre-feet per acre or 4,934 m^3), than to alfalfa (5.4 acre-feet per acre or 6,661 m^3) or cotton (4.5 acre-feet per acre or 5,551 m^3) (USDA, NASS, 2014b).

Were alfalfa to be fallowed in order to grow $70,550 of vegetables in a vegetable-wheat rotation, 38.4 acre-feet (47,366 m^3) of water would be freed up by fallowing 11.5 acres (4.7 ha) of alfalfa. With that remaining water, 8.4 acres (3.4 ha) of wheat could be cultivated, resulting in some fallowed land during the wheat rotation. There would be a loss of $17,287 in alfalfa revenue; however, $8,230 in wheat revenue would also be

Table 6. Summary of Sales Impacts by Case Scenario (all in US$)

Case	School Spending on Local Foods	Countervailing Effect(s)	Net Direct Sales Impact	Total Sales Impact Including Multiplier Effects
Case 1 *No Constraints or Opportunity Costs*	$70,550	N/A	$70,550	$149,400
Case 2 *Opportunity Cost of Spending*	$70,550	($12,170)	$58,980	$129,990
Case 3a *Resource Constraints: Fallowing Alfalfa*	$70,550	($9,060)	$61,500	$130,840
Case 3b *Resource Constraints: Fallowing Cotton*	$70,550	($12,400)	$58,100	$127,060
Case 4 *Export Substitution*	$70,550	($43,040)	$27,520	$58,270
Case 5a *Export Substitution, Resource Constraints: Fallowing Alfalfa, and Opportunity Cost of Spending*	$70,550	($51,320)	$19,240	$43,460
Case 5b *Export Substitution, Resource Constraints: Fallowing Cotton, and Opportunity Cost of Spending*	$70,550	($52,620)	$17,930	$42,020

generated. This would result in a net countervailing effect of -$9,060, and, overall, a net direct impact of $61,500. That would generate an economic impact of $130,840 in sales, including multiplier effects. Though not examined in this analysis, large-scale crop-shifting from alfalfa to fruit and vegetable specialty crops could have an impact on regional dairy industries that rely on the nearby production of feed crops such as alfalfa. A decrease in alfalfa supply could be expected to lead to an increase in feed prices, which in turn could be passed on to consumers in the form of higher prices for dairy products.

Were cotton to be shifted to a vegetable-wheat rotation, the net countervailing effect would be -$12,400, for a net direct impact of $58,100 and a total economic impact of $127,060. The 18 acre-feet of water (22,203 m^3) freed up by switching 11.5 acres from cotton to vegetables could be used to grow 5.3 acres (2.1 ha) of wheat. Again, this would result in some land being fallowed during the wheat rotation. Therefore, the fact that vegetable crops require less water per acre than alfalfa or cotton means that the crop mix effect is more muted than if one made a simple acreage-switching assumption, as has been made often in previous studies.

Case 4: An increase in local agricultural production of produce other than lettuce, broccoli, and cauliflower (accounting for export substitution)

According to statewide data on DoD program spending on local foods in Arizona, 61% of DoD funds used for local foods are used to purchase Arizona-grown lettuce, cauliflower, and broccoli. As illustrated above, Arizona is almost the exclusive producer of lettuce in winter months when school is in session and is a major producer of broccoli and cauliflower as well. As local lettuce, broccoli, and cauliflower would be purchased from in-state for much of the year when they are in season, this scenario considers only the share of DoD program spending that goes toward other vegetable and melon crops. Considering only the 39% of crops that would represent import substitution (versus export substitution), spending of $70,550 on local produce would have a net direct impact of $27,520 in sales, and a total economic impact of $58,270. However, one must note that, in the case of Southern Arizona, export substitution has a larger effect on net impacts compared to import substitution.

Case 5: All effects combined (opportunity cost, resource constraints, and export substitution)

Finally, in Cases 5a and 5b, we consider all constraints and tradeoffs combined. Spending $70,550 on local produce, not including lettuce, broccoli, and cauliflower, while accounting for a corresponding decrease in wholesale purchases, would have a net direct sales impact of $19,240 if that production were enabled by fallowing alfalfa. The total sales impact, including multiplier effects, would be $43,460. Were the production to occur by fallowing cotton, the direct sales impact would be $17,930, and the total sales impact would be $42,020.

It is important to emphasize that these cases are presented in comparison to a baseline that assumes that the entire $70,550 in school food spending is retained in the local economy. While total sales impacts that are smaller than the value of direct school spending might be perceived as harmful to the local economy, this also must be considered relative to the impacts of school spending on non-local foods. School spending of $70,550 through a local wholesaler on non-local foods would have an estimated total sales impact of $19,410, including multiplier effects. That said, compared to spending on non-local food, spending on local food through crop-shifting would yield greater sales impacts to the local economy compared to spending on non-local food. However, without appropriately accounting for countervailing effects such as export substitution, opportunity costs, and resource constraints, the net positive effect of local food purchases can be considerably overestimated. Similarly, spending on non-local foods does not necessarily represent “harm” to the local economy, unless it represents a change in which local producers experience a decrease in sales and production with no other local actors in the economy acquiring the resources dedicated to agricultural production and putting them to use for other economic activities.

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

Discussion and Conclusions

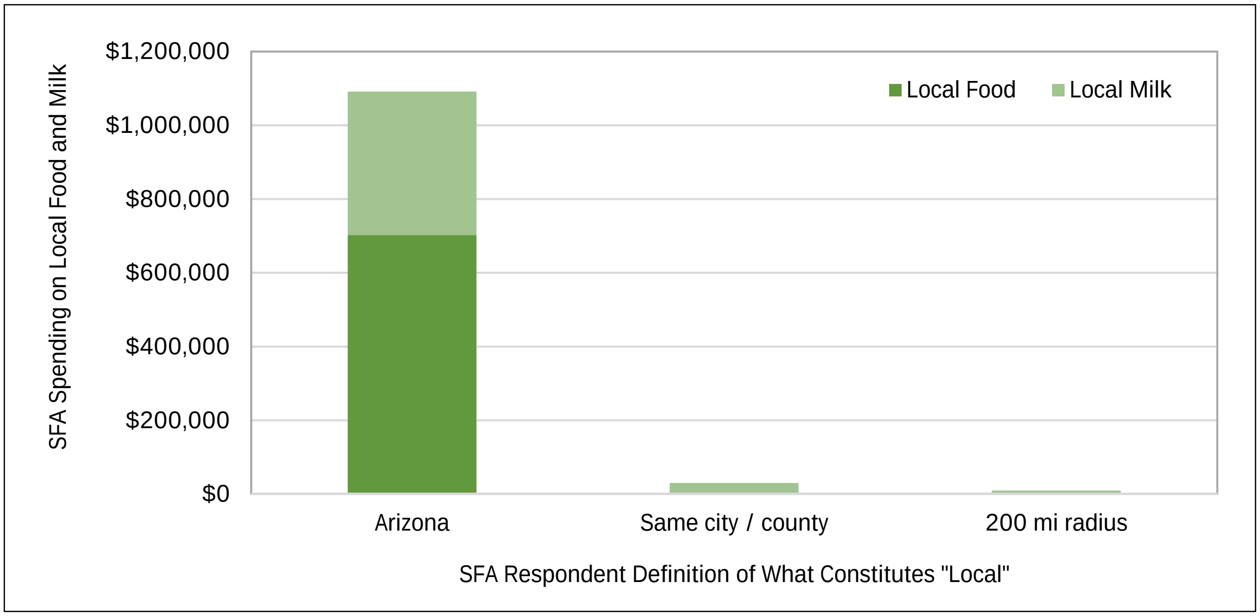
This analysis applies various principles and methods from the USDA Local Foods Toolkit to demonstrate the moderating influence of countervailing effects on the economic impacts of local food purchases through FTS programs in Southern Arizona. Beyond those recommendations presented in the Toolkit, it introduces the concept of export substitution and explores how water resource constraints create tradeoffs for farms through crop-shifting and cropping rotations. This analysis reveals that for fruit and vegetable exporting regions, export substitution can be a major countervailing effect. In fact, it can be larger than other countervailing effects typically considered. This result suggests that gathering information from producers on how FTS procurement (or other local food activities) affects their production and marketing decisions is crucial for an accurate assessment of economic impacts. Is procurement expanding production (i.e., causing local production that would not otherwise occur)? And if so, does the expansion of local food production result in a shift of crops produced? Or, does procurement reflect local production that would have occurred anyway, but shipped out of the region? For those localities pursuing local food initiatives in an effort to promote economic development—in particular those regions specializing in the production of fruit and vegetable specialty crops—these are critical considerations, the effects of which cannot be assessed without information on how producers and intermediaries respond to increases in the demand for local foods. For fresh fruit and vegetable purchases, the countervailing effects of export substitution may well occur in regions that the USDA Economic Research Service identifies as the "Fruitful Rim" (USDA, ERS, 2000). Other examples of this include the production of apples in Washington or potatoes in Idaho.

This analysis included a small number of interviews to inform assumptions about supplier responses; however, they are insufficient to draw any conclusions about countervailing effects at the regional level. A more systematic collection of this information would help to understand the regional implications of the responses of food-chain actors to changes in the demand for local foods. For agricultural producers, this could be achieved through an additional question on the USDA Local Foods Marketing Practices Survey (USDA, 2016b). Furthermore, gathering data on the quantity of spending on the top commodities purchased by schools would be helpful to isolate spending on those commodities for which export substitution effects should be considered. While the Farm to School Census asks SFA respondents to rank their top five items procured, more detailed spending data would be of further use. Finally, a question could be added to address the issue of whether institutions such as schools have a higher willingness to pay for locally marketed produce than for produce coming from outside the local area.

Another important consideration for this analysis is the potential mismatch between the geographic scope of the analysis and the most common definitions of "local" by Southern Arizona SFAs. Figure 5 shows reported spending on local food and milk categorized by the reporting SFA's definition of "local." Overwhelmingly, respondents consider local to be within the state of Arizona. Only two respondents with local purchases defined local as smaller than the state level, and their purchases were comparatively small. This IMPLAN analysis is based upon the assumption that all local spending occurred within the study area (Pima, Cochise, Santa Cruz, and Yuma counties). While it is fair to assume much of that production might have occurred within the study area, there is the potential for additional leakages, which would further moderate the economic impacts. On the other hand, for those SFAs who consider local to be within the same city or county, or within a specific radius, their reported spending could be significantly undercounting purchases from within the study area but that do not fit their definition of local. Future research might consider state-level reliance on DoD program funds as a share of farm-to-school spending and farm-to-school program spending by definition of local.

One final consideration relates to using Farm to School Census data at a granular level. To assess the reliability of SFA-level data for Southern Arizona, we cross-checked total SFA food expenditure responses with FY2014 food expenditure data from the Arizona Department of Education

Figure 5. School Food Authorities' (SFAs') Local Food Spending (in US$) in Southern Arizona by Definition of Local (all in US$)



Note: 1 mile=1.6 km

(Arizona Department of Education, 2018). Of the 10 SFAs that reported their spending on local foods, three respondents' answers matched the figures reported to the Arizona Department of Education for total spending on food. Information for two SFAs was not available. The five remaining respondents all had underreported total food spending on the Farm to School Census compared to the figures reported to the Arizona Department of Education. Total food spending reported by SFAs on the Farm to School Census ranged from 7.4% lower to 90% lower than spending reported to the state. While this does not directly affect the accuracy of local food spending responses in the FTS Census, it does impact the accuracy of the variables measuring the percent of total food cost that is local. It also brings into question the issue of overall accuracy of food expenditure figures, including local expenditures.

Siegfried, Sanderson, and McHenry (2007), in a review of the best practices for assessing the economic impacts of educational institution spending, point to the need to establish a realistic and well-defined counterfactual in order to assess the true economic impacts of institutional spending. The same can be said of farm-to-school programs. For Farm to School Census data to be more easily applied to economic impact analyses, it would be helpful to have a means of comparing local procurement to non-local procurement, both for schools purchasing locally as well as those that do not. For example, do those schools purchasing local produce through farm-to-school programs use the same distributor for local foods as they do for non-local foods? In the case of local purchases for which a non-local option is not available, such as winter lettuce in Arizona, should that spending be counted as a program economic impact?

The regional economic effects of farm-to-school programs are complicated to assess given the varying definitions of local, the potential for negligible impacts resulting from the decisions of individual food-chain actors, and a lack of information to build reliable counterfactual scenarios. That said, the Farm to School Census is one of the few data sources easily accessible for analyzing the economic impacts of local food efforts. Institutional buyers such as schools represent an important opportunity for food producers and intermediary market channels to sell local foods in a structured and steady arrangement (Washington State Department of Agriculture [WSDA], 2014) and potentially achieve improved financial outcomes (Bauman, Thilmany McFadden, & Jablonski, 2018). As the prevalence of farm-to-school programs increases and interest grows in other programs to promote local foods, there is a need for improved information to fully understand the potential scope and scale of the impacts and tradeoffs associated with increases in local food activity, as well as the barriers to its future growth, particularly in areas where water is scarce. The introduction of additional questions to inform counterfactuals for economic impact analysis, particularly regarding export substitution, would be an important step to increase the usefulness to practitioners of the Farm to School Census.

Acknowledgment

The authors would like to thank Ashley Schimke of the Arizona Department of Education for her assistance with primary research for this project.

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

Evaluating the economic impacts of farm-to-school procurement: An approach for primary and secondary financial data collection of producers selling to schools

Special JAFSCD Issue
Economics of Local Food Systems: Utilization of USDA AMS Toolkit Principles
Sponsored by
FOOD SYSTEMS COLORADO STATE UNIVERSITY
USDA

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Submitted April 6, 2018 / Revised June 5, June 29, and July 10, 2018 / Accepted July 11, 2018 / Published online December 20, 2018

Citation: Christensen, L., Jablonski, B. B. R., Stephens, L., & Joshi, A. (2019). Evaluating the economic impacts of farm-to-school procurement: An approach for primary and secondary financial data collection of producers selling to schools. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3), 73–94. https://doi.org/10.5304/jafscd.2019.08C.002

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Abstract
According to the U.S. Department of Agriculture's (USDA) Farm to School Census, during the 2013–2014 school year, 42% of all U.S. schools (5,254 districts including 42,587 schools) participated in farm-to-school activities. These programs included 23.6 million children and purchased almost US$800 million of locally procured food items (USDA Food and Nutrition Services [USDA FNS], 2015). One of the purported benefits of farm-to-school procurement is that it strengthens the local economy by providing expanded market access for local farms and ranches. Despite the claims of positive

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Funding Disclosure
This study was supported through generous funding from CoBank and AgriBank through a grant to the National Farm to School Network, a project of Tides Center.

economic impact, there is limited research to support this. This paper presents a framework for evaluating the economic impacts of farm-to-school programs, adapting the USDA's "Local Food Economics Toolkit" for this specific context. The approach combines primary and secondary data to customize an input-output model, reflecting the complex supply chains that link producers and schools. Additionally, to illustrate the approach, we summarize the findings from two case studies of local food procurement by schools between 2016 and 2017.

Keywords
Farm-to-School, Food Systems, Economic Impact, Local Food Systems Toolkit

Introduction

Farm-to-school is broadly defined "as a school-based program that connects schools (K-12) and local farms with the objectives of serving local and healthy foods in school cafeterias or classrooms, improving student nutrition, providing health and nutrition education opportunities, and supporting small and medium-sized local and regional farmers" (Joshi, Azuma, & Feenstra, 2008, p. 230). Farm-to-school implementation differs by location, but always includes one or more of the following core elements: (1) procurement of local foods to be purchased, promoted, and/or served in the cafeteria or as a snack or taste-test; (2) education activities related to agriculture, food, health, or nutrition; and (3) school gardens (Christensen, Jablonski, Stephens, & Joshi, 2017).

The first farm-to-school programs emerged in California, Connecticut, and Florida in the late 1990s (Feenstra & Ohmart, 2012; Ohmart, 2002). The National Farm to School Network (2016) estimates that there were six programs in five states in 1997. By 2008, the number of programs had grown dramatically to more than 1,000 programs in 34 states (Kalb, 2008). Farm-to-school was officially incorporated into the federal child nutrition program through the Healthy, Hunger-Free Kids Act in 2010. According to the USDA's Farm to School Census, by the 2013–2014 school year, 42% of all U.S. schools (5,254 districts that encompass 42,587 schools) participated in farm-to-school activities. These programs reached 23.6 million children and included almost $800[1] million of locally procured food items, including milk, which accounts for 46% of local food expenditures by school districts (USDA FNS, 2015).

Some of the growth in the number of programs can likely be attributed to the proliferation of financial support and interest from private foundations and public agencies. These organizations provide funding for farm-to-school programs, at least in part due to the assumption that they contribute to positive regional economic development. Despite growing support, there has been limited research exploring the economic impact of farm-to-school activities, including whether its activities, such as local food procurement, strengthen local inter-industry linkages or expand market access for participating producers. While the authors recognize the importance of distinguishing between local and regional foods, most notably that local food is a necessary but not a sufficient component of regional food systems (Clancy & Ruhf, 2010; Palmer et al., 2017), when discussing the geographic source for school food procurement, we use the term "local" as used by the USDA. This allows for the individual school or district to define local. When discussing economic impacts, we refer to the regional impacts and present a specific geographic boundary and justification for its selection. Further discussion about the relationship between the concept of regional food systems and defining the specific geographic boundaries of economic impact assessments, and the implications this has on the results, are presented in the results section.

To promote more standardized, rigorous assessments to evaluate market and economic outcomes of localized markets and/or shorter supply chains, the USDA Agricultural Marketing Service (AMS) developed a best practice assessment methodology and a standardized replicable framework called the Local Food Economics Toolkit (henceforth 'Toolkit') (Thilmany McFadden et al., 2016). Utilizing the impact assessment approach outlined

[1] All currency in this paper is in US$.

in the Toolkit, we propose a methodology intended to expand our understanding of how school districts procure local foods and how these supply chains' structure changes the way in which participating farmers work with other businesses in their community (often referred to as inter-industry linkages) and how this impacts regional economics. We present results from two case studies, one in the Minneapolis School District and one in the state of Georgia. In both, we use a combination of primary data (collected from a limited number of producers engaged in selling to school districts) and secondary data (e.g., USDA's Farm to School Census, USDA's Agricultural Resource Management Survey, and IMPLAN) to customize an input-output model. Importantly, we consider opportunity cost, which represents the relationship between scarcity and choice. Put another way, opportunity costs are the benefits an individual or business misses out on as a result of selecting one alternative over another. Opportunity cost is often considered from the demand side. For example, if a school shifts a portion of its food purchases from a traditional wholesaler to direct purchases from a farm, the opportunity cost of that choice are the value of the displaced purchases from a traditional wholesaler. This paper contributes to the nascent literature evaluating the economic impacts of farm-to-school activities and can also be used to inform efforts to assess the economic impact of similar local food procurement programs in colleges, hospitals, and early childcare and education settings.

The program used in this and many other economic impact analyses is IMPLAN. The IMPLAN software relies on an input-output (I-O) table that reflects the flow of economic linkages, namely the monetary exchanges associated with the trade of goods and services, within a specific geographic area at a moment in time. The I-O tables are based on regional and sometimes national averages from the U.S. Department of Commerce, the U.S. Department of Labor Statistics, USDA, and other federal and state government agencies. These linkages take the form of an expenditure function, which specifies how different inputs are assembled in order to produce a unit of output. Another way to think of the expenditure function is the sector's recipe to produce goods and services (output). So, an I-O table comprises columns that represent all the purchases and final demand, while the rows consist of all industry sales and value added[2] (e.g., labor compensation, interest payments, and rental costs) for every industrial sector within a region's economy. Assume that a regional economy comprises only two industries: agriculture and manufacturing (Table 1).

In the economy represented in Table 1, the agriculture sector purchases $150 worth of goods and services from the agriculture sector and US$200 worth of goods and services from manufacturing within the study region. The sector spends $650 on payments to employees, holders of capital, and governments. The sum of entries in each column represent the total purchases by the industry. Since profits, losses, depreciation, taxes, etc., are included in the table as final payments, total purchases must equal total sales.

The I-O table is used to create an I-O model (Jablonski, Schmit, & Swenson, 2016). Despite the utility of the I-O model in assessing short-term economic impacts, it has several limitations including its assumption of unlimited supply, constant prices, static framework, constant returns to scale, and fixed technology. The I-O model is demand-driven, meaning that there are no supply constraints. The model assumes that there is always excess capacity in the system and that any demand will be met—at the price for which it is currently available. Particularly in

Table 1. Hypothetical Input-Output Transaction Table

	Agriculture	Manufacturing	Final demand	Total output
Agriculture	150	500	350	1,000
Manufacturing	200	100	1,700	2,000
Value added	650	1,400		2,050
Total outlays	1,000	2,000	2,050	

[2] In the economic impact field, value added is the difference between an industry's output and its inputs. More details on IMPLAN's use of the term are at https://implanhelp.zendesk.com/hc/en-us/articles/115009498847-Value-added

agriculture, where prices are extremely volatile, the assumption of constant prices can be highly problematic and serve to distort results (Swenson, 2006). The reason that constant prices are assumed is that I-O models are static, meaning that they capture a specific moment in time. Although this assumption is likely tenable in short-term analyses, it is unlikely that prices will not change in the medium- to long-term. Despite its limitations, I-O models and IMPLAN, if used thoughtfully, are a powerful tool for economic impact analysis. Accordingly, there are many studies that use I-O models and IMPLAN to quantify the economic impacts and contributions of agriculture to county, regional, statewide, and national economies.

We begin this paper with a review of previous economic impact assessments of farm-to-school procurement programs, highlighting inconsistencies in the approach and rigor, followed by the presentation of our study methods using the Toolkit as a roadmap. We then go on to present findings from our survey of producers and discuss the results of our economic impact assessment. Finally, we discuss the implications for assessments of the impacts of local food procurement by schools and suggest opportunities for future work.

Literature Review

There are a handful of studies that assess the economic impacts of farm-to-school procurement (Gunter, 2011; Kane, Kruse, Markesteyn Ratcliffe, Ananda Sobell, & Tessman, 2010; Kluson, 2012; Pesch, 2014; Roche, Becot, Kolodinsky, & Conner, 2016; Tuck, Haynes, King, & Pesch, 2010). Using the recommendations put forth in the Toolkit, we evaluated whether these studies incorporate key recommended components in their assessments (see Table 2). Specifically, we noted whether or not authors described (1) the geographic region and school district; (2) the type of study, specifically if the study is a contribution or impact assessment; (3) assumptions about how food moves from farm to school or the structure of the supply chain; (4) if or how they augmented or modified secondary data (such as that found within IMPLAN) based on interviews with farmers or other secondary data to more accurately reflect local and regional food system activities and farm expenditure patterns; and (5) if the study accounts for opportunity costs (Thilmany McFadden et al., 2016).

Schools generate economic activity through their purchases of goods and services in a regional economy, which in turn results in a series of additional purchases by the businesses from which they purchase products to supply the schools. These existing exchanges are part of a contribution assessment, while assessing whether the impact of a shift in school purchases from traditional food sources to more local sources would be an economic impact assessment.

Generally, the more businesses within a specific region purchase from one another, the stronger the inter-industry linkages and resulting multiplier. The multiplier is a numeric way of describing the secondary impacts stemming from a change in the economy. The multiplier is the sum of the direct, indirect, and induced effects divided by the direct effect. The direct effect is associated with the change in industry spending. In the case of farm-to-school procurement, the direct effect is the change in the quantity or source of food produced within the region. The direct effect results in indirect effects, or changes in backward-linked industry purchases as other industry sectors respond to the new demands of the directly affected industries. The induced effects are the changes in spending from households as labor income is converted into household spending on local goods and services. The indirect and induced effects are influenced by the structure of the supply chain. For example, if the food is purchased directly from farmers, the indirect and induced effects will be different from those associated with a purchase of locally produced products through an intermediary because of the differences in reliance on labor and input requirements.

There are three types of multipliers: output, employment, and labor income. The output multiplier is the base multiplier from which all other multipliers are derived. It describes the total output generated as a result of one additional dollar of output generated by the target economic sector. For example, if an output multiplier is 1.25, that means that every dollar of production in the specific economic sector generates an additional $0.25 in the local economy. Similarly, the employment multiplier describes the total jobs generated as a result of one job in the target economic sector. Finally, the labor income describes the dollars of labor income generated as a result of one a dollar of labor income in the target economic sector. While some of the papers presented in Table 2 include all three multipliers, most did not, so we have limited our comparison to the output multiplier.

With the exception of Haynes (2010), Gunter and Thilmany (2012), and Roche et al. (2016), the studies reviewed do not describe how food travels from the farm to the school. Only Roche et al. (2016) include intermediate local food sales in their assessment. The structure of the supply chain can have important implications for modeling the economic impacts of procurement. For example, USDA Foods are the single largest source of ingredients for schools, and about half of those foods are diverted for processing prior to delivery (Woodward-Lopez et al., 2014). If these foods are replaced with products from local sources, the economic impact assessment must address a number of questions, such as will processing occur on the farm, at a local processor, or in the schools? What implications will changes in the processing location have on employment requirements (i.e., will lighter processing at the farm require additional labor in

Table 2. Summary of Farm-to-School Economic Impact Assessment Studies (all currency in US$)

Study	Haynes, 2010, and Tuck, Haynes, King, & Pesch, 2010	Kane, Kruse, Ratcliffe, Sobell, & Tessman, 2010	Gunter, 2011, and Gunter & Thilmany, 2012	Kluson, 2012	Pesch, 2014	Roche, Becot, Kolodinsky, & Conner, 2016
Location	Minnesota	Oregon	Colorado	Florida	Minnesota	Vermont
Model geographic scale	5-county region (5,600 mi^2)	State of Oregon (98,000 mi^2)	2-county region (6,500 mi^2) and 6-county region (13,500 mi^2)	Unspecified	12-county region (23,890 mi^2)	Statewide (9,600 mi^2)
Size of school district	Cass, Crow Wing, Morrison, Todd, and Wadena counties (20,840 students)	Portland Public Schools (47,000 students) and Gervais school district (1,500 students)	Weld 6 Greeley (19,500 students)	Sarasota School District (42,000 students)	68 K-12[a] schools and 396 health-care facilities (66,900 students)	Vermont (94,000 students)
Type of study	Impact (three scenarios: one special meal, unprocessed substitution, substitute all)	Impact ($462,000)	Contribution and impact ($20,900–$39,125 in planned purchases)	Contribution ($107,000 in existing purchases)	Contribution ($33,000 worth of sales) and impact (20% of all institutional food purchases from local growers)	Contribution ($914,943 existing purchases) and impact (three scenarios: increases in purchases)
Supply chain structure	Direct	Not specified	Direct	Not specified	Not specified	Combination of direct and intermediated
Customization of IMPLAN agricultural sectors	Yes, using survey data	No	Yes, using survey and secondary data	No	No	No
Sample size	11 farmers	No farmers interviewed	14 farmers	No farmers interviewed	No farmers interviewed	No farmers interviewed
Includes opportunity costs (shift in purchases from wholesaler to food producer)	Assumes no loss to current wholesalers because they are not in the region	No	Subtracts the impact of the wholesale sector from the farming sector	No	Assumes a loss of 75% of total new sales to the wholesale sector	Margins purchases shifted from wholesale and transportation sector to direct from producers
Output multiplier	1.03–1.25	1.86	1.47–1.63	2.4	1.7–2.9	1.6

[a] K-12 refers to schools ranging from kindergarten to twelfth grade.
Note: 1 square mile (mi^2) 2.6 square km
Source: Adapted from Becot, Kolodinsky, Roche, Zipparo, Berlin, Buckwalter, & McLaughlin (2017).

the school to prepare the food for student consumption)? Further, while Haynes (2010) and Tuck et al. (2010) acknowledge a decrease in demand for ingredients from more traditional sources (USDA Foods, wholesalers, etc.), they do not account for the opportunity costs because all the distributors were located outside the geographic boundary. Gunter (2011), Pesch (2014), and Roche et al. (2016) attempt to account for the lost sales to intermediaries as a result of the local food purchases.

Primary data collection through farmer surveys or interviews can shed light on the structure of the supply chain. Only two studies (Gunter, 2011; Haynes, 2010) collected primary data from farmers. Primary data is useful to inform and modify the expenditure functions in IMPLAN. The two studies with primary data collection were also the only two studies to customize the IMPLAN agricultural sectors. Not accounting for the different linkages associated with farms that sell to school is a significant shortcoming of the studies that did not modify IMPLAN. As noted in the Toolkit, the industry data presented in IMPLAN is a rich starting point, but the economic activities are derived from national averages, aggregated for an entire commodity or industry sector. This often limits the extent to which local food-system activities can be accurately analyzed. Changes in the expenditure function and local purchasing percentage (the percent of all economic exchanges between two sectors of the economy that occur within the geographic area of interest) can have significant impacts on the multiplier (Schmit, Jablonski, & Mansury, 2016). Aside from the relationships that exist between the producer and the consumer (schools, in the case of farm-to-school procurement), there are a host of additional, often stronger linkages that exist between farms that sell through local channels and other sectors of the regional economy. Previous research suggests that these farms spend a larger proportion of their total expenditure in the regional economy, particularly on labor, relative to more commodity-oriented producers (Bauman, Thilmany McFadden, & Jablonski, 2018; Jablonski, Schmit, & Kay, 2016; Thilmany McFadden et al., 2016). Yet finding data to reflect these linkages often adds significant time and cost to conducting the study. The approach presented and utilized in the next section provides a more standardized and efficient method for primary data collection to allow for a more accurate evaluation of the economic impacts of a school or district's shift to local food procurement.

Surveys and interviews can be used to better understand farmers' motivations or hesitation to participate in farm-to-school programs. The inclusion of farmers' perspectives is surprisingly sparse in the farm-to-school literature, despite as pointed out by Conner, King, Kolodinsky, Roche, Koliba, and Trubek (2012), "farms are by definition an indispensable component of FTS [farm-to-school]; if farmers are unable to participate or derive no benefit, the potential benefits of FTS will not be realized" (p. 322). Much of the farm-to-school literature focuses on the perspective of school foodservice operations (Vogt & Kaiser, 2008). The farm-to-school studies that include farmer surveys observe a tension between economic and non-economic forces (Berkenkamp, 2012; Conner et al., 2012; Izumi, Alaimo, & Hamm, 2010; Izumi, Wright, & Hamm 2010a; 2010b; Matts, Conner, Fisher, Tyler, & Hamm, 2016). As Izumi, Wright, and Hamm (2010a) summarize, "from a purely economic perspective, farm-to-school programs appear to be a relatively insignificant opportunity for farmers" (p. 379). Conner et al. (2012) found that an array of social and economic motivations underpin farmers' participation in farm-to-school programs. These studies helped to inform the development of our survey instrument and resulted in the inclusion of two open-ended questions concerning the non-economic motivation and impact of selling to schools.

All the studies we reviewed found that the output multiplier associated with farm-to-school procurement was greater than that associated with the existing agricultural production sector, although only modestly. As is generally the case with regional economic impact studies, studies with smaller geographic bounds show smaller economic impacts, illustrating the importance of selecting an appropriate functional economic area (Thilmany McFadden et al., 2016). All the studies used political and/or school district boundaries to define the functional economic area. The functional economic area should cover a relatively contained and cohesive network of trade that includes the places where people live, work, and shop. The studies reported output multipliers that varied from 1.03 in a study of six counties in Minnesota (Haynes, 2010) to 2.4 in Florida with an unspecified functional economic area (Kluson, 2012).

Methods

This study roughly followed the seven modules presented in the Toolkit: (1) frame the assessment process, (2) use secondary data sources, (3) generate and use primary data, (4) engage your community process with the data, (5) analyze linkages and contribution through input-output analysis, (6) address opportunity costs, and (7) conduct an advanced IMPLAN analysis.

Module 1. Framing the assessment process

We started by framing our community economic assessment process by working collaboratively with researchers from Colorado State University (CSU) trained in economic impact assessment methods and leaders from the National Farm to School Network (NFSN). Together, we gathered resources including white papers, journal articles, and previous economic impact assessments. We also collected survey protocols from researchers across the country who surveyed farmers and school district foodservice directors about farm-to-school procurement programs. After reviewing the resources, we defined the study objectives to document the short-term economic impacts of farm-to-school sales, apply a best practice economic impact assessment methodology, and develop a standardized, replicable framework to assess the regional economic impact of a school or school district's shift to local food procurement.

As part of Module 1, framing the process, which occurred roughly between August and December 2016, we also reached out to FoodCorps to partner with individuals already embedded in school districts who could assist with data collection. Nine volunteers (from Indiana; Detroit, Michigan [MI]; Traverse City, MI; Greensboro, North Carolina [NC]; the Bay Area of California; Washington, D.C.; Greeley, Colorado [CO]; Pueblo, CO; and Newark, New Jersey [NJ]) offered to take the lead on data collection in their communities. In the beginning of December 2016, CSU provided a webinar training and practice survey to ensure consistency across enumerators.

Modules 2 and 3. Using secondary data and generating/using primary data

Modules 2 and 3 occurred simultaneously and informed one another. We used a combination of primary and secondary data to investigate farm-to-school sales and market linkages. Best-practice economic impact assessments of farm-to-school food procurement require information from producers or available and relevant secondary sources to inform model data and assumptions (Thilmany McFadden et al., 2016). Specifically, the goals of data collection were to (1) provide descriptive data about the type of farms selling to schools, including information about producer level of satisfaction with those transactions; (2) understand if or how farmers shifted their operations based on the availability of school markets (for example, did they increase production, did they shift product from one market to another); and (3) estimate an average farm expenditure profile that could be multiplied by the total number of farms in the study area selling to schools to create a new farm-to-school industry sector in IMPLAN.

The primary data used in this study was collected using a survey of a convenience sample of producers currently selling to schools. The survey was developed collaboratively by CSU and NFSN and included 20 questions that asked farmers about their production practices, sales, markets, overall satisfaction with selling to schools, and participation in various farm-to-school activities (see the Appendix). The instrument was explicitly designed to be as short as possible while still eliciting the information needed for customizing the model, enhancing our understanding of how to define the functional economic area based on where producers were selling their products, and calculating potential opportunity costs. It also included two questions to capture the non-economic impacts of selling to schools. The survey focused on six general expenditure categories that account for 66% of all variable expenditures for all local farmers and ranchers with gross cash farm income up to $350,000 as estimated in the USDA's 2013 Agricultural Resource Management Survey (ARMS) (USDA Economic Research Service [USDA ERS], 2015). The ARMS is an annually conducted, nationally representative survey of approximately 30,000 farms, and includes data on gross cash farm income, marketing channels utilized, key product segments, region where operation is located, fixed and variable expenses, assets, debt, and farm and operator characteristics.

For the sake of brevity, our survey did not include questions about the local purchasing percentage (LPP)—the share of input purchases from sources within the functional economic area. We used IMPLAN coefficients as a secondary data source, which we expected to result in a more conservative multiplier, as local producers are more likely to purchase inputs locally (Jablonski, Schmit, & Kay, 2016; Pesch & Tuck, 2015). We created average expenditure functions for producers in the two case study sites using responses from the survey, which we then compared to an aggregate fruit and vegetable farming sector in IMPLAN.

We test-piloted the survey with six farm-to-school stakeholders before launch. The research was conducted in accordance with CSU's Human Research Protection Program and was deemed exempt (IRB#288-17H). NFSN staff and Food-Corps fellows and alumni conducted the producer surveys. Twenty-six producers selling to schools in nine states (Georgia, Indiana, Michigan, Minnesota, New Jersey, North Carolina, Pennsylvania, Utah, and Wisconsin) and the District of Columbia completed the survey. Descriptive statistics for all 26 producers are presented in this paper, but due to the very small sample size, only data from the two locations with the highest number of responses (Minnesota and Georgia, with five and six completed responses, respectively) were used to test the expenditure data collection tool and to demonstrate how a more generalizable, representative sample could be used to support best-practice economic impact assessments.

Module 4. Engaging your community process with data

Throughout the process of data collection, we convened the project leadership team to review the incoming data and findings. Along the way, we had to revisit the limitations of project resources balanced with the difficulties associated with data collection. Because of the limited capacity of Food-Corps volunteers, the NFSN staff took on great responsibility with data collection and targeted specific communities to ensure we had enough responses to build a model. During this time we also began to organize efforts around different avenues and approaches to present the key findings from the study to our community.

In the fall of 2017, working with our team and additional partners from USDA Agricultural Marketing Service, USDA Food and Nutrition Service, and Cornell University, we organized a webinar on the key findings from the study and other resources to support stakeholder efforts at assessing the economic impact of local food projects and initiatives. Using engaging figures, tables, and graphics helped us to communicate key findings from our study and highlight next steps for farm-to-school research across the country.[3] Over 300 people registered for the webinar, and there have been over 150 views of the recorded webinar on YouTube.

Modules 5. Analyzing the linkages and contribution through input-output analysis

One of the first steps in creating an I-O model is to properly specify the functional economic area. With our case study approach, we had to define the study area for each site. The Minneapolis Public Schools (MPLS) serves the city of Minneapolis, Minnesota. Nearly 37,000 students are enrolled in the 96 public primary and secondary schools in the district (National Center for Education Statistics [NCES], 2017). According to the 2013–2014 Farm to School Census, 63 schools within the district sourced local fruits, vegetables, milk, meat, and/or poultry for their breakfast and lunch meal programs. Products were sourced directly from producers and through intermediaries (food hubs, distributors, and food manufacturers) (USDA FNS,

[3] See a factsheet from the project at http://www.farmtoschool.org/Resources/EconomicImpacts-FactSheet.pdf

2015). During that same year, the district spent a total of $7,842,090 on food, with 13% spent on local food (excluding milk). The district defines local as within a 200-mile (322-km) radius, including 163 counties in four states, which we used as our study area. We collected survey responses from five fruit and vegetable producers selling directly to the MPLS. The five farms were widely dispersed. One producer was located on the western border of the state, and two producers were in Wisconsin. The remaining two were located just south of Minneapolis.

For this study, we estimated that there are 32 farmers selling to MPLS. This calculation was made by dividing the total local food purchases by MPLS ($1,057,880) by the average farm-to-school sales ($33,205) from the five surveyed farms.

The state of Georgia, our second case study, covers 180 public school districts, 62% of which participate in farm-to-school. According to the 2013–2014 Farm to School Census, 82 districts sourced local foods for meal programs in 615 schools serving 1,226,410 students. Seventy-three districts sourced local products through an intermediary, 32 districts sourced directly from producers, and no districts sourced through food hubs. Total food cost data was available for 61 of the 82 districts and indicate that a total of $170,622,272 was spent on all food. The 54 districts spent a total of $10,266,746 (excluding milk) on local food.

Extrapolating the school expenditure patterns to all the districts in Georgia that source local food, we assumed that the 82 districts are spending $229,361,086 on total food and $15,590,243 on local food (excluding milk). Survey data were collected from six fruit and vegetable producers within the study area. For the purposes of this study, it was estimated that there are 92 farms selling to schools in Georgia, which were calculated by dividing the total local food purchases by Georgia schools ($10,266,746) by the average farm-to-school sales ($110,407) from the six surveyed farms. The regional (and thus our study area) was defined as all 159 counties in the state.

Module 6. Addressing opportunity costs

As noted in the literature review, opportunity costs are often overlooked in economic impact assessments of farm-to-school procurement. If a school is going to increase its overall expenditures on local food, it may do so through a one-time influx of dollars (i.e., foundation award, grant, or donation), or it may decide to shift spending permanently away from something else. In general, a school is unlikely to increase its average per student expenditure (other than adjusting for inflation) based on a desire to purchase local food. So, new local purchases will almost certainly supplant non-local purchases. Understanding how local food purchases impact other school purchases is key to conducting a rigorous and accurate economic impact assessment. The degree of the changes will be influenced, at least in part, by the structure of the supply chain. If farmers and school districts choose to enter in a direct relationship, there will likely be reduced purchases through intermediaries (including businesses that might be local). Although it may be tempting to try to maximize the result or multiplier impact when conducting an economic impact assessment, rigorous research must measure net impacts. The goal should be to get as accurate an estimate as possible of how local or regional economies respond based on new or shifted economic activity. In these case studies, to account for the opportunity costs of local food purchases, new farm-to-school purchases (including direct and intermediated, margined for the intermediary mark-up) were subtracted from the total expenditure of the aggregated fruit and vegetable production sector and the wholesale sector.

Module 7. Modifying IMPLAN

The final step outlined in the USDA AMS Toolkit provides information on how to adjust the default settings in IMPLAN to create a model that is more reflective of the conditions on the ground. Using the primary and secondary data described above, we created a customized expenditure pattern for producers selling to schools in each of our case study sites. We then compared these estimated expenditure patterns, after accounting for the sale of the items minus the cost of the goods purchased from wholesalers and retailers (this is called the margined value and must be done for purchases from retail and wholesale sectors), to the secondary data from ARMS and IMPLAN to verify that they were reasonable in comparison to aggregated fruit and vegetable expenditure function (Table 3). We then created a sales profile for producers, recognizing that farm-to-school producers often rely on a variety of markets for their products and that many of the sales to schools are in fact traveling through an intermediary. As stated in the previous section, in the MPLS region producers sold on average $33,205 to schools; 50% was sold directly to schools and 50% was sold through intermediaries. In Georgia, producers sold on average $110,407 to schools; 45% was sold directly, and 55% went through intermediaries.

We then assigned the local purchasing percentage (LPP) using IMPLAN numbers to create our customized IMPLAN model.

Using the six largest expenditure categories, we captured 68% of the Minneapolis farmers' variable costs and 73% of the Georgia farmers'. What may be most surprising, particularly in Georgia, is how similar the survey data is to the IMPLAN data, particularly labor.

Unlike other farm-to-school economic impact studies, this study tried to reflect the fact that farmers rely on a variety of markets for their products. The model thus accounted for direct-to-consumer sales, intermediated sales, and direct-to-school sales.

Once the model in IMPLAN was customized to reflect the new farm-to-school production sector, we conducted the economic impact assessment. A scenario was developed for each of the case studies to evaluate the impact that an increase in final demand for local products by schools would have on the study area. This increase in final demand is referred to as the "shock," or the direct impact. Secondary data sources including press releases, newspaper articles, the 2013–2014 USDA Farm to School Census, the National Farm to School Network website, and farm-to-school grant and funding information were reviewed to develop realistic scenarios.

Results

Farmer Survey Descriptive Statistics

Of the 26 farmers interviewed, 20 grew vegetables, 13 produced fruit, and two also raised livestock. There was substantial heterogeneity in terms of the size of the farm operations. The farms ranged in size from half an acre (0.2 ha) to 500 acres (202 ha). The average farm size was 69 acres (28 ha). The farms' total sales ranged from $9,500 per year to $8 million, with the average sales being $920,000. All the farms started selling to schools after 2005, with the majority starting after 2011.

As part of our effort to understand how farmers responded to the availability of school markets, we asked them why they started selling to schools. Their responses fell into four broad categories: (1) provided a market, (2) opportunity to educate youth, (3) approached by school, and (4) already selling to an intermediary that began to sell to a school. Ten farmers expressed that schools

Table 3. Share of Variable Costs Attributed to the Top Six Expenditure Categories

Expenditure category	ARMS local food farmers (sales up to $350,000)	ARMS farm-to-school farmers	IMPLAN MSLP fruit and vegetable farmers	MSLP farm-to-school farmers	IMPLAN Georgia fruit and vegetable farmers	Georgia farm-to-school farmers
Labor	0.12	0.29	0.41	0.47	0.27	0.27
Fertilizer and chemical inputs	0.11	0.12	0.13	0.03	0.10	0.23
Fuel and transportation	0.12	0.09	0.05	0.03	0.06	0.05
Maintenance and repair	0.14	0.11	0.05	0.06	0.06	0.05
Utilities and rent	0.09	0.09	0.04	0.04	0.05	0.05
Seeds	0.08	0.09	0.02	0.04	0.02	0.07
All other variable costs	0.34	0.22	0.31	0.31	0.43	0.26

Source: USDA ERS (2015); IMPLAN (2013). ARMS data compiled by Allie Bauman, Colorado State University.

provided a needed market for a product, which is in line with the findings from Izumi, Wright, and Hamm (2010a). One farmer explained, "We grow a lot of good keeping winter apples that harvest late and our retail business slows after the end of October, so we need a market for them." Seven farmers expressed that farm-to-school sales provided a unique opportunity to educate youth about healthy food options and agriculture, and another seven farmers stated they started selling to schools because they had been approached by someone at the school. Three farms noted that they had already been selling to an intermediary that just started selling to schools and that it was not an active decision on their part.

We asked the farmers a number of questions to better understand how farm-to-school sales fit into their overall operation and relatedly, the general structure of the supply chain linking producers and schools. In line with Joshi et al.'s (2008) findings, direct farm-to-school sales accounted for a modest portion of all farm sales, which was 13% of sales from our surveyed producers. In addition to direct sales to schools, the farms relied on a diversity of other outlets, including direct to consumer (20 farms); intermediated (e.g., supermarket or supercenter; restaurant or caterer; other retail store; local or regional food processor or food maker; or local or regional aggregator, distributor, food hub, or broker) (16 farms); wholesale marketplace for commodities not identified by source (e.g., auction, wholesale or terminal market) (10 farms); and institutions (e.g., colleges, hospitals, prisons) (5 farms). Three of the farms surveyed had no direct sales to schools, but instead sold to schools exclusively through an intermediary. Twelve farms noted that some of the product they sell to intermediaries ends up at schools. Understandably, some farmers struggled to estimate the percent of their intermediated products sold to schools; as one farmer explained, "My food hub doesn't share that information."

Direct sales from farm to school represent different inter-industry linkages within a local economy than sales from farm to intermediary to school. According to the 2013–2014 Farm to School Census, 65% of school districts buy local food through a distributor. Christensen, Jablonski, and O'Hara (2017) found that schools that purchase local products directly from farms and/or nontraditional distributors spend significantly less per student on non-milk local food purchases. The fact that intermediaries facilitate the majority of farm-to-school transactions also poses new challenges for identifying producers engaged in farm-to-school sales and measuring supply and demand for local foods in schools.

Economic Impact Assessment

Once the model in IMPLAN was customized using our primary and secondary data to reflect the new farm-to-school production sector, we conducted the contribution assessment. Results from the model, incorporating the data collected from the survey, show a gross output multiplier of 1.93 in MPLS and 2.11 in Georgia (Table 3). This indicates that for every additional dollar spent on local food procurement by schools (accounting for no opportunity cost), an additional $0.93 for related sectors is generated in the MPLS study area and $1.11 in the Georgia study area. We see that the multipliers are larger in both examples for our farm-to-school production sector compared to the average fruit and vegetable production sector, yet it should be noted that we are working with a very limited number of observations.

We created a shock for both study areas to evaluate the economic impact of an increase in final demand for local products by schools. For the MPLS case study, we modeled the impact of a $25,000 grant from the Center for Prevention at Blue Cross Blue Shield in Minnesota using an analysis-by-parts approach. We assumed that the awarded grant enabled the district to shift some of their non-local food purchases to local food purchases. The $25,000 in farm-to-school purchases follows the supply chain structure modeled using a combination of primary and secondary data. For this case study, we assumed that 50% of the sales are directly purchased from the grower, while 50% are purchased through an intermediary. Based on the default data in IMPLAN, we assumed a 17% margin for the wholesale trade sector (which includes food intermediaries).

Thus, the grant of $25,000 results in $22,875 worth of purchases from the farm-to-school production sector, with $2,125 of the grant value going toward covering the wholesale trade sector margin, which is allocated to the levels of intermediated purchases and value added outlays necessary to support the farm-to-school production sector ($8,443 is allocated to employee compensation and $2,297 to proprietor income). This approach also allows for a 10% mark-up between the price of local goods as compared to the non-local goods, as it is assumed that the district is spending $22,875 for the same amount of product that they previously purchased for $20,750, when they purchased all of the food through the wholesale trade sector.

Next, we needed to take into account the opportunity cost associated with this shift. As a result of the $22,875 increase in local food purchases, the school purchased $20,750 less of non-local food products. The loss of these sales to the aggregated fruit and vegetable sector and the wholesale sector are the opportunity costs. Because this is a regional economic impact model, this study was only concerned with the loss of sales to the fruit and vegetable producers within the functional economic area; this is calculated using IMPLAN's LPP 21% for the MPLS non–farm-to-school production sector. The shift from non–farm-to-school products to farm-to-school products would result in a loss of $4,250 in outlay to the wholesale sector. This loss is made up in part, because based on the survey findings it is assumed that 50% of the local product is still traveling through an intermediary, resulting in a net loss to the wholesale sector of $2,125.

Table 4 shows the summary of the impact with and without the opportunity cost. For every additional employee added to the Minneapolis farm-to-school production sector's payroll, an additional 0.1 jobs are generated in backward-linked industries (that is, the employment multiplier is 1.1). Because only $22,875 of the total grant amount of $25,000 is going to the farm-to-school production sector, we estimate that the new labor income increases by $11,813, including the $8,443 of the original output that went toward employment, plus an additional $3,332 in indirect and induced income. The initial $25,000 grant results in $22,875 worth of new farm-to-school sales, which in turn generates $33,204 of output impact when all indirect and induced effects are considered, resulting in an implied multiplier of 1.45.

For the Georgia study area, we took the same approach. We modeled the impact of a recent grant of $62,000 to purchase more local foods. We modeled the pathway of the $62,000 through the supply chain based on our survey results. We assumed that 55% of the sales are directly purchased from the grower, while the remaining 45% is purchased through an intermediary. Thus, the grant of $62,000 results in $57,257 worth of purchases from the farm-to-school production sector, which is allocated to the levels of intermediated purchases and value added outlays necessary to support it ($9,890 is allocated to employee compensation, and $20,498 to proprietor income). Again, to account for the opportunity cost associated with the shift in school food purchases, we assumed that the school supplanted non-local food with local food products. As a result of the $57,257 increase in local food purchases, the school purchased $51,460 less

Table 4. Summary of Impact Results for MPLS Study Area, With and Without Opportunity Costs

Impact type	Employment	Labor income	Value added	Output
With opportunity costs				
Direct effect	1.00	$8,443	$2,297	$22,875
Indirect effect	0.00	$48	($931)	$31
Induced effect	0.10	$3,322	$5,808	$10,298
Total effect	1.10	$11,813	$7,174	$33,204
Implied multiplier	1.10	1.40	3.12	1.45
Without opportunity costs				
Direct effect	1.00	$8,443	$2,297	$22,875
Indirect effect	0.10	$3,655	$4,880	$7,742
Induced effect	0.10	$4,367	$7,633	$13,534
Total effect	1.20	$16,465	$14,810	$44,151
Implied multiplier	1.20	1.95	6.45	1.93

of non-local food products. Again, we assumed the school would purchase the same quantity of food no matter the source. As this is a regional economic impact model, the study is only concerned with the loss of sales to non–farm-to-school farms within the functional economic area; this is calculated using IMPLAN's LPP 25% for Georgia's aggregated fruit and vegetable production sector. The shift from the purchase of non-local to local food products would result in a loss of $10,540 in output to the wholesale sector. This loss is made up in part, because based on survey findings, the model assumes 45% of the sales to the farm-to-school production sector still goes through an intermediary, resulting in a net loss to the wholesale sector of $5,797. Table 5 shows the summary of the impact with and without accounting for opportunity costs. As illustrated below, when accounting for the opportunity costs, for every additional employee added to the farm-to-school production sector's payroll, an additional 0.5 jobs are generated in backward-linked industries (employment multiplier of 1.5). Similar to the calculations for the grant awarded to the MPLS region, the initial $62,000 grant results in $57,275 worth of new sales to farm-to-school farms, generating over $84,581 of output impact when all indirect and induced effects are considered, resulting in an implied multiplier of 1.48.

Table 5. Summary of Impact Results for the Georgia Study Area, With and Without Opportunity Costs

Impact type	Employment	Labor income	Value added	Output
With opportunity costs				
Direct effect	1.00	$9,890	$20,498	$57,275
Indirect effect	0.20	($3,879)	($1,448)	$3,622
Induced effect	0.30	$7,739	$13,715	$23,684
Total effect	1.50	$3,860	$32,765	$84,581
Implied multiplier	1.50	0.39	1.60	1.48
Without opportunity costs				
Direct effect	1.00	$9,890	$20,498	$57,275
Indirect effect	0.20	$11,294	$16,245	$26,501
Induced effect	0.30	$12,134	$21,497	$37,124
Total effect	1.50	$23,428	$58,240	$120,900
Implied multiplier	1.50	2.37	2.84	2.11

Discussion and Conclusion

In this paper, we show how to use the approach outlined in the USDA's Local Food Economics Toolkit to estimate the regional economic impacts of local food procurement by schools by using two case studies. Using primary and secondary data to modify an input-output model, our findings have important implications for future research into the economic impact assessments of farm-to-school procurement.

We conducted a thorough review of previously conducted economic impact studies of farm-to-school local food procurement, highlighting significant differences and inconsistencies in approach and rigor. We designed a customized approach for data collection and modeling and used it to elaborate on our understanding of how school districts procure local foods using two case studies: Minneapolis Public Schools and the state of Georgia. This study illustrated an approach utilizing primary and secondary data to determine reasonable definitions of regions for analysis, the size of the farm-to-school sector, modification of the expenditure functions of farms selling to schools, and appropriate shocks. Acknowledging the limitations of our small sample sizes for both sites, the study found that the multiplier impacts for the farm-to-school farm sector are larger than the more traditional fruit and vegetable farm sectors, indicating that farm-to-school farms purchase more inputs from the local economy per unit of output, which results in positive local economic impacts. The Minneapolis and Georgia case studies had multipliers of 1.45 and 1.48, respectively, in line with previous farm-to-school economic assessments. Yet, it should be noted that shifting sales from intermediated to direct, may result in large opportunities costs that need to be accounted for.

As part of this study, we developed a widely adaptable survey protocol for future studies and illustrated how to map survey responses to IMPLAN sector categories. As far as we know, this is the first study to more accurately characterize the farm-to-school production sector using primary data, taking into account the supply chain through which schools procure local products. The survey instrument is a valuable first step for communities, school districts, and others interested in evaluating the economic impacts of farm-to-school procurement and is available on the National Farm to School Network's website.

However, in this study researchers encountered a significant challenge in the implementation of the survey protocol, which is worth discussing. Lead researchers sought to enroll volunteer enumerators with strong relationships with producers to allay any potential concerns about participating in the survey. But we were not able to provide financial compensation for their time in the surveying effort. Without this and/or buy-in from their supervisors, volunteers had little incentive to invest the time and effort necessary to conduct this type of primary data collection. For future studies, we recommend that enumerators be compensated for survey implementation. If not, surveys should be conducted in communities where the research team already has strong relationships with producers in order to elicit prompt and complete responses. If this barrier is appropriately addressed, farm-to-school stakeholders across the country can begin to use this survey tool to collect standardized data that would allow for comparisons across geography of both the farm-to-school farm expenditure profile as well as the percent of sales that are traveling direct from producers versus through intermediaries.

Through the primary data collection for this study, we found that in both case study areas, at least 50% of the school's local food purchases were through an intermediary. This poses new challenges for those seeking to measure the economic impact of farm-to-school procurement. The first challenge is around finding producers who sell to schools. As reported in the Farm to School Census, 65% of schools report purchasing at least some of their local food products through intermediaries, and thus producers may not know if their product is ending up in schools. This additional step in the supply chain may also reduce transparency for the schools, as encapsulated by a foodservice director's response to the 2013–2014 USDA Farm to School Census: "We have a management company, not sure who they purchase from" (USDA FNS, 2015). Furthermore, for many actors on either end of the supply chain, keeping records is onerous. As one foodservice director put it, "I don't keep separate records for local foods and couldn't imagine how I would go back to get this info. My guess isn't close to being accurate, so shouldn't be used at all. If you want this info, you should ask us to set up a system in advance" (USDA FNS, 2015). Some regions are considering developing their own inventory management tools so that schools have a better sense of the total value of their local food purchases as well as their different sources. There are also discussions underway for including questions related to the changing structure of the farm-to-school supply chain in the next Farm to School Census.

It is important to note that although implementing local food procurement programs in schools may create new market opportunities for some farms, it also displaces non–farm-to-school product purchases by schools, potentially negatively impacting other producers as well as intermediaries. These opportunity costs need to be accounted for in rigorous economic impact assessments. Further, the opportunity costs may have important consequences when considering the stated goals of farm-to-school programs. If, for example, the goal of farm-to-school procurement is to strengthen local and regional economies, then the findings herein could suggest that there is an advantage to sourcing through intermediaries. However, if the goal of farm-to-school procurement is to increase the economic viability of small and medium-sized producers, further investigation is needed into the relationship between farm profitability and supply-chain structure.

Economic impact data is valuable in engaging new and diverse stakeholders in farm-to-school initiatives, but may not be appropriate in all settings. The expansion of local and regional food markets has brought with it an increased interest in quantifying the extent to which these programs, including farm-to-school, contribute to economic development (O'Hara & Pirog, 2013). Community and economic developers often employ multipliers to quickly and succinctly communicate the impact of these programs, but the emphasis on brevity may oversimplify the complexity of these systems. Further, advocates for local food systems may be tempted to present larger-than-accurate multipliers to overstate the economic impact of local foods systems. Those using the tools presented in this paper should, as Deller et al. (2017) suggest, proceed with caution. Collecting sufficient data to conduct credible modification of IMPLAN and adequately account for potential opportunity costs are difficult (Conner et al., 2016; Deller et al., 2017).

Growing evidence on the potential positive community economic impacts resulting from farm-to-school procurement creates an opportunity to increase the engagement of farmers and farm-focused organizations. Economic data is also valuable in speaking to federal, state, and local agencies, as well as private investors and philanthropic entities. Positive economic outcomes offer justification and support for investment in local food purchasing and infrastructure that facilitates increased spending on local food. Both community-level infrastructure (e.g., aggregation and processing facilities, transportation) and school- or district-level infrastructure (e.g., equipment and capacity for processing and production) must be in place for local procurement to be feasible and sustainable. Both public and private investments in infrastructure are vital for local procurement opportunities to grow to scale and achieve the economic impact and viability demonstrated in the two case studies highlighted in this paper.

The economic impacts of farm-to-school procurement will continue to be a topic of interest for researchers, farm-to-school stakeholders, and policy-makers, and the authors hope that this study has sparked a deeper understanding of their challenges and opportunities. The preliminary results from the two case studies strengthen the call for those farm-to-school stakeholders with strong relationships to local producers to use the USDA Toolkit to conduct additional assessments evaluating the economic impacts of farm-to-school procurement, so that we may compare case studies in different locations, involving different commodities, scales, and numbers of producers, and relying on different supply chains. The survey protocol and methodology can support more rigorous and comparable economic impact assessments of farm-to-school procurement moving forward, and thus fill an important gap in knowledge and open new opportunities for farm-to-school implementation and advocacy.

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Appendix. Farmer Survey Protocol

Q1.1 Survey enumerator name: ____

Q1.2 The National Farm School Network (NFSN) is collaborating with researchers from Colorado State University (CSU) to conduct a study of the economic impact of farm to school programs. The research aims to understand how selling to the school food market impacts farm sales and profitability. During this survey, we will ask you questions to better understand the nature of your business and any changes you might have made since selling to schools. We do not anticipate any risks from participating in this research. No farm specific information will be shared with anyone outside of the Colorado State University-led research team without your permission. We will hold all information about your farm in strict confidence. The information will only be released in an aggregated format where individual farm information cannot be identified. We may quote your responses to open-ended questions, but your identity will not be associated with any quotes. Please be assured that we are committed to the strictest standards of confidentiality. If you have any questions, please feel free to call or email the Principal Investigator or Project Manager at any time.

If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) for Human Participants at 970-491-1553 or access their website at https://vprnet.research.colostate.edu/RICRO/irb/.

Q1.3 If you agree to participate in the study, please provide your name, farm name, telephone, email below and zip code where your primary farm is located.

- Name (1)
- Farm (2)
- Phone (3)
- Email (4)
- Zip code where your primary farm is located (5)

Q2.1 Why did you/your farm decide to sell product to schools?

Q2.2 What impact(s) has selling to schools had on your business?

Q3.1 What is the name of the school district(s) to which you sell products? Please include city and state.

- District 1 (1)
- District 2 (2)
- District 3 (3)
- District 4 (4)
- District 5 (5)
- District 6 (6)
- District 7 (7)

Q3.2 In what year did you start selling to schools (e.g., k-12, preschool, early care and education facility, etc.)?

- Year (1)

Q3.3 In 2016, which of the following products did you produce on your farm? Please check all that apply.

- ☐ Fruit (1)
- ☐ Vegetable (2)
- ☐ Dairy (3)
- ☐ Grain (4)
- ☐ Beef (5)
- ☐ Hogs, pigs, sheep, goats, other livestock (meat or dairy), honey (6)
- ☐ Chickens, broilers, turkey, duck, and eggs (7)
- ☐ Other (8) ____________________

Q3.4 In 2016, did your farm utilize any season extension techniques (e.g., greenhouse, high-tunnels, hoop-house, etc.)?

- ○ Yes (1) ____________________
- ○ No (2) ____________________

Display This Question [Q3.5]:
If "yes" is selected.

Q3.5 Do you sell these products to schools? In other words, did participation in farm to school stimulate interest in or ability to utilize season extension techniques?

- ○ Yes (1) ___________________
- ○ No (2) ____________________

Q3.6 How many acres did you cultivate:

- When you started selling to schools: (1)
- In 2016: (2)

Q3.7 Did participation in farm to school stimulate changes in the amount of cultivated acreage?

- ○ Yes (1) ____________________
- ○ No (2) ____________________

Q3.8 Which of the following farm to school activities did you engage in during 2016?

- ☐ Sold locally produced foods to be served in the cafeteria. (1)
- ☐ Participated in farmer in the classroom sessions/cooking demonstrations of locally produced foods in the cafeteria, classroom or other school-related setting (2)
- ☐ Hosted student field trips to your farm/business (3)
- ☐ Provided school with marketing/promotional materials about your farm (4)
- ☐ Donated product to school for sample or tasting for free or at a reduced price (5)
- ☐ Worked with school/district staff to develop a specific food product using local foods (6)
- ☐ Were there any I did not mention (please specify): (7) ____________________

Display This Question [Q3.9]:
If "Participated in farmer in the classroom sessions/cooking demonstrations of locally produced foods in the cafeteria, classroom or other school-related setting" "Hosted student field trips to your farm/business" is selected

Q3.9 Which (if any) of the below themes did you cover with the students as part of your classroom and/or field trip engagement?

- ☐ Life on a farm (1)
- ☐ Lessons on specific produce (what is this? why is it good for me?) (2)
- ☐ How food gets from the farm to the plate (3)
- ☐ The importance of farms to the environment (4)
- ☐ Were there any I did not mention (please specify): (5) ____________________

Q4.1 What percent of your 2016 farm sales came from each of the sales channels listed below? (total must equal 100)

- ______ Direct to farm to school (including k-12 and pre-k/early care and education sites) (1)
- ______ Direct to individual consumer (e.g., farmers' market; on-farm store or farm stand; CSA; online market place; pick your own) (2)
- ______ Intermediated market (e.g., supermarket or super center; restaurant or caterer; other retail store; local or regional food processor or food maker; or local or regional aggregator, distributor, food hub, or broker) (3)
- ______ Institution (e.g., college or university; hospital) (4)
- ______ Wholesale marketplace for commodities not identified by source (auction, wholesale or terminal market, etc). (5)

Q4.2 Specifically, which of the following markets did your farm or ranch use in 2016? (please check all that apply)

- ☐ Direct to k-12 schools (1)
- ☐ Direct to preschool or early care and education facilities (2)
- ☐ Farmers' markets (3)
- ☐ On-farm store or farm stands (4)
- ☐ Community Supported Agriculture (CSA) (5)
- ☐ Online market place (6)
- ☐ Pick Your Own (7)
- ☐ Supermarkets or supercenters (8)
- ☐ Restaurants or caterers (9)
- ☐ Other retail stores (independently owned grocery store, food cooperative, small food store, corner store, etc.) (10)
- ☐ Local or regional food processors or food manufacturers (11)
- ☐ Distributors (12)
- ☐ Food buying cooperatives (13)
- ☐ Food hubs (14)
- ☐ Food service management companies (15)

- ☐ DoD Fresh Program Vendors (16)
- ☐ USDA Foods (17)
- ☐ State farm to school program office (18)
- ☐ Colleges or universities (19)
- ☐ Hospitals (20)
- ☐ Other institutions (corporate cafeteria, prison, food bank, senior care facility, etc.) (21)
- ☐ Wholesale marketplaces for commodities not identified by source (auction, wholesale or terminal market, etc). (22)

Q4.3 Does any of the product you sell through intermediaries end up at schools? If yes, what percent of your total intermediated sales goes to schools?

- ○ Yes (1) ____________________
- ○ No (2) ____________________
- ○ Don't know (3) ____________________

Q4.4 Please tell us a bit more about your 2015 sales.

- TOTAL 2015 Sales (including all sales) (1)
- 2015 sales to schools (k-12 or pre-school) (2)

Q4.5 What was your level of satisfaction (very unsatisfied, unsatisfied, neutral, satisfied, or very satisfied) with the following aspects of your farm to school sales?

	very unsatisfied (1)	unsatisfied (2)	neutral (3)	satisfied (4)	very satisfied (5)
Prices paid (1)	○	○	○	○	○
Volume of sales (2)	○	○	○	○	○
Ordering reliability (3)	○	○	○	○	○
Time commitment (4)	○	○	○	○	○
Delivery requirements (6)	○	○	○	○	○
Delivery logistics (5)	○	○	○	○	○
Reliable payment (7)	○	○	○	○	○
Ease of communication with schools (9)	○	○	○	○	○
Overall profitability (8)	○	○	○	○	○

Q4.6 When your farm started to sell to schools, how did it affect your production for and/or sales to other markets? (please check all that apply)

- ☐ We increased production to accommodate school sales (1)
- ☐ We decreased sales to one or multiple direct markets (e.g., farmers' markets, CSA, farm stand, etc.) (2)
- ☐ We lacked adequate market access for our firsts (e.g., highest quality products) before selling to schools (3)
- ☐ We lacked adequate market access for our seconds (e.g., farm to school create an opportunity to sell our seconds/imperfect products) before selling to schools (4)
- ☐ We were a new/beginning farm without pre-existing markets when we started selling to schools (5)
- ☐ We started selling at schools so long ago that I can't remember (6)
- ☐ Other (7) ____

Q4.7 Do you plan to continue selling to schools in the future?

- ○ Yes (1) ____________________
- ○ Maybe/Unsure (2) ____________________
- ○ No (3) ____________________

Q5.1 What were your total farm product sales and operating expenses for 2016 (January 1-December 31).

- Total farm product sales (1)
- Total farm operating expenses (2)

Q5.2 In 2016, approximately what percent of your farm or ranch's total expenditures were devoted to the following categories? (the sum of these expenses should not equal more than 100%)

______ Labor (according to the USDA the average labor expenses were 12% of total expenses) (1)

______ Fertilizers and chemicals (average expenses were 11%) (2)

______ Maintenance and repair (average expenses were 14%) (3)

______ Fuel and oil (average expenses were 12%) (4)

______ Rent and utilities (average expenses were 9%) (5)

______ Seeds and plants (average expenses were 8%) (6)

Q6.1 Thank you for your participation in this research!

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

Communicating economic impact assessments: How research results influence decision-maker attitudes toward the local food sector

Special JAFSCD Issue
Economics of Local Food Systems: Utilization of USDA AMS Toolkit Principles
Sponsored by

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Submitted March 27, 2018 / Revised June 1, July 5, and August 7, 2018 / Accepted August 9, 2018 / Published online December 20, 2018

Citation: Rahe, M. L., Van Dis, K., & Gwin, L. (2019). Communicating economic impact assessments: How research results influence decision-maker attitudes toward the local food sector. *Journal of Agriculture, Food Systems, and Community Development*, *8*(Suppl. 3), 95–105. https://doi.org/10.5304/jafscd.2019.08C.004 p

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Abstract
The local food sector continues to evolve as consumer preferences for economic, environmental, and social values create markets for a range of products. Although measuring the economic impact of these complex systems can provide new insights, it remains challenging. This paper provides evidence of the effectiveness of presenting economic impact results to decision-makers as a way to increase public-sector interest in developing a small and growing local food system. Surveys of local leaders and statewide service providers indicate that most local decision-makers who were presented with the economic impact results say they are now more supportive of local food system development, especially in rural areas. In this region, both producing the economic impact study and pursuing a strategy for communicating the results of this study have promoted thinking about the potential of local food production in new ways and have informed conversations with policy-makers.

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Funding Disclosure
This study was supported by funding from the Ford Family Foundation in Roseburg, Oregon.

Keywords
Economic Impact Assessment, Economic Multipliers, Local Food Producers, USDA Local Food Systems Toolkit

Introduction and Literature Review

The continued growth and long-term viability of local food systems depend on public and private investment of financial, political, and social capital. In pursuit of this investment, food system practitioners increasingly are identifying ways to measure and communicate the multifaceted benefits of local food systems (Brown, Goetz, Ahearn, & Chyi-lyi, 2013; Lev, Brewer, & Stephenson, 2003; Sharp, Clark, Davis, Smith, & McCutcheon, 2011). Economic impact in particular is thought to be a critical and convincing metric. While this is relatively easy to measure compared to other impacts of food systems, there is still tension and confusion about how to measure it accurately. Furthermore, economic impact assessments have little impact themselves if results are not effectively communicated to decision-makers (Druker, 2015). Little research has focused on the effectiveness of communicating these results to decision-makers.

Economic input-output studies are commonly used to estimate how jobs and sales in one part of the economy are connected to jobs and sales in other parts of the economy. All of this related economic activity can be measured as the "economic impact," which also produces various multipliers that compare activity in one sector to related activity in the rest of the economy. A local food system is a unique economic activity because it is not well measured by existing data sources and has no standard definition. To address these modeling challenges, the Agricultural Marketing Service of the U.S. Department of Agriculture (USDA AMS) created an Economic Impact Toolkit (Thilmany McFadden et al., 2016). Conner, Becot, and Imrie (2016) provide an overview of the Toolkit's seven modules. Hughes (2003) explains economic input-output studies, their policy uses, and their limitations to practitioners. A collection of published input-output studies that model the economic impacts of many different aspects of local food systems can be found at the website https://localfoodeconomics.com/.

Even with the Toolkit, estimating the economic impact of the local food sector requires careful consideration of the local economy and the economic activity being modeled (Bauman & Thilmany McFadden, 2017). These limitations are both encouraging the development of alternative measures and methods for estimating local food system impacts (Miller et al., 2015; Watson, Cooke, Kay, Alward, & Morales, 2017) and informing the ongoing efforts of the USDA AMS, which released a simplified tool for estimating economic impact, the Local Food Impact Calculator, in January 2018.

In this paper, we first briefly describe the Central Oregon region and the economic impact assessment of local food producers completed as a partnership between Oregon State University Extension, the Central Oregon Intergovernmental Council, and the High Desert Food and Farm Alliance. The primary contribution of our paper is a study of the effectiveness of presenting economic impact results to regional and statewide audiences. The purpose of our presentations was to increase public-sector interest in supporting local food system development. In our methods and results sections, we describe the survey we used to collect audience reactions and changes in attitudes. In our discussion section, we reflect on divergent views among the attitude changes we documented and the study's limitations.

Central Oregon and the Economic Impact Assessment in Brief

For the economic impact assessment, we focused on small to midsized local food producers, both crop and livestock, who primarily, but not exclusively, marketed their products within Central Oregon. In this section we describe the agriculture and local food sector within the Central Oregon region, briefly summarize our approach to conducting the economic impact assessment, and describe our primary economic impact results.

Agriculture and the Local Food Sector in the Three County Region of Central Oregon

Central Oregon is a region nearly the size of New Hampshire, located on a high desert plateau on the east side of the Cascade Mountain range. This mountain range separates the region from the

Willamette Valley, which holds the majority of the state's population. Containing Crook, Deschutes, and Jefferson counties, the region has high altitudes, an average rainfall of 11 inches (28 cm), and a four-season climate with a short outdoor growing season that ranges from 60 to 120 days, depending on elevation (Detweiler, Douville, Kemp, & Stephan, 2015). Most farms and ranches in the region, similar to farms statewide, are small in size, have low total sales, and market only a small portion of their products through direct channels.

The 2012 USDA Agricultural Census reported that there were 2,308 farms in the three-county region in 2012; 24% were 1–9 acres (0.4–3.6 hectare), and an additional 41% of all farms were 10–49 acres (4.1–19.8 hectare) (USDA National Agricultural Statistics Service, 2014). Eighty-two percent of all farms earned less than US$25,000 in annual gross sales. The region's most valuable agricultural products, by sales revenue, were cattle and calves, and hay. The region has experienced growth in the number of farms producing vegetables, melons, and potatoes; berries; and fruit and nuts. Sixteen percent of farms in the region engaged in direct marketing compared to 19% statewide, and per-farm sales of these direct-marketing farms, averaging US$3,319, was about half the state average.

The Central Oregon region has lagged in local food production compared to the Willamette Valley and Southern Oregon regions, largely due to the difficult growing conditions. Deschutes County contains the city of Bend, the nation's sixth fastest-growing metropolitan area, with a population of 94,520 people in 2017. This city anchors the three-county region and has provided an important source of demand in a largely rural area. Each of the two neighboring counties, Crook and Jefferson, has approximately 20,000 residents (see Figure 1).

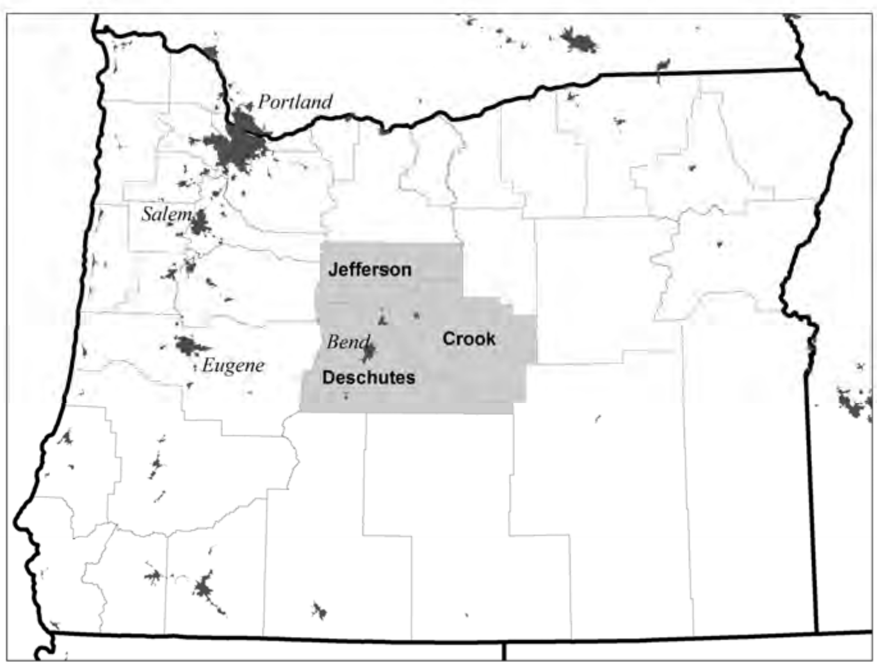
In this context of growth—both the city's population and the number of potential local food producers—two organizations, the Central Oregon Intergovernmental Council (COIC), a council of governments for the region, and the High Desert Food and Farm Alliance (HDFFA), a nonprofit, work with a network of farmers and ranchers to develop the local food sector's capacity. Through these efforts, COIC and HDFFA identified the need to document the sector's economic impact and partnered with the Oregon State University (OSU) Extension Service to conduct the economic impact analysis.

Economic Impact Assessment

Working together, staff from the three organizations used the USDA Toolkit to design an economic impact study with the following parameters:

- Assess the impact of local food system producers using primary survey data;
- Analyze the impact of two types of local

Figure 1. Central Oregon Counties and the City of Bend Shown within the State of Oregon



food farms: crop-focused and livestock-focused;
- Measure current direct impact (using 2014 Schedule F tax form data);
- Create two scenarios of potential future impact that considered resource constraints and opportunity costs; and
- Use this study to pilot the use of the Toolkit in Oregon and evaluate the value of these studies for other regions of the state.

This study is similar to and was modeled after two other recent analyses that focused on estimating the economic impact of local food producers and used surveys to collect expenditure data from producers. Unlike this study, both of the previous efforts focused on mature local food systems: one in a three-county region of California (Hardesty et al., 2016) and one in a multicounty study in the state of New York (Jablonski, Schmit, & Kay, 2016). This study of Central Oregon also analyzed expanding the local food system by adding a food hub following the methodology in Jablonski et al. (2016) using the expenditures of an average U.S. food hub (Hardy et al., 2016). The methods, processes, and results of the Central Oregon economic impact assessment are described in detail in the final report (Rahe, Van Dis, Weiland, & Gwin, 2017).

Using 2015 data, the Central Oregon analysis found that local food producers have a direct impact of supporting 28 full- and part-time jobs, and generating US$1.5 million in sales and US$248,000 in wages and salaries from their farm operations. The purchases made by local food producers supported an additional 7 jobs, US$173,500 in labor income, and US$679,000 in sales across the broader economy (indirect effects). A final level of economic activity associated with local food producers can be calculated from the household spending of earnings and profit from farmers, farmworkers, and the owners and workers in businesses that supply farmers (induced effects). A portion of these activities generate additional economic impact when households buy goods and services within the region. An additional 4 jobs, US$148,000 in labor income, and US$444,000 of sales are supported by the household spending of wages and profits from local food producers and their input suppliers. This estimate is likely conservative for three reasons: we were unable to survey all producers, more than one-third of all producers were planning to expand their operations, and we removed all capital expenditures from the model. It is important to note, however, that local foods are a small part of this region's economy. In total, the input-output modeling software IMPLAN estimates that the three-county region generates US$8.2 billion in gross regional product and 114,060 full- and part-time jobs.

Methods

Once the economic impact estimates were complete, COIC and HDFFA worked with Rural Development Initiatives, a statewide nonprofit, to develop a communication strategy that integrated the economic impact results with prior research on a regional food hub. This communication strategy included a factsheet highlighting the study's results, a presentation, and a press release that resulted in the publication of an article in the region's main newspaper (Ditzler, 2017). Additionally, COIC organized a series of meetings with the region's most influential local leaders and a group of statewide service providers to present the study's findings.

We explored our central research question, "How does the presentation of a local food system's economic impact results change the attitudes of elected officials and statewide service providers?" by collecting surveys at the end of each presentation for a qualitative study. OSU Extension faculty designed a survey containing both five-point ordinal Likert-scale questions and open-ended questions to produce a descriptive analysis. We deliberately kept our survey short to encourage completion rates, although this limited the depth of information collected. Because of our purposive survey sample design, the selection of our small target audience was intentional. This audience consisted of rural and urban elected officials within the region as well as statewide service providers. These methods allowed us to explore how economic impact assessment results could influence attitudes toward Central Oregon's local food system and provide some insight into the value and effectiveness of replicating this study in other regions of Oregon. Next, we describe our audiences, survey instruments, and response rates.

COIC staff presented the economic impact study to five different audiences, totaling 34 people. The selection of these audiences was a purposive sampling strategy, which sought to reach people COIC thought could take action most directly after hearing the results. Twenty-three people, or 68% of all audience members, returned surveys after presentations (see Table 1). The communication strategy targeted public decision-makers within the region, including the three elected county commissioners and some staff of each county, and the City of Bend Economic Development Advisory Board, which includes the business owners of major industries and economic developers for the region's largest urban area. For this strategy, we also convened a meeting with Regional Solutions, a state government agency with offices across the state that connect local projects to state resources. This meeting included local staff of the agency as well as the staff of invited state agencies, including both the Oregon Department of Agriculture and Business Oregon, the state's economic development agency. In our results, we separate these audiences into staff of state agencies, decision-makers for primarily rural areas (Crook and Jefferson counties), and decision-makers for primarily urban areas (Deschutes County and the city of Bend).

COIC and HDFFA first concentrated on scheduling meetings with the regions' most influential, elected leaders with resources to invest in publicly supported economic development. This three-county region also includes seven other incorporated cities, six of which have populations of fewer than 10,000 people. By not focusing on these smaller cities, our results best describe the perceptions of individuals whose jobs require them to think about economic development for the state, for both rural and urban counties, and a major urban area in the region.

All audiences received a one-hour, in-person presentation from COIC staff. Paper surveys were distributed at the end of the meeting as the COIC staff members left, allowing audience members to complete the survey in the room or later. These surveys were anonymous and collected limited personally identifiable information in an effort to encourage response. They were then collected by the staff of the respective organizations, scanned, and returned to COIC within one to two days after each presentation.

The presentations to each audience focused on the results of the study, with an emphasis on how these results fit with prior studies in order to prompt discussion about the potential of creating a regional food hub. The survey included seven questions to address the following three topics:

1. How did the study's findings change your support for local food systems?
2. What was the most important information you took from the presentation?
3. What next steps should occur now that the study is finished?

The survey and other information about the study can be accessed online.[1]

Table 1. Survey Audiences and Response Rates

Date of Presentation	Description	Rural, Urban, or State Agency	Total *N*	Returned Surveys	Response Rate
2/28/2018	Deschutes County	Urban	10	4	40%
2/5/2018	City of Bend	Urban	8	3	38%
2/1/2018	Regional Solutions	State Agency	5	5	100%
1/24/2018	Jefferson County	Rural	7	7	100%
1/17/2018	Crook County	Rural	4	4	100%
Total			34	23	68%

We asked additional questions to control for beginning levels of support and knowledge of local food systems and economic impact analysis. These questions also allowed us to understand how predisposed participants were to positively receiving these results.

COIC was designated as a

[1] https://centerforsmallfarms.oregonstate.edu/communityfoodsystems

Council of Governments in 1972 and has a staff of approximately 100 people with an appointed board of directors, including elected officials of member city and county governments, private business owners, and representatives from Chambers of Commerce. Katrina Van Dis has worked on various local food efforts through COIC for 10 years, and COIC's efforts in this area are somewhat known within the region, although the agency has many other and larger priorities. Although Van Dis does not have personal relationships with any of the local decision-makers, she has appeared before some of them to present other local food research as well as non-local food projects. Neither OSU faculty members (Mallory Rahe or Lauren Gwin) has previously engaged with any of the local decision-makers in the region.

The presence of some minimal prior relationships between COIC and local leaders could partially skew our ability to objectively survey these audiences. Though there may have been prior contact between COIC and local leaders, COIC still felt it necessary to include an explanation of a food system during the presentation because the agency does not do a large amount of work on the topic.

Results

Prior Inclination to Support Local Foods and Prior Knowledge of IMPLAN

Before hearing the presentation, audience members indicated that they were either likely to support or were undecided if they would support expanding the local food system in Central Oregon (see Figure 2). The level of prior support for local foods did not markedly differ among rural leaders (Crook and Jefferson counties), urban leaders (Deschutes County and city of Bend) and state agency representatives (Regional Solutions). All audience members had prior knowledge of IMPLAN and economic multipliers, with most indicating they were either very familiar or somewhat familiar. Audiences in more urban areas, Deschutes County and Bend, were most likely to report being very familiar with IMPLAN and economic multipliers.

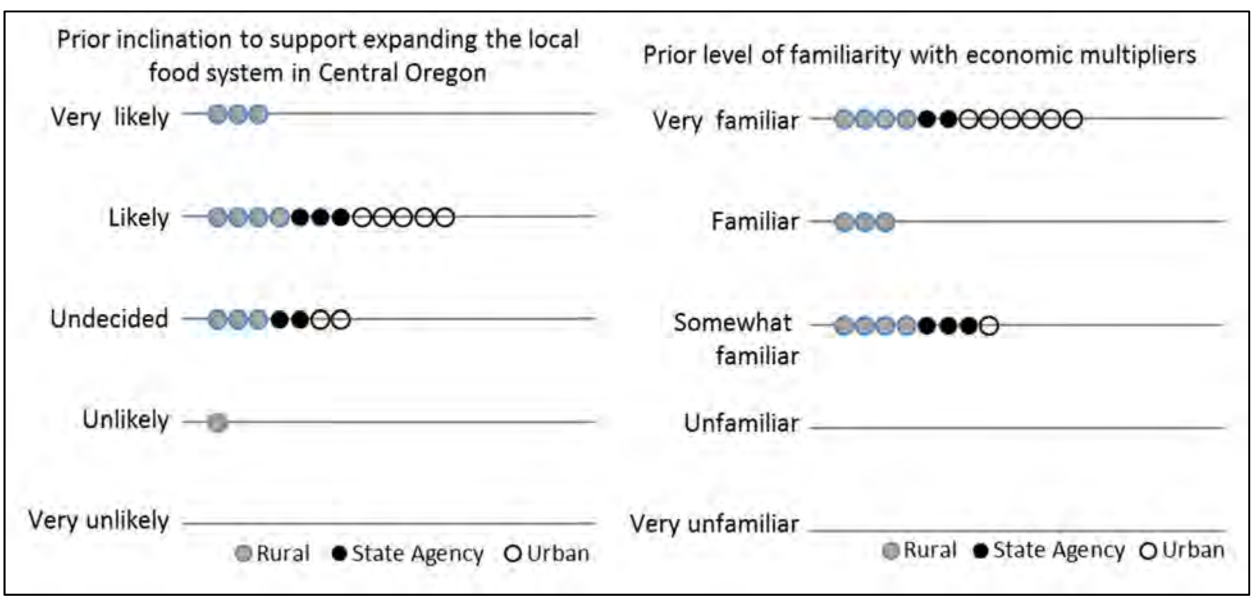
Participant Responses

(1) How did the study findings change reported levels of support for local foods in the region?

Across audiences, participants reported more interest in supporting local food expansion in

Figure 2. Responses to Survey Questions Regarding Expansion of Local Foods and Familiarity with Economic Multipliers

Most respondents held a neutral to favorable inclination toward supporting the expansion of local foods and were familiar with economic multipliers before the presentation.



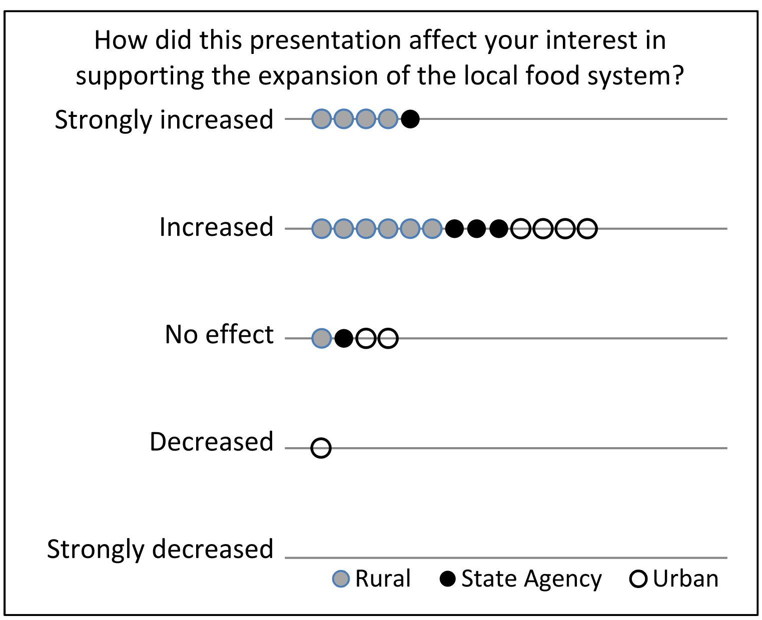
Central Oregon after hearing the study results (see Figure 3). This effect of the presentation was most likely among respondents in rural Crook and Jefferson counties. The study's results did not change the attitudes of four participants, and decreased one participant's interest in supporting the expansion of the local food system. Representatives of three state agencies had a mostly positive reaction to hearing the study's results, as four out of five indicated the results increased their interest in supporting the expansion of the local food system in the region.

(2) What was the most important information participants took from the presentation?

Along with gauging the participants' overall perceptions of the value of the study, we asked all respondents to report the most important thing they heard during the presentation and subsequent discussion through an open-ended question (see Table 2). Participants primarily mentioned the importance of hearing about potential job and economic growth, followed by the importance of gaining new information about the Central Oregon local food system. These comments reflect the focus of the presentations and the fact that the participants were selected because they are positioned to intervene and support, or block support of, public investment in this sector.

Figure 3. Responses to Survey Question Regarding the Presentation's Effect on Interest in Supporting the Local Food System

Most respondents reported hearing the economic impact findings increased their interest in supporting local food systems.



(3) What next steps should occur now that the study is finished?

Across our sample, there was not a strong consensus on what should happen next as local respondents envisioned a range of potential next steps for the region. Fourteen of the 23 people who filled out our survey chose to answer this open-ended question. Four felt that COIC and HDFFA should explore new partnerships in their efforts for expansion. Two said the region should focus on expanding access to local food by making it more widely available. One person made a similar comment about expanding access, but stressed that there should also be focus on equitable access to local foods. Two recommended pursuing value-added options, including building the food hub and investing in local processing capacity. One respondent advocated for additional consumer education of the benefits of buying local food and another respondent suggested pursuing more analysis before making investments in a food hub.

Although most comments were positive, two respondents from urban areas elaborated on their negative views. One respondent reported that the low wages reported in the study confirmed their opinion that commodity agriculture was superior, writing, "I think small farms in Central Oregon are inefficient. Also what about the seed farm in Madras that supplies close to 50% of global carrot seeds? What about hemp? Farmers/ranchers don't only grow things we eat. Sheep farm in Madras provided wool to Olympics." Another respondent said the market—perhaps via a cooperative—should address the gaps in the food system, not the government.

The economic impact assessment for Central Oregon was published in

Table 2. Responses to the Open-ended Survey Question, "What was the most important thing you heard today?"

Potential job and economic growth
Collaboration. Importance of local food and how much money stays local.
The local food stays in the local economy at a much higher rate than exported food.
Central Oregon needs more storage and processing capacity.
Hub details, econ impact, efficiency gains from investment.
Food is being exported. "Support local" needs to be improved.
Opportunity for Jefferson County.
Local food exported out of the area.
Demand is greater than supply.
The potential to invest and add capacity.
Local benefit.
There is more demand than supply.
Gaps in infrastructure exist.
Jobs.
Importance of gaining new information about the Central Oregon local food system
# of farms producing; hub proposal.
Distribution of existing local food products.
Work is being done to help local producers find local markets.
Other comments
Farmers in CO make substantially less than the federal poverty level - 28 people & $248,000 wages.
Interviews and research done.

late 2017, and outreach using the study's results had been underway for six months as of this writing. It will be important to continue tracking the effectiveness of this outreach and what kind of changes, if any, are made by public and private actors. However, our findings suggest that even this initial communication has had a generally positive effect: most local decision-makers indicated on the surveys that they are now more inclined to support local food system development, especially in more rural areas. Central Oregon local food system advocates, led by COIC and HDFFA, are now refining a business plan for a food hub and supporting additional farmer education as they continue to invest in expanding the capacity of the local food system.

State agencies have also responded positively. As a result of hearing about the economic impacts, Business Oregon, the state's economic development department, has committed to working with COIC by joining a steering committee and by helping to identify funding and additional technical expertise for further research on food hubs. The Oregon Department of Agriculture is interested in becoming more connected to local food producers in the region, beginning with providing on-farm food safety workshops in Central Oregon. The Regional Solutions staff in Central Oregon has actively connected COIC to new agencies and grants since the presentation.

We also presented these economic impact results to a network of local food system practitioners and advocates in Oregon. Consequently, two other regions with active local food sectors have expressed interest in pursuing similar studies and are looking for resources to fund the producer interviews and analytical components of the work. In the meantime, practitioners report using the Central Oregon study's results in their own conversations about local food system development as an example of a system "close to home."

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

Discussion

We found the presentation of the results had a stronger and more positive impact among decision-makers in rural counties and the state service providers who work with Regional Solutions. The two urban audiences, Deschutes County and the city of Bend, had lower response rates and responded less positively to the study. Two survey respondents were openly critical of the idea of using public investments to support industry expansion. With just two audiences, our sample of urban decision-makers is small, and while we do not want to overgeneralize from these two responses, it is worthwhile to discuss this opposing viewpoint. This view may be partially explained by differences between the scale of the local food industry and those respondents' prior experiences in economic development. However, the responses of urban audiences also illustrate the ongoing challenges in both collecting accurate data from this industry and exclusively relying on economic impact analysis to justify public investment in the local food sector.

Local foods are not an economic driver of the urbanizing Central Oregon economy and, as a sector, are economically dwarfed by the region's rapidly expanding tourism and construction sectors. Still, where some respondents see only the inefficiencies of local food, others see a small but growing industry that is producing more economic activity than expected.

Furthermore, depending on how the conversation is framed, communicating the results of an economic impact assessment of just one segment of the local food system can be problematic. The total number of jobs, wages, and sales associated with Central Oregon producers were small. COIC and HDFFA built a communication strategy that emphasized the economic impact results from the growth scenarios. Framing the conversation in this way was meant to demonstrate the potential of the industry if additional value chain businesses were in place to support the expansion of small-scale, local production. The presentation included a goal to build a food hub, but did not formally ask for resources. COIC and HDFFA have been analyzing different aspects of the local food system for nearly 10 years and felt that knowing the current and potential economic impacts was necessary to fill a gap in information. In an effort to keep the sessions short and understandable, the presentations largely focused on sharing the economic impacts as well as on providing a thorough definition of a local food system. Based on our initial findings, we suggest that it may be more effective—although more resource-intensive—to garner public investments by presenting a more comprehensive set of impacts for small and growing local food systems. This could entail combining an assessment of economic impacts with evidence of small business development and of health impacts, as well as staying aware of ongoing research into the environmental (Lee, Miller, & Loveridge, 2017) and social benefits of local food systems.

Study Limitations and Areas of Future Research

Both our IMPLAN model and our audience surveys rely on information from a small number of intentionally chosen individuals. Both efforts establish a baseline understanding of the local food system and sentiments about supporting that system. This baseline will be updated with future assessments. The IMPLAN model reflects the business operations of networked and engaged local food producers. These producers are part- and full-time farmers and ranchers who operate businesses with a range of sales in both direct and wholesale markets. It is impossible to know how much of the total local food activity we captured in our data. Furthermore, the audience members for our presentations were not random but were purposefully chosen because of their positions as elected leaders, economic development decision-makers, or resources. We thus chose to present this information to people who would be most likely to take action after learning about this study and its results. Our findings do not indicate how this work would be perceived by other groups and individuals.

Conclusion

After 10 years of efforts to promote and expand the local food system in Central Oregon, COIC and HDFFA decided to partner with OSU Extension to pursue an economic impact assessment. The purpose of this assessment was to broaden the conversation about the local food sector to traditional economic developers and decision-makers in the region. Following a specific communications strategy, we presented the assessment and its findings to 34 decision-makers within the three-county region. In this paper, we reported a descriptive summary of communicating the results of this local food economic impact assessment to decision-makers. This study provided a first look at the value of the assessment to the practitioners and region that requested it.

The estimate of economic impact provided by our study did fill a recognized need for local food stakeholders within the region. The results have value, especially when paired with existing studies, and also speak directly to local decision-makers' concerns and values, such as jobs, wages, and economic growth. The results of a small and developing system, however, have less influence with urban leaders who are more familiar working with major industries.

It is too early to tell whether these results have provided enough additional information to encourage the local investment needed to expand the Central Oregon food system. However, the communication of this assessment has broadened the conversation about local food systems within the region and the state in important ways. COIC and HDFFA have been able to gain the attention of people in key leadership positions and initiate new conversations about the local food system and its potential place in the region's evolving economy.

Acknowledgments

We thank Jess Weiland at the High Desert Food and Farm Alliance for conducting producer interviews for the economic impact analysis, and all of the Central Oregon farmers and ranchers who shared or considered sharing detailed financial information about their farm operations for the IMPLAN model.

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

Assessing a local food system: The Palouse-Clearwater Food Coalition assessment process

Special JAFSCD Issue
Economics of Local Food Systems: Utilization of USDA AMS Toolkit Principles
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Submitted April 3, 2018 / Revised July 20 and August 28, 2018 / Accepted August 28, 2018 / Published online January 9, 2019

Citation: Bauman, A., DePhelps, C., & Thilmany McFadden, D. (2019). Assessing a local food system: The Palouse-Clearwater Food Coalition assessment process. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3), 107–118. https://doi.org/10.5304/jafscd.2019.08C.008

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Abstract

This case study features the Palouse-Clearwater Food Coalition, an alliance of individuals, community organizations, institutions, agencies, nonprofits, and businesses with a shared interest in developing the local food system in southeastern Washington and north central Idaho. The aim of this case study is to demonstrate how a community coalition could utilize the tools in the U.S. Department of Agriculture, Agricultural Marketing Service's economic impact toolkit (Thilmany McFadden et al., 2016) to guide its ongoing local food system assessment efforts and to provide structure and direction to its assessment process. The overall goals of the Coalition's local food economic impact assessment are to (1) make

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Funding Disclosure

We would like to acknowledge the U.S. Department of Agriculture, Agricultural Marketing Service for funding this research through agreement #16-TMMSD-CO-001. Support from the Colorado Ag Experiment Station contributed to this work as well.

meaningful use of existing data and studies; (2) identify gaps in data, then use the methods presented in the Toolkit to fill in critical data gaps to provide a more complete baseline picture of the region; (3) define and communicate what constitutes economic impact to community stakeholders within the construct of a local food system; (4) understand how data and economic impact principles can help identify leverage points in the local food system; and (5) use information about leverage points to strategically acquire and invest resources in food system projects and research that will strengthen the economic viability of the region.

The Moscow Farmers Market economic assessment is an example of how these goals aligned to influence results. This assessment documented the value of the city of Moscow's investment to the Moscow Farmers Market Commission and city council. As a result of this assessment, the city moved the farmers market management out of the city's arts department and funded a full-time community events and farmers market coordinator.

Keywords
Local Foods, Case Study, Economic Impact, USDA Local Foods Toolkit

Introduction

This case study features the Palouse-Clearwater Food Coalition (referred to the Coalition), an alliance of individuals, community organizations, institutions, agencies, nonprofits, and retail businesses with a shared interest in developing the local food system. The Palouse-Clearwater food system encompasses an eight-county region, including parts of southeastern Washington and north central Idaho. The objective of this case study is to demonstrate how a community coalition could utilize the tools presented in the U.S. Department of Agriculture (USDA), Agricultural Marketing Service's (AMS) 2016 publication, *The Economics of Local Food Systems: A Toolkit to Guide Community Discussions, Assessments and Choices* (herein referred to as the Toolkit) to guide its ongoing efforts in assessing its local food system by providing structure and direction to the assessment process.

The Coalition was formed in 2011 with the goal of strengthening the health and vibrancy of the Palouse-Clearwater food system by increasing production, distribution, and consumption of locally grown food and agriculture products. In 2012, the Coalition began working with faculty, students, and Cooperative Extension agents at the University of Idaho, as well as AmeriCorps VISTA members to conduct assessments of their food system. Multiple institutions, including the University of Idaho and the Latah Economic Development Council, provided funding and leadership for the various studies.

While the Coalition and its members have collected extensive data on the food system, the early studies were not under a larger, umbrella assessment with a focus or goal in mind. Given their piecemeal nature, they also do not tell a whole or cohesive story of the food system. The release of the Toolkit in 2016 ushered in changes for these studies. At its release, the Coalition steering committee members discussed how the Toolkit could help them organize existing food system data, provide resources for gathering additional secondary data, and guide the Coalition through the process of conducting a more systematic economic assessment of the food system. Subsequently, the Coalition began using the Toolkit to understand the basic tenets of an economic impact assessment, including how to delineate assessment boundaries, best practices for incorporating primary and secondary data, and selecting key areas of their food system in which to invest resources. Using the Toolkit as a guide, the Coalition set the following overall goals for its current local food economic impact assessment efforts:

1. Make meaningful use of existing data and studies;
2. Identify gaps in data, then use the methods presented in the Toolkit to fill in these critical data gaps to provide a more complete baseline picture of the region;
3. Define and communicate what constitutes economic impact to community stakeholders within the construct of a local food system;
4. Understand how data and economic impact principles can help identify leverage points

in the local food system; and

5. Use that information to strategically acquire and invest resources in food system projects and research that will strengthen the economic viability of the region.

This article begins with background on the Coalition, including the organization's history, profile and current assessment activities. Next, we summarize previous community food assessments conducted by the Coalition and discuss how well they align with the recommendations presented in the Toolkit. The article concludes with a discussion of the Coalition's current work, prerequisites for successful food system assessments, and key next steps for strengthening the Palouse-Clearwater food system.

Organizational History and Profile

The Coalition began in 2011 as a group of University of Idaho Extension professionals and non-profit partners conducting agricultural educational programs and research in Latah County, Idaho. It has since expanded, and now serves a rural, eight-county region that includes parts of southeastern Washington and north central Idaho. The Coalition's members include individuals, community organizations, institutions, agencies, nonprofits, and businesses. Together these individuals and groups share the goal of strengthening the health and vibrancy of the Palouse-Clearwater food system by increasing production, distribution, and consumption of locally grown food and agriculture products.[1] Since its inception, the Coalition's membership has grown its membership to over 100 organizational and individual members from across the eight-county region.

Early on, members of the Coalition realized they were all working to support local, small-scale agriculture and food systems, and that their stakeholders would be better served through a more collaborative and coordinated effort. While the group was in this process of formally organizing, several food system–oriented grants were awarded to organizations in Latah County and neighboring counties, including two grants to conduct a feasibility study for food processing centers located 35 miles apart. With two similar studies underway, the group wanted to collaborate on developing infrastructure that would serve a larger geographic region. The result was the adoption of an expanded geographic scope and regional approach by the Coalition.

The Coalition's steering committee first learned about the Toolkit in spring 2016 and immediately considered it as a guide for its ongoing efforts, particularly for the assessment process. For the remainder of 2016, a portion of each monthly Coalition meeting was devoted to discussions of how to strengthen these assessment efforts. As a result of these discussions, the Coalition decided to use its January 2017 Food Summit as an occasion to educate the community about current food system assessment activities. This summit also included a discussion of how local food can be a driver of economic and community development.

In spring 2017, the Coalition's steering committee—chaired by the newly hired University of Idaho community food systems area extension educator for north Idaho—began reviewing its existing food systems data and, consequently, redirecting assessment efforts. One of the priorities of this project was utilizing the data from previously conducted studies as a baseline for measuring change in the Palouse-Clearwater food system. Under the guidance of the Coalition chair, a half-time intern began using the Toolkit as a guide for collecting additional and updated primary and secondary data on the food system. The purposes of this endeavor were to develop informational graphics that would educate community members and policy-makers about the food system and economic impacts of specific local food businesses and initiatives, and to document how the Palouse-Clearwater food system has changed over time. Additional assessment activities included developing a geolocated map of primary food systems data, case studies on collaborations in the food system, and a newly funded USDA Agriculture and Food Research Initiative (AFRI) research project. This research project used past assessment data to identify a high-priority objective: removing

[1] http://www.pcfoodcoalition.org

constraints to increasing fruit and vegetable production, such as access to land and water, on the Palouse. As an outreach partner on this USDA AFRI research project, the Coalition is now fortunate to be collaborating with University of Idaho faculty from the colleges of Agricultural and Life Sciences, Business and Economics, and Science, a team that is both knowledgeable about and interested in economic impact assessments.

While the Coalition is fiscally sponsored by Rural Roots, Inc., a local nonprofit organization, its food system economic assessment activities are indirectly supported by sources outside of the Coalition's annual budget. Subsequently, one of the main challenges the Coalition faces in its food assessment process is a lack of consistent and coordinated funding. Although the Coalition is very passionate about the food system and committed to conducting a thorough assessment, no one on the Coalition is being funded to conduct the assessment as a sole focus of their employment. While this has been a challenge, the Coalition has effectively leveraged existing resources, particularly those available through the University of Idaho, such as part-time interns, to enable the assessment process to continue.

Previous Assessments

Beginning in 2012, the Coalition began working with faculty, students, and Extension agents at the University of Idaho as well as AmeriCorps VISTA members to conduct more rigorous assessments of their food system. This section describes the strengths and weaknesses of data collected in previous assessments (including secondary and primary data) as well as a detailed discussion of the methods used to conduct an economic impact study. Each of the studies in Table 1 contributed to

Table 1. Previous Assessments Conducted for the Palouse-Clearwater Region

Assessment	Data sources utilized in the study	Comments
Feasibility Study: Latah County Food Innovation and Resource Center (2013)	USDA Economic Research Service, Census of Agriculture, US Bureau of Economic Analysis, IMPLAN, Google Earth, a producer survey, a purchaser survey.	Maps utilized to effectively communicate major differences in arable land that can be found across this diverse region and highlights the need for food systems development strategies that are suited to this diversity.
Direct-to-Consumer Food Markets in the North Central Idaho Health District (2014)	Data sources include Idaho Department of Public Health and Welfare, USDA NASSS Idaho Agricultural Statistics, local economic development associations, US Census Bureau, Idaho Office of Economic Development, city-level comprehensive plans	A combination of local and national level secondary data sources used to tell the story of direct-to-consumer markets in a regional foodshed.
Food Security in the North Central Health District of Idaho (2014)	U.S. Census Bureau's American Community Survey, InfoUSA, USDA's Food Supplemental Nutrition Assistance Program Retailer Locator, GIS data, Stakeholder Surveys	Effectively utilized a combination of primary and secondary data. Results from primary data collection used as a means by which to provide context to the conclusions drawn from secondary data analysis from a local policy standpoint.
Extensive database of food producers, vendors, markets, and organizations including interconnections of who sells to whom	Primary data collected from food producers, vendors, markets, and organizations in the region.	Effectively used network mapping to visualize a database of information.
2016 Report on the Economic Impact of the Moscow Farmers Market	Bureau of Economic Analysis, EMSI, IMPLAN, vendor surveys, community surveys, business surveys.	The report provides a range of estimated economic impacts, utilizing different scenarios and/or assumptions, providing the reader with a range of estimated impacts, effectively incorporates opportunity costs by assuming only a portion of farmers market sales are assumed to be "new" spending in the region.

a better understanding of individual components of the Palouse-Clearwater regional food system, but did not integrate or coordinate with the other efforts listed.

Feasibility Study: Latah County Food Innovation and Resource Center (2013)

The 2013 study conducted by a consulting firm used both primary and secondary data to assess the feasibility of establishing a food innovation and resource center. The report provides secondary data on the study area (including many visualizations of the study area using maps), the agricultural sector in the region, and a market analysis that focuses on demographics and food deserts. One example of a visual representation of the secondary data utilized in the study is a map (Figure 1) that uses the Level IV Ecoregions (U.S. Environmental Protection Agency, n.d.) to define the agriculturally productive (light green) and nonproductive areas (dark green) in the region (outlined in red). This map effectively communicates major differences in arable land that can be found across this diverse region, highlighting the need for food systems development strategies that are suited to this diversity. The map, however, stops short of estimating the supply of various commodities that could be grown, as Swenson (2011) did in the case study highlighted in the Toolkit.

Primary data was collected through a producer survey that targeted food producers, processors, and other sellers, and through a purchaser survey that targeted large-volume buyers. These two surveys aimed to determine the market potential for a food innovation and resource center. The project followed the Toolkit's protocol to contact survey participants first via letters and emails. The letters and emails invited producers and purchasers to attend a regional food hub meeting and informed them they would be receiving an email

Figure 1. Level IV Ecoregions with Significant Growing Capacity

Source: Earth (Manheim Solutions, Inc. & Watson Regional Economic Network, 2013).

asking them to participate in an anonymous survey (if they were a producer) or to participate in an interview (if they were a buyer). Responses to the buyer email survey were poor, and in discussions with peers at food systems meetings, the team learned this was a common challenge across food system assessments. Researchers were able to get a better response by supplementing their initial efforts to reach out by letters or email with phone interviews, resulting in a response of 52 producers and 17 purchaser surveys. Due to both time and resource constraints—a challenge that the Toolkit notes as a common challenge of primary data collection—respondents of the producer survey were not evenly distributed across the region nor across types.

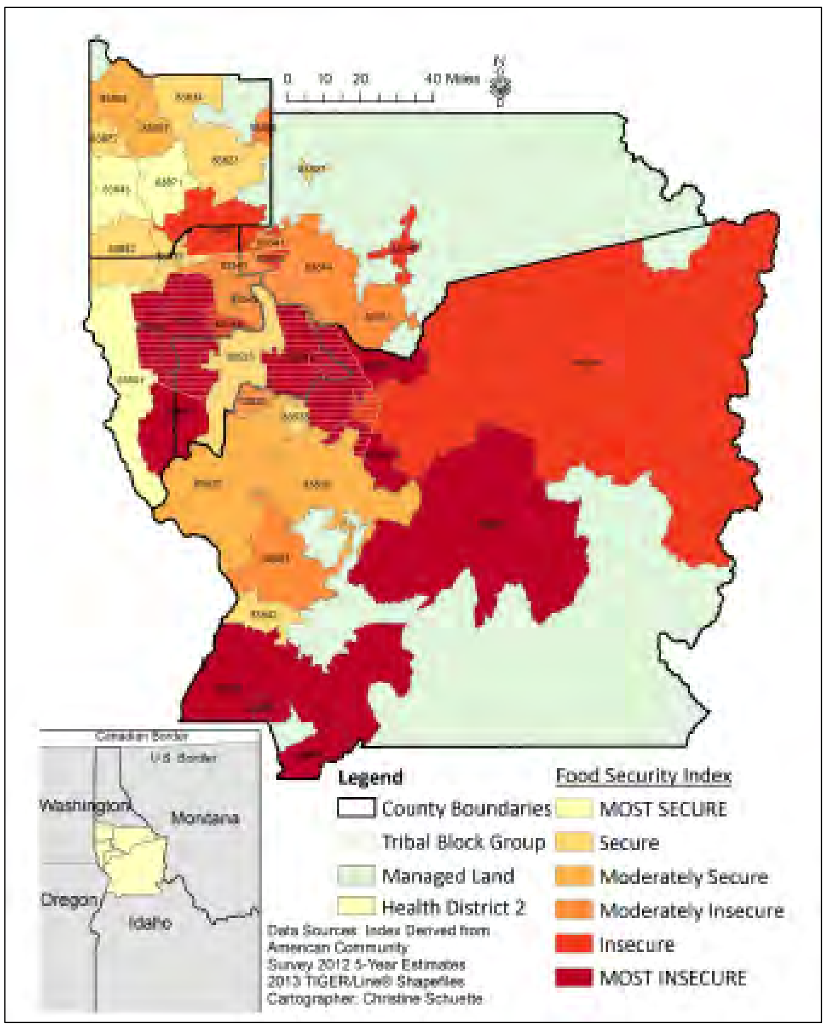
Direct-to-Consumer Food Markets in the North Central Health District of Idaho (2014)

In a 2014 study of direct-to-consumer markets in the region, secondary data was used to describe the natural, human, and cultural capital in the region (Schuette & Merrell, 2014). Data sources included the Idaho Department of Public Health and Welfare, USDA National Agricultural Statistical Service (USDA NASSS), Idaho Agricultural Statistics, local economic development associations, the U.S. Census Bureau, the Idaho Office of Economic Development, and city-level comprehensive plans. Following recommendations of the Toolkit, the study used a combination of local- and national-level secondary data sources to tell the story of their region. Specifically, the national data allowed for a standardized set of measures that enabled the study area to compare itself to other regions. Although they would likely tell the richest story, in many cases local data are not as thorough or inclusive as a researcher may need to understand the "whole picture." So, using all available secondary data from the local level augmented with national-level data where needed is a good way to effectively tell the story of a region, and illustrate where the region varies from the broader U.S., all without having to collect primary data.

Food Security in the North Central Health District of Idaho (2014)

In a 2014 study of food security in the region, a food security index was created at the zip-code level (Figure 2) (Schuette, Laninga, & Merrell, 2014) using data from the U.S. Census Bureau's American Community Survey. The index compiled

Figure 2. Food Security in the North Central Health District of Idaho



Source: Schuette, Laninga & Merrell (2014).

demographic characteristics (population, median age, income, poverty, labor force participation, unemployment rates, health insurance coverage, participation in the Supplemental Nutrition Assistance Program [SNAP, often referred to as food stamps]). To incorporate food access, the study used data from InfoUSA on grocery retail outlets and from the USDA's SNAP Retailer Locator to determine SNAP-approved retail outlets.

In addition to utilizing secondary data, the researchers collected primary data, which assessed stakeholder perceptions of food security in the region and asked both closed- and open-ended questions via online surveys. Stakeholders include members of community-based organizations, the faith community, farmers, processors, distributors, and individuals working in government, health care, and education. The results from primary data collection were used to provide more nuanced local policy context to the conclusions drawn from secondary data analysis.

Extensive Database of Food Producers, Vendors, Markets, and Organizations Including Interconnections of Who Sells to Whom (2013, Current)

The Coalition has also collected primary data to create an extensive database of food producers, vendors, markets, and organizations, along with geographic coordinates for buyers and sellers (Helbling & Hall, 2015). This database was created in 2013 and is being updated through telephone calls, web searches, and physical site visits by the University of Idaho community food systems area extension educator and a part-time intern, as well as through ongoing conversations with Coalition members. The data in this database was originally intended to be used to create a systems graphic of food flow (Figure 3). Completed before the Toolkit was available, this graphic may be overly complex and requires considerable study to understand the magnitude of the food system sectors and processes it represents. It may also have been framed differently if examples from the Toolkit, such as the Maryland food system map in module 3, had been available when it was being created.

2016 Report on the Economic Impact of the Moscow Farmers Market

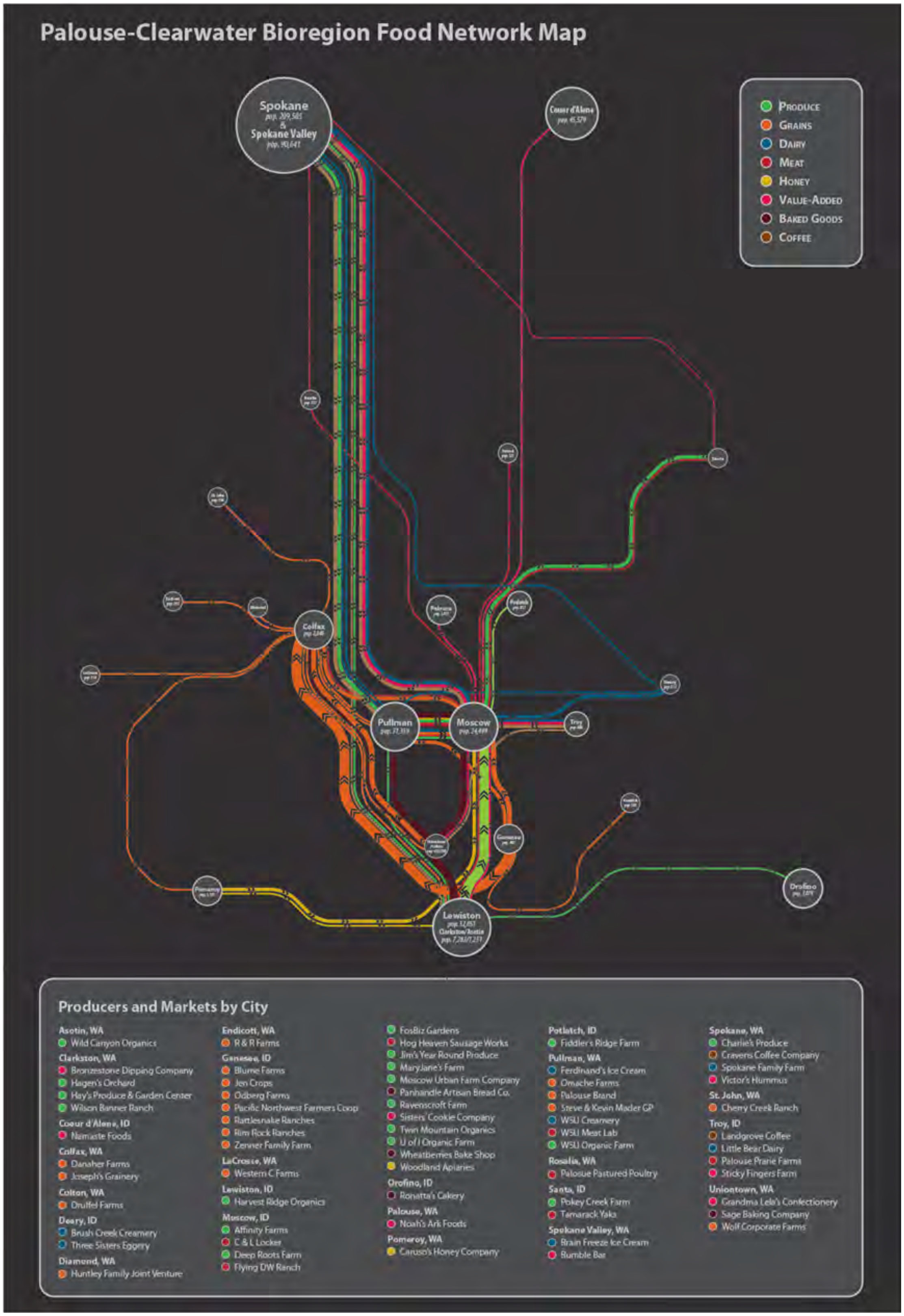
In 2016, the city of Moscow, Idaho, sponsored a study to determine the economic impact of the Moscow Farmers Market (Peterson & Pool, 2016). Secondary data for the analysis was compiled from the Bureau of Economic Analysis, EMSI (a Moscow-based private economic data provider), and IMPLAN (an economic impact data platform). Primary data were collected utilizing three Rapid Market Assessments[2] (RMAs) surveys and three market analyses[3]—a Sticky Economy Evaluation Device (SEED), a Neighborhood Exchange Evaluation Device (NEED), and a Food Environment Evaluation Device (FEED). The RMAs captured customer spending at the Moscow Farmers Market and at downtown businesses adjacent to the market on specific market days using dot surveys. The SEED, NEED, and FEED analyses utilized a combination of in-person interviews, mail surveys, and online surveys to collect data on market sales, customer interests, and market impacts on downtown businesses.

All the data collected on the farmers market were compiled and utilized, in combination with IMPLAN, to conduct the economic impact study. At the community level, the Coalition gained analytical capacity when Steven Peterson from the University of Idaho's College of Business and Economics joined the assessment team, bringing his expertise to estimate the economic impact of specific businesses or initiatives, such as the Moscow Food Co-op and Moscow Farmers Market. The Toolkit's clear explanation of impact analysis helped Coalition members understand and explain Peterson's economic impact results to non-academic and non-economist audiences.

The report provides a range of estimated economic impacts, utilizing different scenarios and assumptions. Because there are often multiple ways to evaluate the economic impacts of a local food system, a scenario approach provides the reader with a range of estimates from which to choose. The first scenario (#1) estimates market economic impacts based on consumer spending as reported

[2] http://smallfarms.oregonstate.edu/sites/default/files/small-farms-tech-report/eesc_1088-e.pdf
[3] http://marketumbrella.org/

Figure 3. Palouse-Clearwater Bioregion Food Network Map



Source: Helbling & Hall (2015).

by vendor surveys. This is the most conservative measure of economic impacts, as vendors typically underreport sales, and the survey data do not include all vendors at the market. The second scenario (#2) estimates the economic impacts generated from brick-and-mortar businesses and other spinoffs that resulted from the existence of the farmers market. In Moscow, the farmers market acts as a business incubator, serving as the starting point for numerous new entrepreneurs in the city. The assumption of this scenario is that without the farmers market, these businesses would not exist, and subsequently, all of their economic activity could be attributed to the Moscow Farmers Market.

The third scenario (#3) estimates market economic impacts based on the RMA and SEED surveys conducted on customers, in which they estimated total spending at the market. Estimates are provided for high and low scenarios because there were differing survey results due to different sampling and collection techniques. The assumption in this scenario is that customer surveys conducted at the market provide a more accurate picture of total spending than do producer surveys.

The final scenario (#4) integrates the economic impact of customer spending that spills over beyond the farmers market vendors to adjacent businesses in downtown Moscow. As was the case in the previous scenario, high and low scenario estimates were provided. Data for this scenario were also generated from RMA and SEED surveys in which farmers market customers were asked if they planned on doing additional shopping or eating downtown that day and, if yes, how much they anticipated spending. Author Peterson made assumptions regarding which sectors received this spending (due to missing data). Predefined margins from IMPLAN were used for all value-added and craft sales, following the Toolkit's best practices.

The Toolkit gives clear advice on how important the geographic scope of the analysis and market area are for providing valid estimates. Peterson's analysis aligned with the Toolkit's advice. Based on survey data, the author assumed that 35% of the market visitors come from outside of Latah County and 15% of market visitors would have spent their money outside the county in the absence of the farmers market (i.e., they would have gone outside the region for shopping trips). These assumptions mean that 50% of the customers that visit the market represent "new" spending in Latah County (and thus are appropriate to include in the economic impact estimate). This is an example of how to account for opportunity costs, as discussed in Chapter 6 of the Toolkit. By assuming that only 50% of farmers market sales can be attributed to the economic impact of the farmers market itself, the authors are careful to consider the fact that many of the shoppers at the Moscow Farmers Market otherwise would have simply spent their money at another retail outlet in Latah County. This would result in a net impact closer to zero than if these were truly new flows into the economic system of the area.

The results presented in Table 2 include direct, indirect, and induced impacts to jobs, wages and salaries, and output from the Moscow Farmers Market for each of the scenarios described above as well as total tax impacts. Total economic impacts when all scenarios are included range from US$3.9 million to US$5.5 million in output (with multipliers ranging from 1.2 to 1.4), 94 to 129 local jobs, and US$290,000 to US$405,000 in taxes generated in the state. The author conducted a robustness check on the reliability of the results by comparing tax results to average tax payments per job in Latah County, based on taxpayer data.

The study provides evidence that the market has a positive impact on the downtown community of Moscow due to direct sales at the market and sales at nearby downtown businesses. Moreover, there is evidence that the market fosters the brick-and-mortar businesses that may develop as a spillover effect of business-to-business activity with market vendors. By including ranges of estimates and utilizing transparent, sound assumptions, this study adopts and highlights one of the Toolkit's best practices. Results from this study documented the value of the city of Moscow's investment in the farmers market to the Moscow Farmers Market Commission and city council, which led to the city moving management of the farmers market out of the city's arts department and funding a full-time community events and farmers market coordinator.

Table 2. Economic Impacts of Moscow Farmers Market (Low and High Estimates), Includes the Direct, Indirect and Induced Impacts

Low Estimate			
Category	Jobs	Wages/Salaries (US$)	Output (US$)
#1: Vendor Expenditures	15	$266,434	$557,787
#2: Brick and Mortar/Spinoffs	54	$944,643	$2,278,578
#3: Visitor Spending Market (Net)	12	$221,977	$518,194
#4: Visitor Spending Downtown	13	$251,538	$585,701
Total	94	$1,684,591	$3,940,260
High Estimate			
Category	Jobs	Wages/Salaries (US$)	Output (US$)
#1: Vendor Expenditures	15	$266,434	$557,787
#2: Brick and Mortar/Spinoffs	54	$944,643	$2,278,578
#3: Visitor Spending Market (Net)	33	$624,164	$1,454,681
#4: Visitor Spending Downtown	26	$503,075	$1,171,401
Total	128	$2,338,316	$5,462,477
Tax Impacts			
	Local (US$)	State (US$)	Total (US$)
Low Scenario	$92,865	$195,164	$288,029
High Scenario	$131,692	$273,343	$405,035

Source: Peterson & Pool, 2016: Note: Across the scenarios, the author uses similar assumptions.

Lessons Learned and Next Steps

While the Coalition has conducted extensive data collection on its food system, previous studies were not coordinated within a larger, umbrella assessment with a specific set of goals. Given the piecemeal nature of the studies, they do not tell a cohesive story of the food system; in short, the sum of all parts is not greater than the whole. Without a systematic process of framing, team-building, defining a unified priority, and goal-setting, the resources secured to assess this region were not effectively invested to build a comprehensive understanding of the Palouse-Clearwater food system and did not result in a unified action plan for further food system development.

When the Toolkit was released in 2016, the Coalition's steering committee discussed how it could help the Coalition better organize its existing food system data, find a greater set of secondary data that could be integrated with the primary findings, and guide the Coalition through a more systematic and rigorous economic assessment of the food system. Utilizing the ideas presented in the Toolkit, the Coalition embarked on an effort to expand its baseline assessment of the local food system. This set the stage for future updates of the economic contributions of specific food system businesses and initiatives, as well as for assessment plans that will use relevant criteria and data to evaluate changes in the Palouse-Clearwater food system. Specifically, the Coalition began using the Toolkit and its basic tenets of an economic impact assessment to evaluate future actions. These include (1) defining and communicating what constitutes economic impact within the construct of a local food system, (2) understanding how economic impact data can help identify leverage points in the local food system, (3) building an understanding of the real and potential economic impacts of local food system components or sectors, and (4) using that information to strategically acquire and invest resources in food system projects and research that will most likely strengthen the economic viability of the region.

As a first step in the Coalition's assessment, members began working together to compile all relevant data from previous assessments for review by the steering committee and key Coalition members. However, changes in Coalition leadership over that period disrupted the momentum on the economic assessment. At the same time, multiple career changes, program redirections, and staff changes in key leadership roles in member organizations have stalled the community process. And although Coalition is fortunate to have a great deal of historical data collected by different groups—especially students in University of Idaho courses and AmeriCorps VISTA members—the quality and context of collected data may limit its value as a true baseline.

As the Coalition's leadership recoalesces, the economic impact study of the Moscow Farmers Market is being updated and an economic impact of the Moscow Food Co-op (Peterson, 2017) is being completed. The Coalition's expectation is that these economic impact assessments on individual components of the food system will help to engage a broader stakeholder group, including city staff, economic development professionals, elected officials, and downtown businesses. If the studies effectively demonstrate the positive economic spillovers associated with these markets, food system development may become a higher priority among community leaders. In turn, more holistic, systemwide assessment and planning may occur. Finally, several other assessments are taking place within the Coalition's region, including a food security assessment in Whitman and Latah counties, a Nez Perce Tribal food sovereignty assessment, and a newly funded AFRI small farms research project. As in the past, there is no cohesive coordination among these studies.

The Coalition's initial interest in how to use the Toolkit to make use of the existing data and then to move forward in understanding change in the Palouse-Clearwater food system over the past 5 to 6 years has only been partially effective. However, lessons learned through this process improve the Coalition's chances for future coordination and integration of regional assessment efforts. In the process of using the Toolkit to assess its past studies, the Coalition has clarified its goals for assessing economic impact and gained a deeper understanding of the need for systematic planning and assessment processes. The Coalition's goals of making meaningful use of existing data and studies and comparing existing, baseline data with the 2017 Census of Agriculture data that will be available soon may provide an opportunity for the team to reassemble and rebuild momentum. Yet some challenges remain. To be successful in creating a comprehensive understanding of the Palouse-Clearwater food system, the Coalition will need to find committed leadership and sufficient resources to follow best practices outlined by the Toolkit. Without a more holistic understanding of the Palouse-Clearwater food system, Coalition members may not effectively identify leverage points for strengthening its regional food system. An important lesson learned from this case study is that the Coalition and its peer community-based organizations across the country need to develop clear assessment goals, establish a commitment to the assessment process within member organizations, and secure the resources necessary to complete an integrated assessment process. Beyond gathering data and conducting analysis, a team of community leaders and experts needs to commit the energy and time to build long-term capacity and increase community engagement in order to turn that data into actionable projects that will enhance the regional food system.

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

San Jose Food Works Study: Demonstrating the Economics of Local Food Systems Toolkit methodology

Special JAFSCD Issue
Economics of Local Food Systems: Utilization of USDA AMS Toolkit Principles
Sponsored by
FOOD SYSTEMS COLORADO STATE UNIVERSITY USDA

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Submitted April 12, 2018 / Revised June 28 and July 30, 2018 / Accepted July 30, 2018 / Published online January 16, 2019

Citation: Kraus, S. (2019). San Jose Food Works Study: Demonstrating the Economics of Local Food Systems Toolkit methodology. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3), 119–135. https://doi.org/10.5304/jafscd.2019.08C.007

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Abstract
Like many fast-growing cities with a history as a major food production area, San Jose, California, has largely left its agricultural heritage behind. Much of its famed Valley of the Heart's Delight, so-called because of the vista of springtime blossoms and once a nationally important fruit production region, has been developed into the Silicon Valley, now a global high-tech center. The San Jose Food Works study makes a case that the food sector can be an important driver for achieving the city's goals for economic development, place-making, public health, and sustainability. The study analyzes the economic contributions to the city from each food supply chain sector—production, distribution, processing, retail, and food service. It also engages stakeholders from agencies, businesses, and community-based organizations in identifying gaps and opportunities for strengthening these contributions. The recommendations developed with these stakeholders reflect a new commitment to collaborate on building a more robust, equitable, vibrant, and sustainable local food system. This reflective essay describes the practitioner-led development of a city-scale food supply chain assessment, as a process and product that demonstrate the methodology presented in the U.S. Department of Agriculture's Economics of Local Food Systems Toolkit (Thilmany McFadden et al., 2016).

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Keywords
Food Sector, Food Economic Cluster, Local Food Economy, Regional Food Economy, Local Food Systems Toolkit, Food Systems, Bay Area, San Jose

Introduction
In many cities and regions, the agricultural and food economic cluster ("food sector") is largely taken for granted. Food supply, for the most part, is left to the invisible hand of market forces. Public scrutiny and intervention come into play to address sector-specific issues (e.g., farmland and environ-

mental protection, farming viability, food safety, public health, urban farming, food access, etc.), but there is much less public attention paid to connectivity across the sectors of the food supply chain and between food supply economics and the overall economy. In contrast, other inputs that are required for survival, namely water and energy, receive much more attention in the public realm. Government at all levels plays a major role in planning for and investing in the provision of these commodities, even while most providers (certainly of energy) are private businesses. Water and energy are delivered from relatively few source points (e.g., watershed impoundments, power plants) via large-scale infrastructure and orderly distribution systems throughout the built environment. Every step entails significant public oversight to ensure reliable and relatively affordable and equitable end-user access. In some ways, the housing sector is a more apt analogy, in that housing—like food, water, and energy—is a necessity, and the government often intervenes in the provision of it. However, more similar to the provision of food, the distribution of housing is unequal, and there are multiple providers and marketplaces.

To date, most cities and regions regard their food sector in terms of its disparate parts, with production, distribution, processing, and consumption not significantly connected. The fact is that understanding and quantifying, let alone incentivizing, local food economies is challenging. This is mainly due to the existence of complex and often global supply chains and the increasing prevalence of processed and prepared food. Both of these are factors that contribute to the current lack of connection between many consumers and the places and people that produce their food—a phenomenon that is sometimes described as the 'placelessness' of food.

However, not looking at the food sector supply chain holistically and in terms of its interconnections with broader issues such as resource conservation and public health presents challenges as well as missed opportunities. When a supply chain framing is not in place, city and regional planning and economic assessment processes tend to undercount the direct contributions of the food sector, rarely count its indirect contributions, undervalue natural and especially cultural resources that underlie vital food systems, and insufficiently recognize the vulnerabilities and investment needs of the sector. Even when a city or region aspires to conduct an assessment of a local food economy, doing so is a complex endeavor requiring a credible methodology. The U.S. Department of Agriculture's (USDA's) Economics of Local Food Systems Toolkit provides a clear methodology (framing, secondary data, primary data, engaging community, input-output analysis) for conducting such an assessment, as well as helpful examples of assessments and action plans undertaken by municipalities across the country.

Teams led by Sustainable Agriculture Education (SAGE) demonstrated the Toolkit methodology and principles in two recent food sector economic assessments: the San Jose Food Works report (Sustainable Agriculture Education [SAGE], 2016), produced for the city of San Jose; and the *Bay Area Food Economy: Existing Conditions and Strategies for Resilience*, a white paper produced for the Association of Bay Area Governments (SAGE & American Farmland Trust [AFT], 2017). Both these projects aimed to analyze the food sector in terms of its contributions to the economy and to broader municipal goals. They also aimed to analyze the vulnerabilities and challenges facing the food sector. The resulting studies also outline strategies and strategic investments that need to be implemented in order for the food sector to be able to continue to contribute to the economy.

This reflective essay describes how the San Jose Food Works study demonstrates the effective application of the Toolkit methodology and principles. Because the *Bay Area Food Economy* white paper was produced after the Food Works study and report and by some of the same team, it benefited from the previous experience with Toolkit research methodology. The *Bay Area Food Economy* white paper, though not described in this article, is available online.

An analysis of economic linkages and indirect and induced contributions of the food sector to the wider economy, part of the Toolkit methodology, was not undertaken by either project because such analysis was beyond the project scope. It should also be noted that the Food Works study, as a practitioner-led project, lacks the inclusiveness and spirit of advocacy of more community-driven assessments, such as some of those profiled in the Toolkit.

Overview and Impetus

What would San Jose look like if a robust local food system were one of the vital frameworks linking the city's goals for economic development, community health, environmental stewardship, culture, and identity as the city's population grows to a projected 1.5 million people over the next 25 years?

SAGE initiated the Food Works study in fall 2015 to answer this question. Another impetus for SAGE was its involvement in a long-term effort to create an agriculture and conservation area in Coyote Valley—7,500 acres (3,000 hectares) of prime farmland on San Jose's southern boundary. Already partly incorporated into San Jose, this fertile farmland (originally called the Valley of the Heart's Delight, named after its thriving orchards) has been in the crosshairs of development for decades, most recently in a specific planning process that was ended, in part, by the 2008 recession. In 2015, city policies make it clear that the concept for an urban-edge food belt was still in direct contradiction to long-standing land use designations that anticipated expanded housing and jobs for this area. However, on the other hand, the city's department of housing wanted to investigate how local food businesses could be incorporated as street-level activation and community-engagement elements in the 72 urban villages being planned for construction in the coming decades. Despite these seemingly disparate interests, the city decided to support an assessment of its food supply chain sectors as a holistic economic cluster. The city recognized that 'food' was already making significant contributions to the city's economy and that strategic investments and partnerships could strengthen those contributions.

The study was funded by grants from the John S. and James L. Knight Foundation, Santa Clara Valley Open Space Authority, City of San Jose Department of Housing, and the 11th Hour Project. An award from the Local Food Promotion Program of the USDA Agricultural Marketing Service funded the exploration of a San Jose Market District, a subcomponent of the overall Food Works project. BAE Urban Economics, a regular partner on SAGE projects, took the lead on the economic analysis and The Health Trust was the main community partner. An advisory committee composed of engaged agencies, businesses, nonprofits, and community groups contributed to developing this roadmap for making San Jose a vibrant food city and a healthier, more resilient place.

The Food Works study is modeled on food system assessments and action plans developed by cities across the country, many of which exemplify the Toolkit methodology. It also builds on San Jose's existing planning framework, Envision 2040, while drawing from recent studies, such as the *San Jose Economic Strategy 2010 Report* (City of San Jose, 2010), the *Economic Contribution of Agriculture to Santa Clara County* (County of Santa Clara, Agricultural Commissioner's Office, 2014) and the *Santa Clara County Food System Assessment* (Santa Clara County Food System Alliance, 2013).

The Food Works study is an assessment and a call to action. It provides a compelling vision and actionable recommendations for a food system that serves all San Jose communities, now and into the future. The report analyzes food sector assets and contributions, identifies opportunities for food system investments and actions, and makes recommendations for partnerships and strategies to initiate new investment activities. The aim is for city leaders and key partners to use this information to elevate food as a driver to advance the city's goals for economic development, place-making, public health, and sustainability.

Framing and Approach

The framing is provided in the introductory chapter of the study, by the positing of an overarching vision: "San Jose's spirit of innovation, commitment to resilience and renowned diversity are expressed in a dynamic food culture of healthy food access for all residents and thriving food businesses, from ethnic grocery stores and neighborhood restaurants, to industrial processing and distribution, to market gardens and farms located in and around the City" (SAGE, 2017, p. 5). This vision was put forward by the consultant team to serve as a frame of reference for the values that the team believed would help galvanize city and public support for the study. Presented more as a proposition than a consensus, the framing in the study differs from the more participatory framing processes presented in the Toolkit.

The starting point for the study, presented in the San Jose Food System Today chapter, is an analysis of existing city policies and initiatives, the overall economic activity for food-related businesses, the geography of food in San Jose, selected Santa Clara County data and actions, other key food-related actors in the city, and the regional food systems context. In effect, this policy context took the place of the more community-based framing described in the Toolkit.

The core focus of the study is the Food Supply Chain chapter, which analyzes five primary sectors of the food supply chain—production, distribution, processing, retail, and restaurants and food service—in terms of economic activity, notable trends and businesses, gaps and opportunities, and preliminary recommendations. The Other Food Sectors chapter analyzes sectors that contribute to the overall food system but for which there are no economic data readily available in terms of notable trends and businesses, gaps and opportunities, and preliminary recommendations. The San Jose Market District/Wholesale Food Market Preliminary Assessment, included in the appendix, investigates the demand and opportunity for a facility serving co-located wholesale food distributors and processors.

To present exemplary models, the Best Practices chapter looks at what San Jose can learn from other cities as it considers ways in which food systems can contribute to economic development, neighborhood revitalization, public health outcomes, more sustainable environments, and preservation of cultural heritage.

The actionable part of the study—the Findings, Opportunities, and Recommendations chapter—summarizes key findings, opportunities, and sector-specific recommendations from previous chapters and concludes with seven overarching, cross-cutting recommendations. These recommendations propose a holistic, integrated approach to building the San Jose food system and point to various opportunities for San Jose to improve its food system in ways that support numerous city goals. For each recommendation, the team identified one or more lead actors who have agreed to help, or who are considering helping, with implementation.

Using Secondary Data Sources

As described in the Toolkit, an analysis of the economy of a local food system relies on a foundation of relevant and reliable secondary data. The first step in understanding the food sector as an economic cluster is determining those industries that compose the overall sector. In order to collect data pertinent to the San Jose food system, the consultant team defined various food-related industries using the North American Industry Classification System (NAICS). This system involves a nested range of codes, where two-digit codes broadly classify industry sectors (e.g., Manufacturing, Retail Trade, etc.), and three-, four-, five-, and six-digit codes break a two-digit code into a sequential series of subsectors, each with a greater level of industry detail.

The team first looked at how other regions had defined their food industry cluster through the NAICS to determine the set of NAICS codes most commonly used elsewhere. The team then used this set of NAICS codes to analyze the San Jose food sector through industry-level data purchased from Dun & Bradstreet and employment data furnished by the California Employment Development Department (EDD). Below are examples of tables from the study that show the results of this analysis. Table 1 uses the NAICS food sector classification to present revenue data by industry sector.

Table 2 summarizes city-level employment data from the Quarterly Census of Employment and Wages (QCEW), furnished by the EDD. San Jose food-related businesses employed just under 42,000 persons in 2015, which represents about 11.2% of the total number of jobs in San Jose. The trend data indicate that food-related employment has grown by almost 30% since 2005, which is double the rate of growth for all jobs in San Jose during the same period. (At a future point, with

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

Table 1. Total Revenue of Food-Related Establishments by Industry Sector, City of San Jose

NAICS	Industry Description	Total Revenue (in Millions) Dollars (a)	Percent
11	**Agriculture, Forestry, Fishing and Hunting**	**$39.2**	**1.4%**
111	*Crop Production*	*$24.4*	*0.9%*
112	*Animal Production and Aquaculture*	*$6.5*	*0.2%*
115	*Support Activities for Agriculture and Forestry*	*$8.2*	*0.3%*
31	**Manufacturing**	**$377.0**	**13.3%**
311	*Food Manufacturing*	*$343.6*	*12.1%*
312	*Beverage and Tobacco Product Manufacturing*	*$33.4*	*1.2%*
42	**Wholesale Trade**	**$865.2**	**30.6%**
4244	*Grocery and Related Product Merchant Wholesalers*	*$741.6*	*26.2%*
4245	*Farm Product Raw Material Merchant Wholesalers*	*$3.7*	*0.1%*
4248	*Beer, Wine, and Distilled Alcoholic Beverage Merchant Wholesalers*	*$90.8*	*3.2%*
42491	*Farm Supplies Merchant Wholesalers*	*$2.6*	*0.1%*
42493	*Flower, Nursery Stock, and Florists' Supplies Merchant Wholesalers*	*$26.4*	*0.9%*
44	**Retail Trade**	**$816.1**	**28.8%**
44422	*Nursery, Garden Center, and Farm Supply Stores*	*$11.7*	*0.4%*
445	*Food and Beverage Stores*	*$804.5*	*28.4%*
49	**Transportation and Warehousing**	**$0.0**	**0.0%**
49312	*Refrigerated Warehousing and Storage*	*$0.0*	*0.0%*
49313	*Farm Product Warehousing and Storage*	*$0.0*	*0.0%*
72	**Accommodation and Food Services**	**$731.6**	**25.9%**
722	*Food Services and Drinking Places*	*$731.6*	*25.9%*
	Total, All Food-Related Industries	**$2,829.1**	**100%**

Notes:
(a) Revenue estimates not available for all establishments from Dun & Bradstreet. In these cases, BAE estimated revenues as the average from all other establishments in the same industry sub-sector.

Sources: Dun & Bradstreet, 2016; BAE, 2016.

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more resources, it could be interesting and instructive to include the percentage of all employment in the city that each of these categories represents.)

Table 3 presents the number of establishments, number of employees, and total annual revenue by food industry category in 2016. In total, local food-related industries generate about US$2.8 billion in annual revenue. While food-related establishments represented just under 7% of all San Jose business establishments, they employed just under 42,000 people in 2015, representing about 11.2% of the total number of jobs in San Jose.

With the intention of better understanding the San Jose food system, the team also reviewed several food industry studies that have been prepared for other cities to seek data against which to benchmark San Jose's food-related business activity. The fact is, there is a relative dearth of such studies. However, the team found that studies prepared for San Francisco provided some comparable city-level data, as illustrated in Table 4 below, and also had the advantage of comparing these relatively close cities.

Mapping the locations of food-related businesses allows for a visual representation of their geographic distribution within the city of San Jose. Figure 1 depicts the location of establishments with 15 or more employees by industry. As seen in the

Table 2. Food-Related Employment in San Jose, 2005–2015

NAICS Code	Industry Description	Total Employment 2005	Total Employment 2015	% Change (2005-2015)
111	Crop Production	260	219	-15.8%
112 + 115	Animal Production and Aquaculture + Support Activities for Agriculture and Forestry	244	281	15.2%
311 + 312	Food Manufacturing + Beverage and Tobacco Product Manufacturing	1,143	1,485	29.9%
445	Food and Beverage Stores	7,511	8,015	6.7%
722	Food Services and Drinking Places	21,090	29,671	40.7%
4244 + 4248	Grocery and Related Product Merchant Wholesalers + Beer, Wine, and Distilled Alcoholic Beverage Merchant Wholesalers	1,645	1,709	3.9%
4245 + 42491 + 42493	Farm Product Raw Material Merchant Wholesalers + Farm Supplies Merchant Wholesalers + Flower, Nursery Stock, and Florists' Supplies Merchant Wholesalers	69	57	-17.4%
44422	Nursery, Garden Center, and Farm Supply Stores	126	127	0.8%
49312	Refrigerated Warehousing and Storage	(a)	(a)	(a)
Total, All Food-Related Industries		**32,088**	**41,564**	**29.5%**
Total Employment in San Jose, All Industries		**322,843**	**369,655**	**14.5%**
Food-Related Employment as % of Total San Jose Employment		*9.9%*	*11.2%*	

Notes:
(a) Data suppressed to preserve confidentiality of individual businesses.

Sources: California Employment Development Department, QCEW, 2016; BAE, 2016.

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figure, there is a cluster of food-related establishments in downtown San Jose, the majority of which are in the Accommodation and Food Services industry sector. With regard to the food businesses in the Manufacturing industry sector, the majority of the larger establishments are located close to major roadways, including a cluster near the intersection of Highway 101 and Interstate 880. This is consistent with the need for manufacturing operations to be situated in areas with easy access to the goods movement system. Similar to the Manufacturing industry sector, the larger food-related Wholesale Trade establishments also generally cluster near major thoroughfares, allowing for easy freight access.

The research demonstrated that, although they account for a small proportion of the city's overall total establishments and jobs, food-related business activity expanded at a rate of about two times the citywide average between 2005 and 2015. Food-

Table 3. Food-Related Establishments, Employees and Revenue, by Industry Sector

Industry	Number of Establishments	Number of Employees (a)	Total Annual Revenue (b)
Production	160	644	$39,164,047
Processing	189	1,935	$376,989,705
Distribution	283	1,859	$865,205,029
Retail	671	8,062	$816,125,758
Restaurants & Food Service	2,095	25,186	$731,603,698
All Food-Related Industries	**3,398**	**37,686**	**$2,829,088,238**

Notes:
(a) Excludes data for establishments for which employment data not reported.
(b) Revenue estimates not available for all establishments from Dun & Bradstreet. In these cases, BAE estimated revenues as the average fron all other establishments in the same industry sub-sector.

Sources: Dun & Bradstreet, 2016; BAE, 2016.

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Table 4. Establishment and Employment by Industry Sector, Bay Area, San Francisco and San Jose

Industry Sector	Bay Area Establishments (a)	San Francisco Establishments (a)	San Jose Establishments (b)
Food & Beverage Wholesale/Dist. (c)	1,437	211	260
Food Manufacturing (d)	778	139	161
Beverage Manufacturing (e)	768	20	26
Total, All Industry Sectors	**2,983**	**370**	**447**

Industry Sector	Bay Area Employment (a)	San Francisco Employment (a)	San Jose Employment (b)
Food & Beverage Wholesale/Dist. (c)	22,201	2,986	1,711
Food Manufacturing (d)	23,308	1,853	1,606
Beverage Manufacturing (e)	18,085	211	327
Total, All Industry Sectors	**63,594**	**5,050**	**3,644**

Notes:
(a) Data comes from Makers & Movers report, which used 2012 QCEW data published by the Bureau of Labor Statistics.
(b) Comparable data from 2016 Dun & Bradstreet database.
(c) Includes NAICS sectors:
4244: Grocery and Related Product Merchandise Wholesalers
4245: Farm Product Raw Material Merchandise Wholesalers
4248: Beer, Wine, Distilled Alcoholic Bev. Merchandise Wholesalers
(d) Includes NAICS Sector 311: Food Manufacturing
(e) Includes NAICS Sector 3121: Beverage Manufacturing

Sources: Quarterly Census of Employment and Wages (QCEW), Bureau of Labor Statistics (BLS), 2012; Dun & Bradstreet, 2016; BAE 2016.

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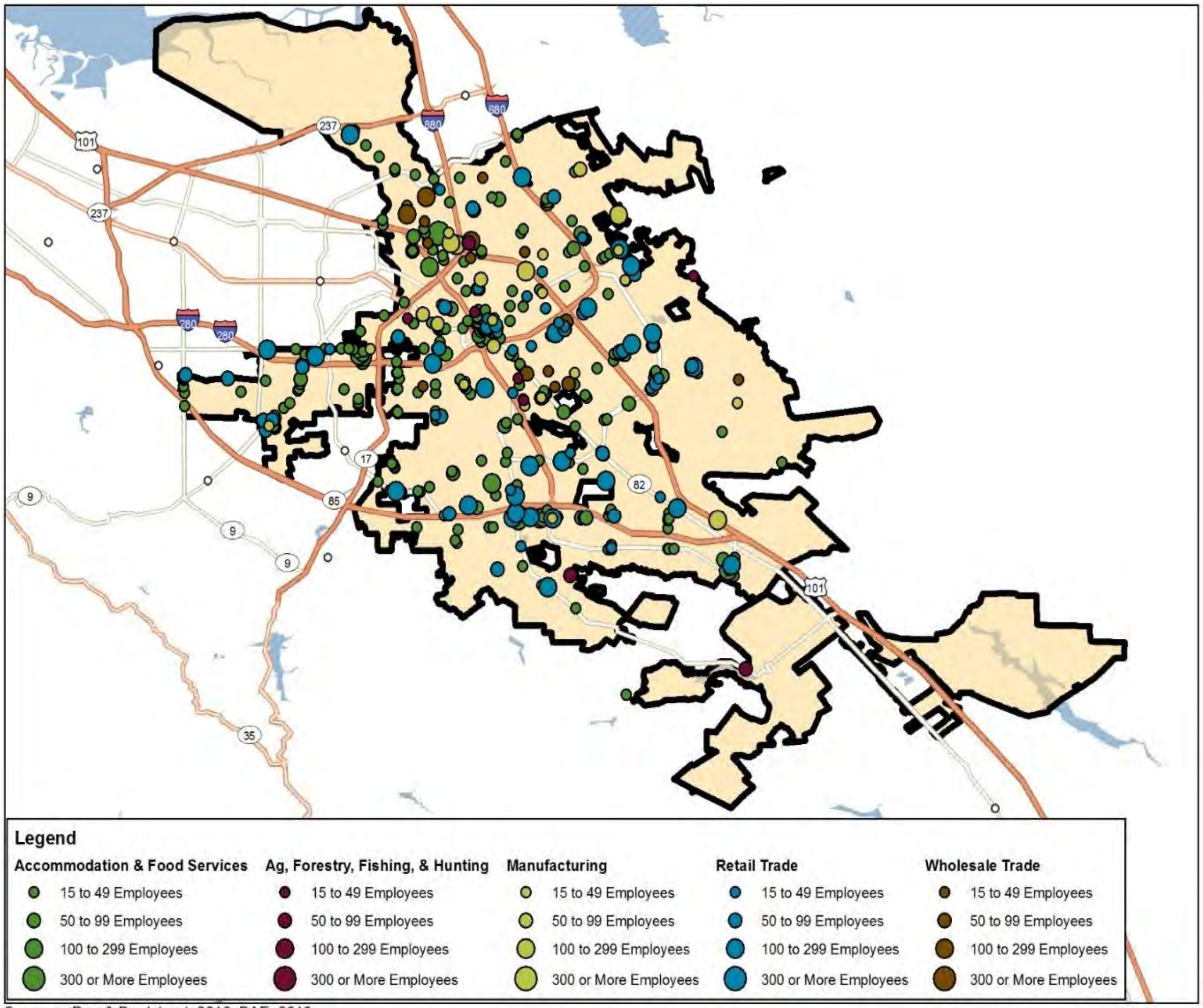
related businesses also provide job opportunities across a range of broad industry sectors and in locations that are accessible throughout San Jose's neighborhoods. This finding is corroborated by the Association of Bay Area Government's (ABAG's) *San Francisco Bay Area State of the Region 2015* report, which shows that jobs related to food preparation and serving in the Bay Area grew by the second greatest degree among all occupation fields between 2010 and 2013, after computer and mathematical jobs (ABAG, 2016). In the San Jose–Sunnyvale–Santa Clara Metropolitan Statistical Area, "food preparation and serving related jobs" account for 7.6% of total employment, which is 1.5% less than the national average, and the average hourly wage for jobs in this sector is US$12.70, which is nearly US$2 (or 16%) higher than the national average (U.S. Department of Labor, Bureau of Labor Statistics, 2016). According to the U.S. Bureau of Labor Statistics, Food Preparation and Serving Related Jobs are the fifth-biggest source of employment in the area (U.S. Department of Labor, Bureau of Labor Statistics, 2018).

In addition to analyzing economic data, the team also looked at existing city policies and strategy documents to get a better understanding of how the city regards the food sector. The review of these policies makes it clear that food is viewed as a key ingredient in San Jose's quality of life and also in place-making, which in turn is a catalyst for economic development and attracting high-quality businesses and a world-class workforce to San Jose. In addition to place-making and economic development, references to food can be found in city policies dealing with health, the environment, land use, and housing. The study includes an appendix that correlates specific city policies and strategies with food-related activities.

To understand the extent to which these food-related policies were being implemented, the team

Figure 1. Geographic Distribution of Food-Related Businesses with 15 or More Employees



Sources: Dun & Bradstreet, 2016; BAE, 2016.

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also researched current initiatives and actions. It found that, consistent with city policy documents, many city of San Jose departments and divisions are actively involved in activities that are directly or indirectly related to food. In addition to these, the study found that numerous private-sector and nonprofit organizations promote aspects of San Jose's food system, as a focus or as part of larger missions. Taken together, the prominence of food and food-related activity within city policies emphasizes the central role that food plays in all aspects of life within San Jose.

Finally, the team researched numerous city-level food system assessments that have been conducted for cities throughout the United States. In doing so, it identified case studies of exemplary projects as well as reports that provide context for the food system assessment of San Jose. The study includes a summary of policies, programs, projects, and recommendations from these assessments in an appendix to the study.

Generating and Using Primary Data

In order to corroborate, extend, and add a personal dimension to its secondary data research findings, and demonstrating the Toolkit's methodology, the team generated primary data by conducting interviews and organizing meetings with dozens of city staff, business owners, thought leaders, and staff of community organizations. A list of informants is included in an appendix in the study. A primary set of these interviews was conducted with businesses leaders and stakeholders for each of the food supply chain sectors. Information from these interviews was compiled along with secondary data research findings in a summary organized in terms of economic activity, notable trends and businesses, gaps and opportunities, and preliminary recommendations. These findings are summarized below.

Production includes agricultural businesses located in San Jose, commercial farms and ranches operating on farmland within the San Jose city limits, and community gardens and farm enterprises operating within urban San Jose. The team summarized key findings and opportunities and also made preliminary recommendations. Farms and ranches located within the city limits, as extrapolated from the Santa Clara County 2015 Crop Report (County of Santa Clara Department of Agriculture, 2015), produce an estimated US$5.2 million in annual revenue. In addition to the crop production revenue from farms in San Jose, an additional US$39.2 million of revenue comes from production businesses with headquarters located in San Jose but with their operations located outside of San Jose, either within the county or in other jurisdictions altogether. San Jose could be a much more significant market outlet for locally grown farm products if there were a stronger market "pull" coming from the local wholesale, retail, processing, and restaurant sectors.

Preliminary recommendations for the production sector included (1) retaining agriculture business headquarters and facilities in San Jose; (2) retaining and investing in remaining existing farmland in San Jose; (3) supporting initiatives and programs that link local producers with local market outlets and that showcase local food production; (4) implementing the Urban Agriculture Incentives Act (AB551); and (5) developing infrastructure for selling locally produced farm products.

Distribution. This sector covers wholesale and distribution businesses handling food and beverage products. The team summarized key findings and opportunities and made preliminary recommendations. With revenues per establishment ranging from US$100 thousand to over US$100 million and an average revenue of over US$3 million, the distribution and wholesale produce sector is growing. Many companies are critically squeezed for space and are also experiencing some labor shortages. The advent of food safety and traceability concerns has added operational costs and required facility upgrades. Based on anecdotal evidence, there is growing interest in organic and specialty items in San Jose, but the demand is still lower than elsewhere in the Bay Area.

Preliminary recommendations for the distribution sector included (1) encouraging the city to undertake proactive efforts to retain and support food distribution businesses, and (2) conducting a full feasibility analysis for a wholesale food market, based on the preliminary assessment conducted for this report (included as an appendix to the report). As shown in Table 5, of the six wholesale distribution and processing companies that were interviewed for the assessment and that indicated interest, as of 2016, there was a combined need for industrial space of 145,000 ft^2 (13,500 m^2) and 40 loading docks.

Processing. This sector encompasses food manufacturing, including the more recent emergence of commercial kitchens and food business incubators. The team summarized key findings and opportunities and also made preliminary recommendations. Specialty food manufacturing and processing is a vital and highly diverse sector, ranging from family-run businesses with a few employees to businesses with international supply chains and hundreds of employees. Some businesses are in need of affordable space to grow.

Preliminary recommendations for the distribution sector included (1) encouraging the city to undertake proactive efforts to retain and support food processing businesses; (2) supporting the development of commercial kitchens and new kitchen incubators that can help launch new food enterprises, which can be stand-alone or part of market projects; and (3) promoting the city's many unique specialty food processors, which represent a

Table 5. Summary of Demand for a Wholesale Food Market from Distributors and Processors (all currency in US$)

	Current					Needed			
Company	Current location	Facility size (sq. ft.)	# of employees	Annual revenue	Percentage annual growth	Facility size needed (sq. ft.)	# of docks needed	Projected # employees	Want ownership/ equity
A & J Produce	San Jose	4,000	10	$2 M		10,000	3	20	N
Bassian Farms	San Jose	25,000	65	$54 M	10–20%	40,000	10	75	Y
Eddie's Produce	San Jose	4,000	6	$0.5 M		5,000	3	10	N
Farm Fresh to You	San Jose satellite	5,500	20			5,500	2	20	N
Galli Produce	San Jose	16,000	35			30,000	6	50	Y
Pacific Rim Produce	Oakland + 5 cities					50,000	16	100	Y
Total		54,500	136			140,500	40	275	

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wide range of culinary traditions and would benefit from higher visibility; for example, the San Jose Office of Economic Development could promote them as part of the city's cultural richness.

Retail. This sector includes food and beverage stores, including supermarkets, convenience stores, meat and seafood markets, fruit and vegetable markets, baked goods stores, other specialty stores, and liquor stores. The team summarized key findings and opportunities and also made preliminary recommendations. National, regional, and local supermarkets represent the largest percentage of revenues. However, the largest number of establishments are small ethnic grocery stores, which are mainly owned by minorities and employ, on average, four people or fewer. Smaller stores supplement their direct deliveries of products with purchases from large local grocery outlet stores as well as purchases made via trips several times a week to the San Francisco wholesale produce markets. Several stores are seeking assistance with sourcing more local products, public education about healthy, fresh, locally produced food, and best practices in reducing food waste.

Preliminary recommendations for the retail sector included (1) streamlining the process for meeting permitting and licensing requirements for small retailers, and (2) increasing the percentage of smaller retail food outlets that offer healthy, affordable food.

Food service. This is a broad sector that includes restaurants, food service, and drinking establishments. The team summarized key findings and opportunities and also made preliminary recommendations. San Jose restaurants range from basic to fine dining and represent dozens of culinary traditions in different neighborhoods throughout the city. Places like San Pedro Square Market and Santana Row help restaurants get established. Restaurants interested in sourcing more locally produced products are encountering barriers related to information gaps, price, logistics, and convenience. Foodservice companies across the Bay Area are experiencing a growth of above 10% per year. For many businesses in this category, the biggest challenge is the shortage of labor, including skilled cooks, managers, and dishwashers.

Preliminary recommendations for the foodservice sector included (1) supporting efforts to develop more destination restaurants (i.e., restaurants that attract regional customers and tourists); (2) exploring the development of a wholesale food market that could help increase the availability of locally grown farm products; and (3) supporting food job training programs.

Other food sectors. The team also researched four other food sectors—farmers markets, information technology (IT) related to food and agriculture, research and development (R&D) related to food and ag, and e-commerce. They corroborated their findings with selected interviews to determine the role of these sectors in the overall food system and to identify growth opportunities for these sectors. These findings include (1) some farmers market operators have an interest in developing indoor-outdoor infrastructure in central locations, such as in Guadalupe Park; (2) while business clusters for the food and agriculture technology industry have been centered in New York, Silicon Valley, and San Francisco, there are potential new opportunities in San Jose; (3) there are no major food and agriculture R&D centers based in San Jose, although many efforts are underway regionally (e.g., in Salinas, Davis, and Fresno); and (4) the food e-commerce sector has seen huge growth in recent years, receiving 36% of total global funding raised by food and agriculture tech companies in 2015 (Burwood-Taylor, Leclerc, & Tilney, 2016). The meal kit preparation and delivery sector has seen the most start-ups and the largest increase in funding in the past two years, and several of these start-ups are located in San Jose.

General Findings Across Sectors

Following are a series of broad findings that cut across the various food sectors.

- The Food Works team's economic analysis indicates that the food system is an important contributor to the city of San Jose's economic base, but based on comparisons with other cities it is not as fully developed as it could be. Still, employment growth within the food system was twice the citywide average between 2005 and 2015. Food system businesses provide a career ladder that is accessible to a diverse population, including minorities, people with limited formal education and/or limited English language proficiency, and people at various socio-economic levels. (An analysis of the wages and working conditions of these jobs was beyond the scope of the study.)
- Reviewing city documents and interviewing city employees, business owners, and thought leaders clearly showed that, even though there are considerable challenges, food is an integral part of the city of San Jose's policies regarding land use, health, economic development, housing, and the environment.
- Interviews and meetings conducted throughout this process showed that San Jose's diverse food environment creates a cultural bridge between communities and attracts visitors to San Jose as a food destination; however, this aspect could be increased significantly.

Engaging the Community

In order to engage various San Jose stakeholder communities with the data, the team identified specific areas of opportunities, developed recommendations, and identified various actors who agreed to take the lead on implementing certain actions associated with each recommendation. These recommendations primarily drew from the analysis of primary data. The secondary data on revenues, establishments, and jobs provided more of an indirect platform for the recommendations. By demonstrating the considerable economic contributions of the food sectors, the recommendations were intended to bolster the case for the city to take action to address certain vulnerabilities and opportunities in the food sector. The kinds of robust community engagement outlined in the Toolkit are limited in the study and are expected to be more fully realized through implementation of the recommendations.

Based on the analysis of the food system environment in and around San Jose, the team synthesized the most significant opportunities in food system programs and planning. The individual sections on food supply chain sectors have identified opportunities and gaps and include recommended actions to improve the environment for each of the sectors. In the synthesis approach, the process of identifying opportunities entailed looking at cross-cutting issues affecting more than one part of the supply chain and more than one of the city's goals for economic growth, place-making, and public health.

The most significant opportunities in food system programs and planning were (1) increasing jobs and developing the economic value of the food sector; (2) integrating healthy food access initiatives with efforts to develop entrepreneurship and place-making; (3) improving quality of life and protecting air and water quality by protecting urban and peri-urban agricultural lands; and (4) enhancing the effectiveness of existing programs and initiating strategic new efforts by increasing coordination between the city, nonprofit organizations, and food businesses.

The next step was to correlate opportunities with cross-cutting recommendations, as shown in Table 6. The final step in the scope of the Food Works Study was to identify, for each cross-cutting recommendation, a series of actions and one or more lead actors who agreed to help or to consider helping with the implementation of the recommendation and its actions. The team has also made preliminary, rough estimates of the resources needed to implement the recommendations.

Recommendation #1. Grow the city's economy by investing in food jobs and supporting new, expanded, or relocated food businesses. (Lead actors: Office of Economic Development, Center for Employment Training, vocational education training programs, food businesses.) Minimal initial funding requirement: Primary commitment is city staff time.

Recommendation #2. Conduct a detailed feasibility study for a wholesale food market. (Lead actors: wholesale food businesses, Knight Foundation, Office of Economic Development.) Funding requirement of approximately US$150,000–$200,000 and a partial match of city staff time for planning efforts.

Recommendation #3. Improve quality of life and public health outcomes by increasing opportunities for all San Jose residents to access fresh, affordable, healthy, and culturally appropriate foods close to where they live and work. (Lead actors: Santa Clara County Public Health Department, Parks and

Table 6. Opportunities and Cross-cutting Recommendations

Opportunities	Recommendations
a. Opportunity to increase jobs and to develop the economic value of the food sector.	Recommendation # 1. Grow the city's economy by investing in food jobs and new, expanded, or relocated food businesses.
	Recommendation #2. Develop a feasibility study for a wholesale food market terminal.
b. Opportunity to integrate healthy food access initiatives with efforts to develop entrepreneurship and placemaking.	Recommendation #3. Improve quality of life and public health outcomes by increasing opportunities for all San Jose residents to access fresh, affordable, healthy, and culturally appropriate foods.
	Recommendation #4. Advance food as place-making at city and neighborhood scales: permanently in development projects, street upgrades, and new marketplaces; and occasionally through food pop-ups, events, festivals and other promotions.
	Recommendation #5. Support development of food business incubators such as kitchen incubators, food maker-spaces, commercial kitchens, farm business incubators, and food and agricultural information technology (IT) incubators; and provide related technical assistance programs for food entrepreneurs.
c. Opportunity to improve quality of life and protect air and water quality by protecting urban and peri-urban agricultural lands.	Recommendation #6. Cultivate initiatives and dedicate land for multi-benefit urban and peri-urban food production.
d. Opportunity to enhance the effectiveness of existing programs and initiate strategic new efforts by increasing coordination between the City, nonprofit organizations and food businesses.	Recommendation #7. Institutionalize food system planning and implementation in city policies and plans.

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Recreation Department, school districts, The Health Trust.) Minimal initial funding requirement: Primary commitment is staff time from The Health Trust and the city to continue and expand on current efforts.

Recommendation #4. Advance food as place-making at the city and neighborhood scales on a permanent basis through development projects, street upgrades, and new marketplaces; and temporarily through food pop-ups, events, festivals, and other promotions. (Lead actors: Housing Department, Planning Department, Parks and Recreation Department, Office of Economic Development, Chamber of Commerce, Visitors and Convention Bureau, Business Districts and Associations, SJ Made.) Minimal initial funding requirement: Primary commitment is city staff time.

Recommendation #5. Support the development of food business incubators such as kitchen incubators (including as part of small public markets), commercial kitchens, food maker-spaces, farm business incubators, and food and agriculture IT incubators; provide related technical assistance programs for food entrepreneurs. (Lead actors: Planning Dept., Office of Economic Development, Parks and Recreation Department, Silicon Valley Small Business Development Center.) The funding requirement is primarily staff time. A feasibility study for an incubator kitchen would cost approximately US$100,000.

Recommendation #6. Cultivate initiatives and dedicate land for multi-benefit urban and peri-urban food production. (Lead actors: City Council, Parks and Recreation Department, Planning Department, Santa Clara County Agriculture Commissioner's Office, Santa Clara Valley Open Space Authority.) The initial funding requirement is primarily staff time; significant funding is required for land acquisition and improvements.

Recommendation #7. Institutionalize food system planning and implementation in city policies and plans. (Lead actors: City Council, Office of Economic Development, Parks and Recreation Department, Planning Department, Housing Department, Santa Clara County Food System Alliance.) The funding requirement is approximately US$75,000 per year for a part-time, dedicated staff position at the city. Initial funding could be provided by foundations already engaged with San Jose.

Implementation

This reflective essay describes the process of producing the San Jose Food Works study as an effective demonstration of the Economics of Local Food Systems Toolkit methodology and principles. In the hopes that the essay will encourage other municipalities to undertake similar kinds of assessments—due to both the effective analysis and impactful outcome—below is a brief summary of the impact of the San Jose Food Works study.

Following its completion, the city hosted an event for stakeholders from agencies, businesses, and community-based organizations that had contributed to the study to acknowledge the achievement and to consider next steps. With the support of funders, key food businesses, agency staff, and community stakeholders, SAGE then completed implementation of two of the Food Works recommendations with the release of two reports in June 2018: the *San Jose Wholesale Food Center Preliminary Development Prospectus* (SAGE, 2018a) and the *San Jose Food Business Incubator Needs Assessment* (SAGE, 2018b). In fall 2018, SAGE was awarded a USDA Local Food Promotion Program grant for the project, *San Jose Wholesale Food Center Feasibility Analysis —Linking Agricultural Roots to Future Sustainability*, which builds on the Preliminary Development Prospectus. This work is synergistic with three other important local initiatives: the city's climate action plan (Climate Smart San Jose); San Jose's recently adopted public safety bond, which will support protection of urban-edge farmland that provides flood protection and water recharge benefits for the city; and the county's Santa Clara Valley Agricultural Plan, a strategic action plan for protecting and revitalizing the county's remaining farmland and local agricultural economy (County of Santa Clara, Santa Clara Valley Open Space Authority, 2018).

In parallel with the implementation of San Jose Food Works recommendations, strategies proposed in the Bay Area Food Economy white paper (mentioned in the essay introduction as another SAGE-led assessment of local food economies) are now being implemented through the follow-up Bay Area Food Futures project. Funded in part by a grant from the Kaiser Permanente Northern California Community Benefit Programs, this project is being integrated into the implementation of the Bay Area's regional economic action plan.

Beyond the implementation of specific strategies, the broader impact of the San Jose Food Works study and the *Bay Area Food Economy* white paper is the growing understanding in San Jose and the region that a healthy, equitable, and sustainable food system needs to be recognized and invested in as an integral element of local and regional resilience.

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Appendix: Bibliography

The team reviewed studies and reports from San Jose, Santa Clara County, the San Francisco Bay Area, and the U.S. that had a bearing on our understanding of San Jose's food system. These reports are listed below. The team also identified numerous city-level food system assessments that have been conducted for cities throughout the United States. The team also identified case studies of exemplary projects as well as reports that provide context for local food system assessments.

San Jose Food Works Key Studies and Reports—San Jose, Santa Clara County, Bay Area, and the US

City of San Jose Studies and Reports	
Department	**Title**
Economic Development (OED)	San Jose Economic Strategy Report, 2010
	San Jose Economic Strategy Update (2013-2014) and Proposed 18-month Workplan
	San Jose Green Vision
OED - Office of Cultural Affairs	Arts and Economic Prosperity IV: the Economic Impact of Nonprofit Arts and Cultural Organizations and their Audiences in San Jose
	Cultural Connection
	Public Art Next! San Jose's New Public Arts Master Plan
	The Creative Industries of San Jose, California
	Downtown Next! A Public Art Focus Plan for Downtown San Jose
	Downtown San Jose Street Life Plan
Housing	City of San Jose Final 2015-2020 Consolidated Plan and 2015-2016 Action Plan
	City of San Jose 2014-2023 Housing Element
Planning	Envision San Jose 2040 General Plan Update (report and presentation)

County of Santa Clara Studies and Reports	
Department	**Title**
Planning	Santa Clara County General Plan Update of Health Element
Agriculture	Direct Econmic Contributions of Santa Clara County Agriculture, 2015
	Food Rescue Services, Barriers, and Recommendations in Santa Clara County

San Jose and Santa Clara County Food System Reports and Studies	
Sector	**Author and Title**
Land Conservation	Santa Clara County Open Space Authority. Santa Clara Valley Greenprint: a Guide for Protecting Open Space and Livable Communiities
	SAGE with BAE Urban Economics, Cultivate, Sustaining Agriculture and Conservation in Coyote Valley
Health	The Health Trust, The Health Trust's Healthy Eating Strategies (2014-2018)
	The Health Trust, Food for Everyone, 2016
Sustainable Food Systems	Santa Clara County Food System Alliance. Santa Clara County Food System Assessment
Planning	San Jose Downtown Association. Downtown San Jose Street Life Plan
Planning and Economic Devel.	San Jose Downtown Association (DSJA). Ten-point plan for Downtown San Jose

Bay Area Food Systems Reports and Studies	
Sector	**Title**
Economics and Food	SF Offices of Economic Development and SF Planning. Makers and Movers Economic Cluster Study: Recommendations for San Francisco
Food and Technology	San Jose Mercury News (Business).High-Tech Farming Poised to Change the Way World Eats
Health and equity	SPUR. Healthy Food Within Reach
Food Shed	SAGE, American Farmland Trust. San Francisco Foodshed Assessment
Regional Agriculture	SAGE, American Farmland Trust, Greenbelt Alliance. Sustaining our Agricultural Bounty
Food, Economics, Law	Sustainable Economies Law Center. Resources for Food and Farming Enterprises
Economics and Agriculture	Contra Costa County Food System Analysis and Economic Strategy

Key Studies and Reports—San Jose, Santa Clara County, Bay Area, and the US (cont.)

Other Reports, Studies and Articles about Exemplary Projects and Tools	
Sector	**Title**
Economics and Food	North American Food Sector Scan Part One: Program Scan and Literature Review . Changing Tastes
Economics and Food	North American Roadmap Part Two: A Roadmap for City Food Sector Innovation and Investment. Changing Tastes
Economics and Food	The $11T Reward: How Simple Dietary Changes Can Save Lives and Money, and How We Get There. Union of Concerned Scientists
Equity and Climate Change	NRDC Urban Solutions Strategic Plan: Creating Strong, Just and Resilient Communities
Food and Place	Local Foods, Local Places Summary Report for 2015, 2016. Environmental Protection Agency (EPA)
Food Distribution	$16M Food Hub Could Break Ground Next Month
Food Distribution	Anthony Bourdain's Food Market Takes Shape
Food Distribution	Case Study of Baltimore Food Initiative
Food Distribution	Findings of the 2013 National Food Hub Survey
Food Distribution	Food Commons 2.0
Food Distribution	Food Production Campus Aims to Help Entrepreneurs Get Started
Food Distribution	Jack and Jake's (website for regional food hub in New Orleans)
Food Distribution	Making the Invisible Visible: Looking Back at 15 years of Local Food Systems Distribution Solution
Food Distribution	New Fresh Grocery Concepts Poised to Shake up St. Louis Market
Food Distribution	Running a Food Hub: Lessons Learned from the Field (Volume One)
Food Distribution	Why Louisville is Betting Big on a Massive Food Wonderland
Food System	Assessing the San Luis Obispo County Food System
Food System	City of Seattle's Food Action Plan
Food System	Food Markets Nourishing Development
Food System	Food Works: A Vision to Improve NYC's Food System
Food System	Food Works: A Vision to Improve NYC's Food System. Accomplishments and New Ideas 2013
Food System	Multnomah County Food Report
Food System	NYC Food Policy: Food Metrics Report for 2014
Food System	Resilient Food Systems, Resilient Cities: Recommendations for the City of Boston
Food System	Trends in U.S. Local and Regional Food Systems: a Report to Congress. USDA ERS
Food System	Planning / Baltimore Food Policy Initiative / Healthy Food Retail
Economics and Agriculture	Contra Costa County Food System Analysis and Economic Strategy
Food Distribution	Making the Invisible Visible: Looking Back at 15 years of Local Food Systems Distribution Solution
Food Distribution	Findings of the 2013 National Food Hub Survey
Food Distribution	Running a Food Hub: Lessons Learned from the Field (Volume One)
Equity and Climate Change	NRDC Urban Solutions Strategic Plan: Creating Strong, Just and Resilient Communities

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

Finding common ground: Defining agricultural viability and streamlining multi-organization data collection

Special JAFSCD Issue
Economics of Local Food Systems: Utilization of USDA AMS Toolkit Principles
Sponsored by
FOOD SYSTEMS COLORADO STATE UNIVERSITY
USDA

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Submitted April 6, 2018 / Revised July 20, September 18, and October 2, 2018 / Accepted October 2, 2018 / Published online January 2, 2019

Citation: Christensen, L, & Limbach, L. (2019). Finding common ground: Defining agricultural viability and streamlining multi-organization data collection. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3), 137–152. https://doi.org/10.5304/jafscd.2019.08C.005

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Abstract
In 2011, the state of Washington created the Voluntary Stewardship Program (VSP), a collaborative and incentive-based approach to land-use management with the goal of protecting critical areas while maintaining and improving the viability of agriculture. Agricultural viability is an attractive ideal supported by a variety of stakeholder groups. Narrowly defined, agricultural viability is the ability of a farmer or a group of farmers to maintain an economically viable farm business. Yet, many feel this definition does not go far enough to reflect the long-term viability of agriculture in a community. It is, however, difficult to develop a broader shared definition and strategies to evaluate successful implementation of programs to achieve viability across multiple organizations. This paper explores how one county in Washington state organized a multistakeholder engagement process, employing the U.S. Department of Agriculture (USDA) Agricultural and Marketing Service (AMS) Toolkit (Thilmany McFadden et al., 2016) to define and measure agricultural viability. The process included collaborative design and implementation of an agricultural viability survey in San Juan County, Washington. We frame our reflective piece within

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Disclosures
Learner Limbach serves as the chair of the San Juan County Agricultural Resource Committee. At the time of data collection, Libby Christensen was a postdoctoral research fellow at Colorado State University (CSU) and received support from the USDA Economics of Local Food Systems Toolkit team at CSU. The results of this study did not provide either of the authors with any monetary gain, and there were no other conflicts of interest.

the literature on agricultural viability and multi-stakeholder engagement literature. To conclude, we reflect on the unique features of a multistakeholder working group and the implications for improving the viability of agriculture at the county level.

Keywords
Agriculture, Viability, Farmland Preservation, Rural-Urban Linkages, USDA Local Food Systems Toolkit

Introduction
Agriculture underlies the rural economy of San Juan County (SJC), Washington. Over the last 35 years, the number of farms and farmers, as well as farm revenue, has steadily increased in part due to a thriving tourist economy from surrounding urban centers and beyond. Despite this rise, local agricultural products account for only 2% of the total food market (San Juan County Food Hub Project Team, 2016). Additionally, growth in local agricultural production continues to face a number of challenges, including geographic isolation, high production costs, lack of available infrastructure and access to reliable markets, seasonal drought, and an aging farmer population (San Juan County Voluntary Stewardship Program, 2018). These challenges prompt many to worry about the continued viability of agriculture in SJC. Narrowly defined, agricultural viability is the ability of a farmer or a group of farmers to maintain an economically viable farm business. Yet many feel this definition does not go far enough to reflect the complex set of conditions and attributes associated with a thriving agricultural community.

Organizations involved in agricultural viability programs have different missions and capacities, which influence their approach to defining and measuring agricultural viability. Figuring out how these new programs fit into existing programs and do not compete for limited resources or create programmatic redundancies is a real challenge. Using an example from Washington State, we present how a group of stakeholder organizations covering the entire food system supply chain, from land access to food sales, came together to create a shared definition of viability. Together the group was also able to develop metrics to evaluate the successful implementation of individual programs as well as the collective impact of its work at the county scale. The organizations used the U.S. Department of Agriculture, Agricultural Marketing Service (USDA AMS) Toolkit (Toolkit) (Thilmany McFadden, 2016) to frame this process. The Toolkit was created to guide and enhance the capacity of local organizations to make more deliberate and credible measurements of local and small-scale economic activity and other benefits. It is made up of seven modules. The first set of modules guides early stages of framing local food assessments, including collecting and analyzing relevant primary and secondary data. The process in SJC utilizes this first set of modules.

While SJC is unique with regard to its geography and history, the process outlined below will be familiar to any community with a growing number of organizations—both traditional and nontraditional—looking to address challenges associated with their regional food system. Coordinating efforts can be exceedingly difficult, but can have three major benefits: (1) improved collaboration, (2) enhanced resource investments, and (3) critical alignment to reduce organizational inefficiencies (Jablonski, Angelo, Fox, Christensen, & Thilmany McFadden, in press).

It is important to note this community-led discussion regarding the appropriate definition of agricultural viability and the development of realistic measurable metrics is eerily similar to efforts to define and measure sustainability with regard to food systems (Hansen, 1996; Kloppenburg, Lezberg, De Master, Stevenson, & Hendrickson, 2000). Illustrating this point, it is hard to distinguish between sustainability and agricultural viability, as defined by the Washington State Conversation Commission. This definition of agricultural viability is the ability of a farmer or group of farmers to:

- Productively farm on a given piece of land or in a specific area,
- Maintain an economically viable farm business,
- Keep the land in agriculture long-term, and
- Steward the land so it will remain productive in the future.

While the similarities between viability and sustainability are not central to this paper, future thought should be directed toward understanding this shift and critically reflecting on the theoretical and applied implications, if any.

What follows is a literature review in which we explore the origins of the concept of agricultural viability and efforts to measure it. We then briefly review the literature on multi-organization collaborative efforts to define key food systems concepts and activities. We then describe the geographic context and the particular process that occurred in SJC, discussing the implications of a collaborative effort to conceptualize and measure agricultural viability. Here it is important to note that multi-stakeholder food system initiatives are often messy and do not follow a linear temporal path. We have done our best to organize the process section in a logical fashion and we have also provided a visual timeline to help navigate. We conclude with the opportunities and challenges of using the Toolkit to frame these types of efforts.

Literature Review

Agricultural viability is a key term in conversations across the globe about the survival of farms. It is often used in relation to individual producers, groups of producers, and assessments of programmatic success. Viability often connotes ideals of "success" and sustainability," yet in the academic literature and policy setting, viability is often narrowly focused on farm productivity and economic returns (Adelaja, Sullivan, & Lake, 2005; Barnes, Hansson, Manevska-Tasevska, Shrestha, & Thomson, 2015; Bauman, Thilmany, & Jablonski, 2017; Cocciarelli, Smalley, & Hamm, 2011; Duane, 2010; Robertson et al., 2008). As such, authors tend to fail to adequately justify, or explain the justification for, selecting their definition. Few if any discuss the relevancy of their selected definition and metrics to the communities of concern. Despite this narrow focus, a standard measure of farm viability is still lacking (Savickiene, Miceikiene, & Jurgelaitiene, 2015). Ireland, however, has been collecting data on the economic situation of Irish farms since 1996, using the Frawley and Commins' (1996) metric of farm viability, which is assessed as the ability of a farm business to remunerate family labor at the minimum agricultural wage and provide a 5% return on the capital invested in non-land assets. But this approach has not been widely adopted.

Measuring viability in terms of income, Smale, Saupe, and Salant (1986) and Salant, Smale, and Saupe (1986) studied viability of farms in Wisconsin, Mississippi, and Tennessee. They created a metric based on the ratio of farm and off-farm household income to consumption expenses, capital replacement costs, and principal payments. The authors theorized that farm households with a ratio of at least 1.0 can maintain their current business, while those with less than 1.0 cannot meet their financial obligations. The farm may survive in the short term by utilizing credit or savings, but the farm is not expected to be viable in the long run. While their methodology is relatively comprehensive because it reflects the surge in diversified on-farm activities and other income streams, the study encountered difficulty due to the absence of data on calculations of interest and debt ratios (O'Donoghue, 2017). Brown, Goetz, and Fleming (2012) tested whether farm income diversification impacts farm viability, which they define as the change in the number of farms at the county level. In their analysis, the authors found that the impacts of farm income diversification are not always positive. Measuring agriculture viability is further complicated by yearly variations and external forces, including environmental and biological ones (e.g., droughts, floods, pest pressures, etc.).

Despite being the most discussed component of viability in the literature, Scott (2003) found differing opinions of what economic viability looked like. In her study of farm viability in Nova Scotia, Canada, Scott (2003) interviewed over 100 people tied to agriculture about their definition of viability. Their responses fell into four categories. The first category was economic viability and included income, debt, economic efficiency, farm income support programs, and fair farm pricing. The issue of fair price generated the most discussion and was the most universally agreed upon. As for the other three categories, interviewees noted the importance of ecological viability, the ability of the land and animals to sustain a productive farming operation; of human capital, the ability of the farmer, their family and employees to continue farming; and finally the importance of social capital, the ability of farmers and their community to work and live together. Further, the way in which the term "agricultural viability" is framed influences how interest groups measure viability and use the findings to contest wider politics of agriculture in a region (Cousins & Scoones, 2010).

The causes of the decline in family farmers have been discussed at great lengths in the literature (Goldschmidt, 1947; Oberholtzer, Clancy, & Esseks, 2010). In fact, advocacy groups have been seeking to address the many challenges facing agriculture in the United States for over a half century, but over the last decade there has been a groundswell of interest in food and agriculture. Coupled with this general interest is growing concern regarding the continued survival of agriculture in the United States. Between 1992 and 2012, the U.S. lost nearly 31 million acres (12.5 million hectares) of land (Sorensen, Freedgood, Dempsey, & Theobald, 2018). Farmlands closest to urban centers face the greatest threat of development, despite providing important ecosystem and cultural services to urban residents (Brinkley, 2018). While SJC may be separate from the major urban centers of Vancouver and Seattle by bodies of water, the county is still impacted by urban growth because of its popularity as a vacation and second-home destination for urban residents. Population growth and mobility have led to intense demand for agricultural lands on the urban edge. In addition to the physical pressures, these urban-adjacent farmlands face additional challenges, including conflicts with non-farm neighbors over odor and noise; vandalism; local planning zoning laws that curtail agriculture and agriculture-related activities; and limited access to agriculture-related suppliers, capital, and services (Inwood & Sharp, 2012). Lapping and FitzSimons (1982) argue that any policy or programmatic efforts to retain or preserve farmland must focus on improving the economic viability of agriculture. To this end, urban-adjacent farmlands often have the greatest economic potential because of their location on some of the nation's most productive soils (American Farmland Trust, n.d.). Additionally, their proximity to markets (Brown & Miller, 2008; Low & Vogel, 2011) allows them to specialize in specialty crops, which often demand higher prices than commodity crops. Increasingly a wider array of nonprofit organizations, planning agencies, and government agencies in North America are developing and implementing policies and programs with the goal of improving the viability of agriculture (Clark, Inwood, & Jackson-Smith, 2016). These programs are often in addition to already existing resources provided by traditional agricultural groups in the U.S. such as the Farm Bureau, the USDA, and the land-grant university system with its network of Cooperative Extension agents to support farmers. Some nontraditional programs emerged in response to a general critique of the role of the more traditional organizations in increasing the intensification, concentration, capitalization, corporatization, and globalization of agriculture (Marshall, 2000).

These nontraditional viability programs and policies go beyond those established to preserve and protect farmland, like conservation easements, use-value property taxation of farmland, low-density agricultural zoning, urban growth boundaries, right-to-farm laws, agricultural districts, and a governor's executive order to direct state infrastructure projects away from farmland. At its core, agriculture viability programs assert that changes at the farm level can lead to enhanced farm profitability and, as a result, to the preservation of farmlands. Farm viability programs often provide technical assistance—and in some cases, grants or access to land—to improve the profitability of farms. Farm viability programs have been implemented in Connecticut, Maine, Maryland, Massachusetts, Minnesota, New Jersey, New York, Ohio, Rhode Island, Pennsylvania, and Vermont (Farmland Information Center, n.d.).

As more organizations become involved in the discussions around the viability of agriculture, it is important to consider how these different types of organizations can work together. Fortunately, there are numerous academic articles describing the process of multiple organizations or researchers coming together around a shared understanding of regional food systems (Aiking & de Boer, 2004; Eriksen, 2013; Jablonski et al., in press; Kloppenberg et al., 2000; Koliba et al., 2017). These studies have shown numerous benefits that result from coordinating multi-organization efforts, including improved collaboration, enhanced resource investments, and critical alignment to reduce organizational inefficiencies (Jablonski et al., forthcoming). Yet a general trend across these different examples is the uniqueness of the processes implemented in each community. Hayati, Ranjbar, and Karami (2010) suggest that this type of multi-organizational effort requires a process and identification of metrics that need to be specific to the location and constructed within the socioeconomic context and ecological situation. While the community-level customization has many benefits, some communities may be overwhelmed at the prospect of developing their own unique process.

Given the nascent nature of many of these multi-organizational collaborative efforts and the uniqueness of the processes implemented in each community, there continue to be relatively few efforts guided by a standardized approach. As a result, the USDA convened a team of regional economic and food system specialists to develop the Toolkit, with the goal of guiding and enhancing the capacity of local organizations to make more deliberate and credible measurements of local and regional economic activity and ancillary benefits (Thilmany McFadden et al., 2016). Other authors have shown how the Toolkit can be used to conduct an economic impact assessment (Becot et al., 2018; Christensen, Jablonski, Stephens, & Joshi, in press; Conner, Becot, & Imrie, 2017). Instead of focusing on the implementation of a full economic impact assessment, this is the first paper to focus on how the first four modules of the Toolkit can be used to facilitate multi-organization collaboration during the earlier stages of food system discussion.

In the following sections we will discuss how the members of the VSP Work Group, a multi-organization collaboration, worked together to identify a shared definition of agriculture viability and metrics using the USDA Toolkit to facilitate the process.

The Context and Process

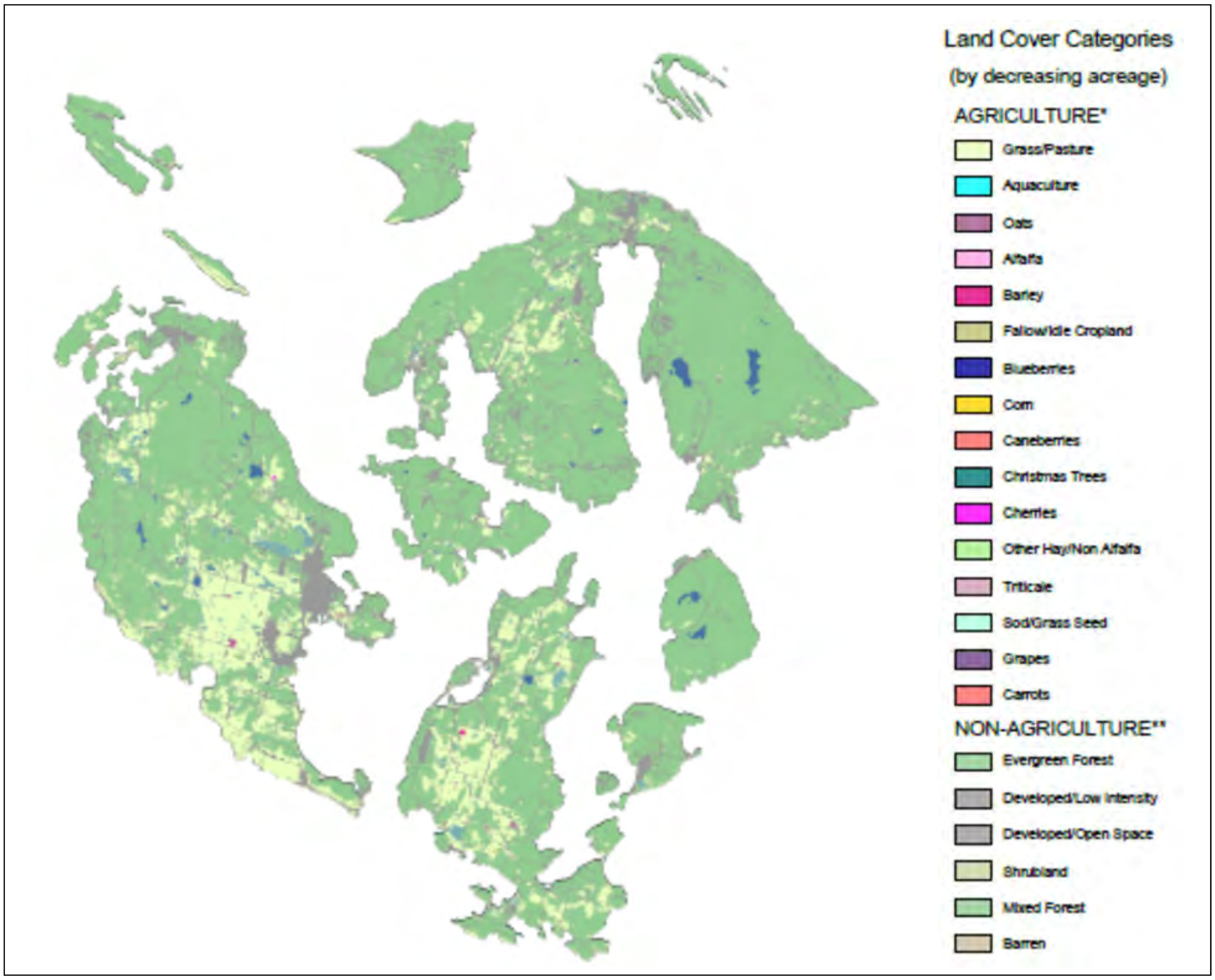
A ferry-served archipelago in the far northwest corner of the state, SJC is 174 square miles (451 square km) and is the smallest county in Washington by land area and fourth smallest by total area (U.S. Census Bureau, 2010). While the county is centrally located between Seattle, Washington, and Vancouver, Canada, it is the only county in the state without a state highway (Figure 1). SJC holds a unique, island-based tradition of small-scale farming that originated in the homestead culture of the late 1800s.

To maintain and support the agricultural heritage of the county, the SJC county commissioners created the Agricultural Resource Committee of San Juan County (ARC) in 2005 (Figure 2). The mission of the ARC is to protect and restore agricultural resources in SJC (San Juan County, 2005). The ARC is composed of farmers and representatives from many organizations working to support agriculture in SJC. The ARC seeks to achieve its mission by advising SJC Council on relevant agricultural issues; identifying emerging opportunities; informing and educating elected officials and local citizens about the importance of agriculture; promoting programs, initiatives, and policies that strengthen and expand the agricultural economy; and effectively advocating on behalf of local farmers.

In 2011, the steering committee for SJC Agricultural Strategic Action Plan with representation from the Agricultural Resources Committee (ARC) of SJC, the SJC Land Bank, the San Juan Preservation Trust, Washington State University Extension, and Mulno Cove Creations, prepared an agricultural strategic action plan for the county. The plan identified key goals and strategies to prioritize the preservation of farmland and to generally strengthen agriculture in SJC. The report concluded, "As a result of this strategic planning process, it is clear that success in protecting farmland will ultimately be defined not only by the amount of farmland conserved, but also by the productive, profitable, and sustainable use of that farmland by local farmers, thereby contributing to a strong, diversified economy that benefits farmers and their community, while also building a viable and resilient local food system" (Bill, Clark, Hover, Jagel, & Pratt, 2011, p. 10).

Building off a number of key priorities identified in the agricultural strategic action plan and a

Figure 1. San Juan County, Washington, Cropland Data Layer, 2016.



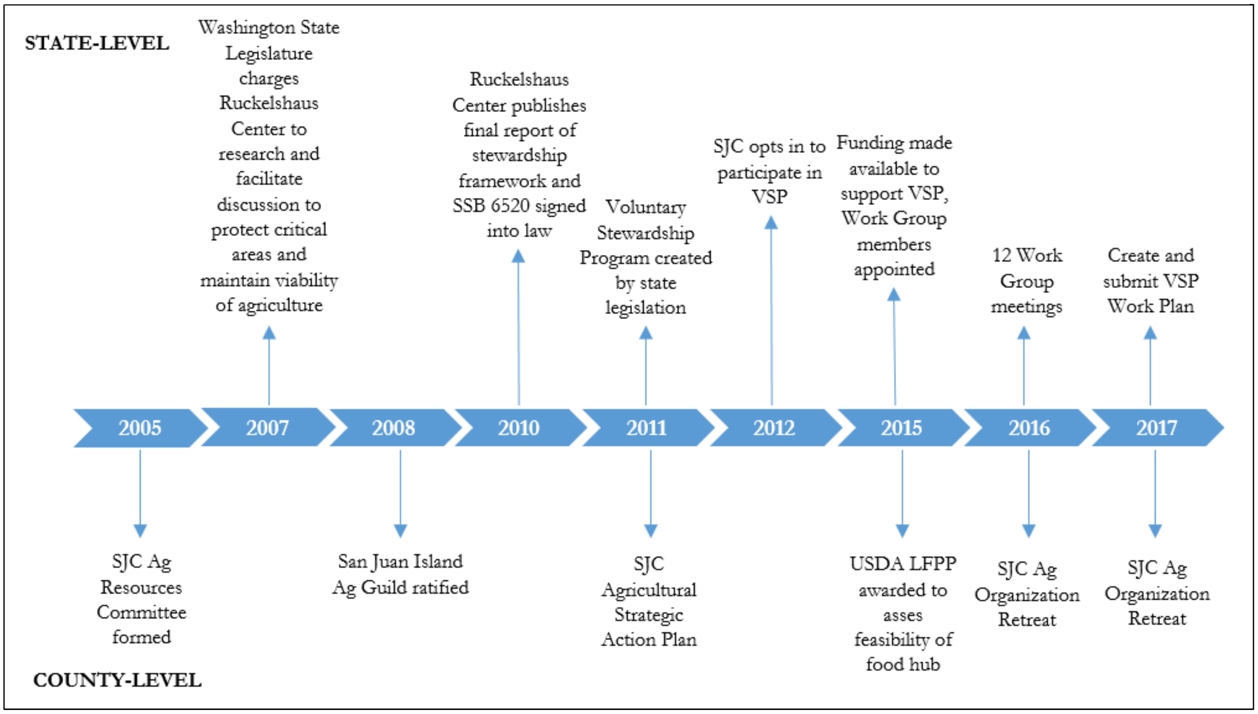
Source: USDA NASS (2016).

community needs assessment by the Community Foundation of the San Juan Islands (2015), the San Juan Islands Agricultural Guild, applied for and was awarded a USDA Local Food Promotion Program (LFPP) grant in 2015. Working in collaboration with the ARC, the Orcas Food Co-op, Northwest Agriculture Business Center, and Washington State University (WSU) Extension, the San Juan Islands Agricultural Guild intended to use the grant to assess the feasibility of establishing a food hub to coordinate the sales and distribution of food produced in San Juan County. The goals of the project were to increase food security, diversify and strengthen the local food economy, and promote access to healthy and sustainably produced foods.

As part of the feasibility study, the project team surveyed 80 San Juan County stakeholders, including 37 farmers, 28 food purveyors, five food manufacturers, four local distributors, four nonprofit organizations, and two public institutions. The purpose of the survey was to assess interest and willingness to utilize a food hub; it included questions about sales and market channels. In all, the survey results clearly showed SJC farmers' need for support in accessing new markets. As a result of the study, in addition to other work in the community, stakeholders wanted to conduct an assessment of the economic impact of agriculture in the county. They believed that understanding and effectively communicating the economic impact of

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

Figure 2. San Juan Count Voluntary Stewardship Program Timeline at the State and County Level



Abbreviations: SJC: San Juan County; VSP=Voluntary Stewardship Program; USDA LFPP=U.S. Department of Agriculture Local Food Promotion Program

local agriculture could play an important role in securing additional support for agriculture and affecting future policy decisions in the county.

In early 2016, the ARC convened an Agricultural Organizations Retreat with participation from 16 organizations in SJC. Goals of the retreat included identifying short- and long-term priority issues and projects, aligning efforts and resources to reduce redundancies, and increasing collaboration and resource-sharing to work toward common goals. Participating organizations were asked to fill out a questionnaire prior to the retreat to describe their mission as it relates to agriculture (Table 1).

While work continued at the county level, there were efforts at the state level to address tensions between agricultural and environmental groups. In 2007, the Washington State Legislature charged the Ruckelshaus Center—a joint effort of Washington State University and the University of Washington established to foster collaborative public policy in the state of Washington and the Pacific Northwest—to examine the tension between maintaining viable agriculture and protecting Critical Aquifer Recharge Areas (CARA), as defined by the state's Growth Management Act (GMA), which includes wetlands, fish and wildlife habitat conservation areas, geologically hazardous areas, critical aquifer recharged areas, and frequently flooded areas (San Juan County VSP, 2018). The GMA was passed in 1990 and 1991, and requires all counties to establish ordinances to protect critical areas. After the GMA became law, several counties exempted agriculture from their critical area ordinances, but legal challenges from environmental groups in the early 2000s ended the exemption.

The result of the Ruckelshaus Center report was the Voluntary Stewardship Program (VSP), enacted by the state legislature in 2011. The goal of the VSP is to provide an alternative approach for counties to address growth management requirements for agricultural activities. The program uses a watershed-based, collaborative stewardship planning process, relying on incentive-based practices that protect critical areas, promote viable agriculture, and encourage cooperation among diverse

Table 1. Participants in the 2016 SJC Agricultural Organizations Annual Retreat

Organization Name	Mission as it relates to agriculture
San Juan Island Food Co-op	To provide access to local and regional food and goods that are organic, sustainable and fairly produced with the smallest carbon footprint. The Co-op encourages conscientious consumption and nurtures community connections.
San Juan Island Transport Service	To link farmers and producers to markets with transport of goods.
San Juan Islands Agricultural Guild	To foster a vibrant, resilient and sustainable local agriculture and food system in San Juan County.
Northwest Agriculture Business Center	To support the economic sustainability of farms in Northwest Washington.
Orcasong Farm	To promote regenerative land stewardship, holistic community development, environmental advocacy, & ecological awareness through education, demonstration, mindful leadership development, and the incubation of ecologically responsible commercial enterprises.
SJC Food Hub	To coordinate sales and distribution of local food in SJC.
Thrive San Juan Islands/Thriving Salish Sea	To amplify the efforts of Thriving Communities initiatives (food, shelter, economy, healthcare, water, etc.) for greater engagement and learning from/about/with one another. Leadership and organizational resources, potential for collaborative funding and community-of-practice development are beneficial to serving the whole system.
SJC Agricultural Resources Committee	To restore and protect agriculture in SJC.
San Juan Islands Conservation District	To work with land managers to develop and implement sustainable land-use practices that protect and conserve SJC's soil, water, and natural resources for farming, forestry, and wildlife.
San Juan Islands Visitors Bureau	To support a sustainable food & farms community through promoting events and businesses to travelers who love the San Juan Islands and are looking for local culinary travel experiences that support local farmers, restaurants and artisan food producers.
Washington State University Extension	To provide practical research-based information to the public.
SJC Land Bank	To preserve agricultural land in SJC.
Farmers Collaborative	To increase communication between all Island farmers, create a network of support and information sharing, and create a more singular voice to advocate for our needs.
Orcas Food Cooperative	The Orcas Food Co-op exists so that owners, customers, food producers and the Orcas Island Community will have: 1. Equitable and affordable access to high quality, local and organic foods that support diverse nutritional needs. 2. A sustainable local food system with strong regional connections. As a cooperative, we also operate according to the cooperative principles, which include cooperation among cooperatives and working for the sustainable development of our community.
SJC Economic Development Council	To strengthen and diversify the economy of SJC. We believe a strong economy builds a strong community. The EDC works to build an environment that helps business owners create jobs. We serve business: linking organizations and resources, providing valuable information, rendering assistance and advocating for an improved island business environment.
Lopez Community Land Trust	To provide permanently affordable access to land for such purposes as quality housing, sustainable agriculture and forestry, cottage industries and co-operatives by forever removing the land from the speculative market. Develop and exercise responsible and ecological practices, which preserve, protect and enhance the land's natural attributes. Serve as a model in land stewardship and community development by providing information, resources and expertise.

Note: The groups in bold participated in the ARC Agricultural Organization Retreat in early 2016.

stakeholders. In 2012, SJC became one of 28 counties in Washington State that opted to participate in the VSP. Since all of SJC is designated as a CARA, the VSP applies to all agricultural activities in the county. For this reason, baseline data becomes not only essential for the development of sound VSP benchmarks and goals, but also valuable for current and future assessment of other ongoing and emerging agricultural and local food initiatives in the county. Funding to implement the program did not become available until 2015.

The intent of the VSP statute is to protect and enhance critical areas where agricultural activities take place while maintaining and improving the long-term viability of agriculture. Yet early documents from the Ruckelshaus Center fail to define what is meant by agricultural viability (The William D. Ruckelshaus Center, 2007; 2008; 2010). It was not until September 2016 that the Washington State Conservation Commission suggested its first definition of agricultural viability (Washington State Conservation Commission, 2016a). This first definition was quite narrow and simply defined viability as a farm's ability to meet its financial obligations. By November 2016, this definition for agricultural viability was vastly expanded to include the spatial, economic, temporal, and environmental components presented in the literature review (Washington State Conservation Commission, 2016b). The expanded definition was adopted by the Washington State Department of Agriculture, the Washington State Conservation Commission, and Washington State Farm Bureau. These same agencies stressed that the definition was meant to be a starting point and that the statute did not include specific language defining viability. County-specific work groups would be expected to agree upon their own definition and would be responsible for demonstrating how they would maintain and enhance agricultural viability, as they defined it, 10 years after adoption of the statute.

As funding to support the VSP became available, the county established the Watershed Work Group in December 2015 to develop an action plan. The work group included representation from seven organizations that also participated in the ARC Agricultural Organization Retreat (whose names are in boldface in Table 1). The retreat provided a valuable foundation for collaborative efforts moving forward. In addition to the seven organizations that attended the retreat, the SJC Council appointed representatives from 11 farms, one resource management organization, three county departments, one environmental organization, and three tribes to the work group (San Juan County VSP, 2018).

The work group was charged with developing a ten-year work plan specifying the purpose, goals, and measurable objectives for enhancing agricultural viability while protecting critical areas in SJC. Between January 2016 and October 2017, the group met 12 times as a whole. In addition, two subcommittees were established to discuss and work out the details of the critical areas and agricultural viability components of the plan. The work plan focused on establishing a baseline and monitoring approach to conserve critical landscapes and to maintain and improve the long-term viability of agriculture. Under the VSP, agricultural producers can voluntarily develop an individual stewardship plan. There is no penalty for producers who choose not to participate. The VSP is incentive-based and does not restrict new or existing agricultural activities. The San Juan Islands Conservation District (SJICD) was designated as the technical assistance provider to the VSP and is responsible for the VSP monitoring and reporting at the watershed scale.

In 2016, one of the work group participants and the co-author of this paper reached out to one of the team members that helped to develop the USDA Toolkit. The co-author was seeking assistance in guiding and enhancing the capacity of the work group to make more deliberate and credible measurements of viable agriculture in SJC. Together they organized a training for the VSP Work Group Agricultural Viability Subcommittee (Subcommittee) on March 10, 2017, in Friday Harbor, Washington. There were 15 attendees. The training reviewed the first four modules of the Toolkit: (1) framing your community economic assessment process, (2) using secondary data sources, (3) generating and using primary data, and (4) engaging your community process with data.

Framing the Community Assessment Process: Defining the Parameters

As a first step, in line with the first module in the USDA Toolkit, the SJICD proposed a logic model to help frame the community process and define the parameters of the VSP. The logic model included two strategic goals of the VSP (maintain and improve the viability of agriculture, and protect and enhance critical areas) and highlighted the relationship between them. The logic model included potential objectives, benchmarks, and metrics (Figure 3).

The SJICD sent the draft model out to the work group and solicited feedback. Some of the feedback was incorporated into the model, which was captured in red. The logic model was a starting point from which in-depth conversations continued to occur. Work group members struggled with three major challenges between 2016 and 2017: (1) assembling the right team, (2) defining agricultural viability, and (3) delineating the boundaries of the project. The results of this process are presented in the SJC VSP Work Plan (SJC VSP, 2018).

The first challenge confronted by the work group was making sure the right people were around the table. As one working group member noted, "The Conservation District is the logical primary technical assistance provider for VSP goal number two [Protect and Enhance Critical Areas in Areas with Ag Activities]. VSP goal number one [Maintain and Improve Long-term Viability of Agriculture], however, extends beyond resource protection and includes objectives related to agricultural production, infrastructure, and economics. It would be logical to involve agencies that specialize in research and providing technical assistance on such topics, for example, WSU Extension, the SJC Economic Development Council, and the SJC

Figure 3. April 2016 Voluntary Stewardship Program Agricultural Viability Goal and Benchmarks Logic Model

Strategic Goals	Objectives to Achieve Goals	Benchmarks and Metrics: What to Measure	Benchmarks and Metrics: How / Who	Benchmarks and Metrics: 2016 Baseline Data
Maintain and Improve Long-term Viability of Agriculture	• Maintain/increase Ag production • Maintain or increase designated Ag land • Maintain/increase participation and implementation of conservation practices to enhance Ag activities • Maintain and improve a vibrant Ag economy • Assess adequate Ag infrastructure (Define infrastructure, inventory, and ID gaps) • Provide technical assistance and information	• Available financial incentives • # of Ag operators • # of Resource Management Conservation Plans (Farm Plans) • Acres of land in Ag production	• Parcel Level—Technical assistance: acreage in Ag production, # of people provided assistance for VSP • Watershed level – Conservation District; # of Farm Plans participating; Reporting requirements • Promote Ag. Economy - ARC, WSU, Ag Guild • Education – partners	• Estimated acreage of Ag activities: xx acres • Growing Our Future 2011 • USDA census (2012): • # of farms: 274 • Land in farms: 15,669 a. • Market Value of Ag Products: 4,245,000 • Average size of farm: 57 acres • Median size of farm: 26 acres
Protect and Enhance Critical Areas in Areas with Ag Activities	• Maintain/increase participation and implementation of conservation practices to protect and enhance critical areas • Fish and Wildlife Habitat areas: maintain or increase acreage of protected habitat • Wetlands: protect and enhance current functions • Critical Aquifer Recharge areas: implement irrigation efficiencies, promote water conservation and water quality enhancement activities • Reduce geologic hazards • Protect and enhance floodplain area and function.	• Acres/stream miles of wetlands, riparian areas & fencing • Acres of fish & wildlife habitat protected or enhanced • Habitat/WQ ratings (NRCS tools) • Number of projects using water quality or quantity conservation BMPs (# of Catchments installed? Acre-feet of water stored annually?) • Participation: number of Farm Plans & types of conservation practices implemented (# of BMPs	• Parcel level Technical assistance: # of Farm Plans and types of conservation practices implemented, acreage affected • Watershed level Conservation District : acreage & #'s overall • Soil Health/Structure • Water Catchments (# of) • Climate change/ Adaptive Mgmt	• Estimated acreage of critical areas intersecting with Ag: • Geologic Hazard Areas: (xx acres) • Streams , Lakes and ponds (xx lineal feet?) • Wetlands: (xxx acres) • Frequently Flooded Areas (xx acres) • Salmon – streams and nearshore (FWHCA) • Aquifer Recharge mapping • Other FWHCAs – in process

Source: San Juan Islands Conservation District, 2016a.

Agricultural Resources Committee. I also believe that the VSP could become a more collaborative, holistic effort involving teams of specialists and mentors who work with farmers collaboratively" (Comment 43 from SJICD, 2016b). This quotation summarizes the need to assemble a solid leadership team for the study that incorporates a broad range of skill sets, expertise, and perspectives (Thilmany McFadden, 2016). All the organizations noted in the quotation were eventually asked to take part in the VSP process to some degree.

The second challenge was coming up with a shared understanding of agricultural viability. As one member of the work group put it, "Interestingly, there are some stark differences in how some of us on the Subcommittee interpret what exactly it is that we are supposed to be doing with VSP and Ag Viability." This member then went on to explain the role of the Toolkit in bringing the group together around a shared understanding of agricultural viability. The Toolkit includes questions to help team members clarify definitions and data needs for establishing the relationship between the project objectives and economic and non-economic objectives. One of the central challenges the work group faced was whether to focus exclusively on the more quantifiable economic metrics of viability or to also include the often intangible social viability of agriculture, like those noted by Scott (2003) in Nova Scotia. The work group concluded that agricultural viability includes:

- Economic Prosperity: Support a thriving and viable local farm economy that increases profitability of local farmers.
- Farm Retention and Expansion: Maintain and increase the number of acres and/or farms in long-term commercial agricultural production by making farmland available and increasing the capacity of farmers.
- Farm Stewardship and Sustainability: Maintain and increase healthy agricultural natural resource systems that are adaptable to climate change.
- Supportive Regulatory Environment: Establish a supportive regulatory environment.
- Agricultural Ethic: Increase the social value of a local food system (San Juan County Voluntary Stewardship Program, 2018).

The work group recognized that many factors that contribute to agricultural viability are beyond local control, particularly climate and global events. As a result, progress toward the agricultural viability goals will be monitored every two years through a survey of producers. Unlike performance metrics associated with critical areas of protection, measures for agricultural viability are not tied to measurable benchmarks. Progress toward attaining agricultural viability goals and strategies will not be used to determine success or failure of VSP but rather to inform future adaptive management strategies.

The third challenge was drawing boundaries around the scope of the study. The work group had a clear geographic boundary, SJC, which helped with secondary data collection, but struggled with the "level of analysis" (Thilmany McFadden, 2016). Some work group participants wanted to include operations that do not sell their products, such as personal or hobby farms, while others wanted to only include producers engaged in market transactions. The work group decided that its assessment of agricultural viability needed to encompass all forms of agriculture, including family and community food systems that are not part of the marketplace.

The Toolkit was a crucial resource for the work group in the early planning stages of the process. The Toolkit would also prove useful in the data-collection process. After making these decisions, the next step in the VSP process was collecting data to assess progress toward agricultural viability goals.

Using Secondary and Primary Data Sources

The Toolkit provides resources to help community groups identify and access available secondary data sets, evaluate key strengths and drawbacks of datasets, decide when primary data is necessary, and what to do once the decision is made to collect primary data. During the 2017 Toolkit Training, much of the discussion focused on the pros and cons of primary versus secondary data collection. The training facilitators, Dr. Becca Jablonski from

Colorado State University and Samantha Schaffstall from the USDA, noted that community groups often jump to surveying producers. They suggested using available secondary data first and then developing primary data collection tools to most effectively fill those gaps. The workshop facilitators recognized that federal government data is not readily available and many community members performing assessments do not feel comfortable or do not know the best way to use the data to tell their story. After reviewing existing secondary data sources during the Toolkit training, including the USDA's Agricultural Census, the Local Food Survey, the Dollar Bill series, Food Consumption Intakes, and Consumer Food Expenditure, some participants still had concerns about the accuracy of the data. The training facilitators reviewed the methodology and sampling approach of the secondary datasets and encouraged participants to review the resources. In the final work plan, the work group used USDA Census data to help establish a baseline against which to measure agricultural viability.

Using secondary data from the 2007 and 2012 Agricultural Censuses, the SJC VSP Work Plan Report (San Juan County Voluntary Stewardship Program, 2018) describes general trends in SJC agriculture, finding,

> The market value of farm products has increased 17% since 2007. Reflecting a national trend, crop production has surpassed livestock production for the first time in the history of the USDA census data. The 2012 census also indicates that since 2007, there has been a 6% decrease in the number of farms, a 27% decrease in acres that are actively farmed, and a 23% decrease in the average size of farms. Farmers in San Juan County are making more money on less acreage. (p. 49)

In addition to the secondary data, the work group felt they needed the primary data provided by a survey.

As noted in the previous section, the VSP Work Group broke down agricultural viability into five subgoals: (1) economic prosperity, (2) farm retention and expansion, (3) farm stewardship and sustainability, (4) supportive regulatory environment, and (5) agricultural ethic. VSP Work Group members, SJICD staff, and the SJC ARC, in consultation with WSU Social and Economic Science Research Center and Dr. Mike Brady, WSU economist and survey specialist, created a survey using the subgoals. The survey was sent to established farms. Respondents were able to complete either a paper survey or web-based survey. The SJICD received 71 completed or partially completed responses from a list of 249 producers, for a response rate of 29%. The survey had 24 questions and collected information about number of acres leased or owned, market channels, lost sales, challenges to farming, future plans for farming, barriers to expansion, gross sales, net profit, and owner equity (ratio of debt to assets).

According to the survey results, the ability of local producers to find affordable, skilled labor is one of the greatest challenges farmers face in San Juan County. The survey found that the average age of respondents was 63 years old, which reflects an aging population of farmers and raises a potential concern for farm transitions. Farmers reported the total number of acres that they farmed in 2014, 2015, and 2016, revealing a 10% increase between 2014 and 2015. It should be noted that this is the total acreage from a subset of farmers in the county (71 respondents) and does not reflect total agricultural activity in San Juan County. Farming in San Juan County tends to be done on a relatively small scale. For example, the 2012 Census of Agriculture states that the median size of farms in San Juan County is 26 acres (11 ha), with an average size of 57 acres (23 ha). Statewide the median farm size is 24 acres (10 ha), with an average size of 396 acres (160 ha). The market value of agricultural products sold in San Juan County was US$15,492 on average per farm, according to the 2012 Census of Agriculture, while statewide the average per farm was US$244,859.

The SJICD will conduct the survey and collect data every two years, with guidance and input from the work group and stakeholders. Unlike the measures to assess the protection of critical areas, the measures for agricultural viability are not tied to measurable benchmarks. As a result, data collected through the survey regarding agricultural viability will not be used to determine the success or failure of the VSP, but rather to inform ongoing and future management activities. After survey implementation, the work group will determine if the agricultural viability goals are being met. If they are not, the work group will develop management processes with the intent to increase agricultural viability, and the findings will be shared with the broader agricultural community.

Conclusion

Defining and measuring farm viability is largely dependent on the goals of and resources available to the community, but the USDA Toolkit is a valuable resource that can help to coordinate these efforts. As one participant summed it up, "the VSP process was kind of crazy. When I feel lost along the way, I would check in with the Toolkit. It became sort of like a mentor." Instead of needing to create a whole new process from scratch, the Toolkit provided a roadmap. While SJC is unique geographically, many of the challenges the VSP Work Group confronted while creating the work plan are familiar to those working with multiple organizations to find common ground. Key to the success of this project and others like it is assuring that participants know that the project can have important implications for individual organizations and the entire community. It is also important to recognize the flexibility of the tool and that work group participants could be working on more than one module simultaneously.

Participants saw the VSP Work Group as a unique opportunity to increase the visibility of their local work at the state level. Further, as Koliba et al. (2017) found, this type of multi-organization collaboration gives participants the opportunity to strengthen their networks, allowing for improved information-sharing and for strengthening partnerships with organizations from a broad spectrum of fields, from economic development to tribal advocacy. Work group participants also felt that findings from the process could be valuable to ongoing work within their own organizations and could result in enhanced resource investment. The Agricultural Guild, for example, plans to use the findings from the viability survey for future grant proposals and as an evaluation tool.

At the same time, however, the Toolkit is not without its challenges. Some work group members were hesitant to use the Toolkit because it was intimidating and dense. The economic language can be difficult to grasp, and many felt that despite the Toolkit authors' attempts to utilize laypeople terms throughout, the document still was not very accessible. It was not until the in-person training that many of the work group participants saw the potential of the Toolkit. During the training, people had an opportunity to engage with the Toolkit and to ask questions. Considering how to create opportunities for communities to use the Toolkit that are not as costly will be important for the successful utilization of the Toolkit. There were also suggestions for changes in language and structure that might make the Toolkit more accessible, such as a more flexible organization of the modules. This type of change would recognize that sometimes communities will be moving forward on multiple modules simultaneously, but it is unclear how a change such as this could be reflected in the resource. Moving forward with the project, it will be important for the VSP Work Group to return to the Toolkit, recognizing the iterative nature of these types of projects.

Each of the organizations with representation on the work group share a common goal of creating a more robust food system. Supporting the economic viability of farms is central to that goal. Understanding how farmers are currently faring economically is a crucial step toward evaluating the impact of current efforts in the county and the development of future planning. The agricultural viability assessment study provides a benchmark and showed work group members the limitation of existing data and the difficulty of implementing a successful survey. The USDA AMS Toolkit played an integral role in supporting the VSP Work Group's efforts to create a meaningful definition for agricultural viability and to develop an assessment tool.

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

Special JAFSCD Issue
Economics of Local Food Systems: Utilization of USDA AMS Toolkit Principles
Sponsored by
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Building economic multipliers, rather than measuring them: Community-minded ways to develop economic impacts

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Submitted April 5, 2018 / Revised June 26, August 9, and September 6, 2018 / Accepted September 6, 2018 / Published online January 23, 2019

Citation: Goldenberg, M. P., & Meter, K. (2019). Building economic multipliers, rather than measuring them: Community-minded ways to develop economic impacts. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3), 153–164. https://doi.org/10.5304/jafscd.2019.08C.010

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Abstract
As co-authors of the USDA Agricultural Marketing Service's (AMS) Economics of Local Food Systems Toolkit featured in this special issue, we pose the question of whether standard input-output (I-O) modeling approaches are appropriate for use in community foods work. In this reflective essay, we discuss the underlying data used in the most common assessment tools and suggest that they are not precise enough for estimating the impacts of emergent small local food firms amid rapidly changing contexts, even when modified following generally accepted methodologies. Since the basis of I-O modeling is the understanding that the various sectors of an economy are linked—an output from one sector may be an input to another—we are proposing approaches that make these community linkages more visible to food system practitioners. We wish to advance the idea that placing the focus on *how communities build robust multipliers* may be a better use of resources than generating multiplier calculations that hold questionable value. We suggest that methodologies derived from social network analysis (SNA) will prove increasingly useful in the impact(s) discussion.

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Disclosures
Goldenberg and Meter were both paid as members of a team of authors of the original U.S. Department of Agriculture, Agricultural Marketing Service's (USDA AMS) Economics of Local Food Systems Toolkit. Goldenberg and Meter are both consultants paid by organizations utilizing economic, business, and social network analysis as means for furthering food systems and economic development.

Keywords
Community Development, Community-Based Food Systems, Economic Development, Social Network Analysis, Economic Impact Analysis, Economic Multipliers, Supply Chains, Value Chains, Value Networks, USDA Local Food Systems Toolkit

Introduction
Increased interest in local food systems over the last two decades has sparked investment in infrastructure and market development. This development has occurred at the consumer level (forward investments in community supported agriculture farms), the regional level (development of food hubs), and the institutional level (farm-to-institution programs). Economic impact analysis is often viewed as the essential tool for gauging the importance of these food systems investments. Government officials seek guidance in making development decisions and rely largely on commercially available input-output (I-O) models for weighing costs versus benefits and return on investment of development projects and programs.

While impact studies vary greatly in their approach and methodology, their conclusions are almost always the same: investments in local food systems yield positive economic impacts (Conner, Knudson, Hamm, & Peterson, 2008; Gunter & Thilmany, 2012; Hughes, Brown, Miller, & McConnell, 2008; Hughes & Isengildina-Massa, 2013; Mullinix et al., 2016; Tuck, Haynes, King, & Pesch, 2010;). Yet the magnitudes of these impacts and the methodologies used to derive them are a topic of debate. It is also not clear which types of food systems initiatives render the best returns on investment. Results can vary widely depending on the locale, the quality and quantity of the data available, the assumptions made, the different scenarios modeled, and the validity of the approach taken (Crompton, 2006).

Indeed, one strong motivation for producing the Economics of Local Food Systems Toolkit (Thilmany McFadden et al., 2016) was increasing criticism of the extent to which local food systems initiatives produce economic and community benefits, and how those impacts are determined—along with lingering concerns about whether economics should even be the primary tool for measuring success (O'Hara & Pirog, 2013).

Our intention in this essay is to provide practical guidance to community food practitioners while expanding the general discussion of impacts. We wish to emphasize that economic impact estimation can be a valuable tool in certain settings, but is not necessarily appropriate or adequate for community food systems work. In this essay, we use the term "multiplier" to mean economic multipliers.

We begin by offering a theoretical overview highlighting key strengths and limitations of economic impact modeling. We highlight a core insight that drives modeling: that local economic actors are linked. Expanding upon this understanding, we identify ways of making these community linkages more discernable to community members through visible representations, and we show there is an economic value to these connections. We report on the results of using this approach in partnership with economic developers. Finally, we offer an introduction to social network analysis (SNA), a methodology we are using to help community foods practitioners understand how to strengthen community multipliers. We give examples of this approach by summarizing research commissioned by a county food systems initiative, and we suggest that tools from SNA, including network mapping and showing how commercial networks are constructed, may prove increasingly useful in enhancing and in some instances reframing the food systems discussion.

Theoretical Basis for Economic Impact Assessments and Resulting Multipliers
To establish a theoretical basis, we begin by clarifying one definition. The term "economic impacts" is regularly misused in common discourse. Often the term is misleadingly used to identify "spending" (e.g., an expense to a school and revenue for a producer; an output) rather than the "impact of spending." For example, one might hear a school nutrition director describing the economic impact of a farm to school program in terms like this: "We made an impact of US$200,000 in new food purchases." A more technical definition of "impacts" would focus on how this expenditure rippled

through the local economy to create new jobs or personal income, as in, "Our investment of US$200,000 to buy local foods created an additional US$63,000 of income for local residents." In this example, the US$200,000 initial input is considered the direct impact, whereas the US$63,000 additional income is an indirect and/or induced impact, and the total impact is US$263,000, assuming these purchases did not displace existing local food trade.

To estimate these additional impacts (beyond initial spending), an economic impact assessment is needed. The most commonly used and commercially available models follow the same basic linear I-O approach and are considered the standard for economic development and capital investment discussions. They are typically applied to large firms or major industries operating in specific regions; they were not developed to assess small and hyper-local impacts, which are more typical of local food systems activities.

The basis of I-O modeling is understanding that sectors of an economy are linked: an output from one sector may be an input in another sector (for example, a farm may produce carrots that are washed, diced, frozen, and packaged by a nearby firm, and these may in turn be purchased by a school lunch program). Any change in an economy will have effects that are both direct (the farm sells carrots) and indirect (new jobs are created at the food processor). Furthermore, new jobs at the processing facility will lead to increases in household income, which in turn may lead to additional jobs in a service sector (medical personnel, for example) and increased local spending by employees (induced effects).

Impact calculations are often posed as an economic "multiplier." A multiplier is a measure of how many times a dollar earned in a given geographic area cycles through that locale before it leaves. For example, if an economic impact assessment (EIA) focuses on jobs, it might estimate the ratio of new jobs that will be created by an investment of a certain amount compared to employment found under prevailing economic conditions. To think about this in a more abstract way, a multiplier is the ratio of new outputs to new inputs.

At minimum, a multiplier must be 1.0. Such a result would mean that each dollar of new revenue leaves the community immediately. Tribal reservations often have multipliers close to one since so few goods and services are produced internally. If a given locale's multiplier were 2.0, this would mean that for each dollar of new revenue, one additional dollar is spent at other local businesses—a total of two dollars. A region of small farms and businesses that buy many of their essential goods and services from each other, and are closely connected socially, might enjoy multipliers as high as 2.6 (Swain, 1999; and personal communication, Feb. 12, 2001; Swain & Kabes, 1998), although this may only be a historical phenomenon given that the recent integration of the global economy has limited regions' abilities to produce for themselves. In the farm-to-school example presented at the beginning of this section, the output multiplier would be 1.3 (US$263,000/US$200,000).

Practical Limitations to Common Approaches

No economy can be fully modeled, since all models are inherently simplifications while economies are exceedingly complex. Simplifying assumptions must be made to make any calculations at all. For example, I-O models assume perfect supply and demand.[1] That is to say, for example, the modeling assumes that when demand for fresh fruits and vegetables increases, supply increases to meet this demand without prices changing. This is a faulty assumption, particularly in regard to local food systems. Locally produced food items can often be substituted by easily available produce (grapes may come from the farm next door, California, or Chile, or may be replaced by eating bananas from Costa Rica).[2]

A similar issue involves price differentials: if local farmers charge a premium for their products, consumers are free to turn to grocery stores for cheaper alternatives. Very few studies discuss the importance of price in their evaluation of food systems impacts, but some studies account for it

[1] The technical term for this assumption is "market clearing conditions."
[2] Many I-O experts attempt to account for these complexities by modifying standard data sets.

directly. Tuck, Haynes, King, and Pesch (2010) specifically address the issue of prices in their modeling of several farm-to-school scenarios, in which they adjust the model by raising tax rates as one way to account for increased food prices due to buying locally.

Furthermore, I-O models assume that unlimited supplies of inputs (e.g., raw materials, fuel, or subcomponents) are available. Real-life constraints on input supplies (such as land, water, and soil fertility) mean that actual impacts may be smaller than standard I-O models project. This is a recurrent theme in local and regional food systems assessments; consumers may wish to purchase more food from local farms, but land or water access costs are often prohibitive for a starting farmer to bear. There are often harsh limits to the pool of skilled or willing labor available, or to the infrastructure required to process and distribute foods within the community.

IMPLAN,[3] an I-O model developed at the University of Minnesota, is by far the most commonly used model for EIA. This is because it is relatively affordable and straightforward to use. It is the model most likely to be taught in academic settings and used in governmental decision-making. Moreover, advanced users are able to alter the underlying structure of the modeled economy, the data, and the manner in which impacts are calculated (Deller, Hoyt, Hueth, & Sundaram-Stukel, 2009). Accordingly, many consulting firms have adapted IMPLAN to create proprietary models. The USDA AMS Toolkit devotes considerable attention to customizing this base model.

Other common EIA methodologies are more complex and involve simulating the workings of an economy that is changing over time (economic simulation models, or ESMs). These models include computable general equilibrium (CGE) models and others. To ensure that the strengths of more complex economic modeling are not overlooked here, we offer a brief summary of these. These are discussed more fully in Lynch et al. (2015) and Goldenberg and Colasanti (2017).

ESMs include most aspects of linear I-O models and add even more features. They try to account for complexity, rather than being limited to simpler (linear) relationships. These can be used to estimate changes over a longer period of time and allow for more dynamic aspects of an economy to also change (such as prices). They are necessarily more complicated, requiring more time and resources to build, and sophisticated computer software programs to execute. As such, these are not as readily available or financially accessible as stand-alone I-O models. These models are also more difficult to customize.

Overall, I-O models such as IMPLAN are not only easier to use and construct, but they are also more generous in their results than CGE or econometric models. This means that practitioners and politicians alike often prefer the conclusions of I-O–based impact estimates, even if those estimates cannot be verified and will never be actualized.

Still, our core concerns are somewhat deeper. However refined these quantitative methodologies, and however useful I-O may prove when analyzing relatively stable larger industries and regional economies, the underlying I-O data used in the most common economic impact assessment tools are not precise enough for estimating impacts for emergent small food firms at the local level. This is true even if modified following the most advanced methodologies, as outlined in the USDA AMS Toolkit.

Typically, the data underlying I-O models are derived from state or national data sets. The "local share" is estimated by dividing these counts by population or regional income shares (Goldenberg & Colasanti, 2017; Lynch et al., 2015). While useful as broad approximations, these data are neither fine-grained enough to closely reflect actual local economic exchange, nor can they account for emerging local food firms that have sprung up since national data sets were compiled, or firms that are too small to show up in broader samples.

Practitioners often attempt to offset these limitations by gathering suitable local data through primary research. However, even when excellent data can be compiled from local firms, the ultimate modeling calculations rely heavily upon industry averages. For example, when a local food firm sells

[3] The acronym stands for "Impact Analysis for Planning."

to a wholesaler, modeling software still assumes the wholesaler conforms to industry averages unless the wholesaler has also supplied original data. This continues up the supply chain.

We also note that IMPLAN multiplier calculations do not include estimates of error. Often results are presented to several decimals despite the limits of the underlying data mentioned above, giving readers a misleading impression of accuracy and precision (Lynch et al., 2015).

Finally, and perhaps most importantly from a community development perspective, the results of an I-O based analysis have limited utility to community practitioners and stakeholders because the calculation process is often viewed as a "black box," using modeling equations that are not readily understood by community members or even systems-level stakeholders (Meter, 2011). The very people being studied seldom understand how I-O results were derived, although they are often asked to provide sensitive data to modelers and then to accept findings on faith.

Due to the complexity and cost of prevailing EIA models, a very real practical issue surfaces when considering the use of economic models in community foods contexts: Should scarce resources be allocated to economic impact modeling and modifying conventional models, or to building the foundation of local food trade? We suggest that community food systems practitioners across the U.S. have a limited need for traditional economic impact analysis, as stated above. We recommend that technical assistance professionals add alternative methodologies to their approach lest local-food-systems-as-economic-development strategies lose all credibility.[4]

A Signal in the Noise: Considerations and Alternatives for Interpreting the Value of Multipliers

At its core, a multiplier is a measure of the local economic context and its level of connectivity. The more that local firms and residents are interconnected and trading goods and services with each other, the longer a dollar is likely to cycle through the region, and the higher the multiplier. The same business (or investment) placed in different settings may yield quite different multipliers. Thus the crux of any impact assessment is not necessarily "how is output affected by a change to input?" but rather, "what are the strengths and weaknesses of the linkages active in the underlying economy?"

Thus the prevailing emphasis on measuring and quantifying economic multipliers is often misplaced. Because strong linkages are essential for strong multipliers, the emphasis should be placed on building larger multipliers by nurturing the growth of dozens of independent yet interconnected small businesses owned by local residents, and to foster local purchasing of locally produced goods and services.[5] In general, when a sector consists of larger firms, local multipliers (positive local economic impacts) are smaller (Swain, 1999; and personal communication, Feb. 12, 2001; Swain & Kabes, 1998).

Economic approaches that measure economic progress strictly from the perspective of the firm, or of the national economy, often overlook this reality. Attempting to create greater efficiencies—when viewed strictly from these perspectives—may indeed generate considerable surplus value[6] that can be diverted to what is often considered a "higher use"[7] (Lynch et al., 2015). Yet from the perspective of those communities, or their business networks, that have contributed to the creation of this surplus value without gaining financial reward, such a shift in resources amounts to an extraction of potential wealth (Hassebrook, 2006; Meter, 1990, 2003). Thus agricultural regions have adopted labor-saving technology in a devoted effort to promote national efficiencies, despite the

[4] In his 2006 paper, Crompton discusses how the practice of analyzing tourism events has lost its integrity since assumptions are not based on reality and projected impacts are not realized. He further wonders if tourism events themselves have any credibility in the eyes of community leaders after a decade of these questionable practices.
[5] This is endemic to the definition of a local economic multiplier. See also Goldschmidt (1978).
[6] Surplus value is created through selling a given good or service that either exceeds the actual costs of production including labor, or that generates a consumer surplus by being priced at less than what consumers would be willing to pay.
[7] While the authors do not necessarily subscribe to this concept, it is often assumed by prevailing economic theories that larger economic units can make better use of surplus value than can households or smaller firms.

fact that their children and neighbors need employment opportunities (Heffernan, 1999). In the process, rural youth have become "exports" to metropolitan areas (Meter, 1999, 2001). Moreover, although farmers have doubled total-factor productivity since 1969, net cash income from farming nationally has remained constant or declined when inflation is taken into account (Meter, 2004; USDA Economic Research Service, 2012, 2013). The only exceptions have been when external shocks drove short-lived commodity price spikes in 1973, 1979, and 2010–2012.

Additionally, extractive economic structures diminish the potential to create local wealth by removing resources from rural and inner-city locales. This has consequences not only for each locale, but also for the national economy (Carr & Kefalas, 2009). When local economic engines are weakened, labor availability and productive skills decline, and stored capital may be diverted to maintaining income flows, rather than toward new productive capacity (Meter, 2006). This creates a downward spiral in which resources increasingly flow to metropolitan areas, while draining rural communities (Carr & Kefalas, 2009; Meter, 1983, 1990, 2001; National Farmers Union of Canada, 2012). In recent years, political resentment toward financial centers has erupted in regions that felt undervalued compared to metro centers, leading to great political division and legislative stasis (Cramer, 2016).

The Economic Value of Connectivity

The driving force, and indeed the competitive advantage, of community-based food systems is relational trading—what some call "sticky" relationships. Examples are commerce based on mutual loyalties (community supported agriculture models that reduce farmer risk; slow money investments with reduced expectations of return; or differentiation and branding based upon personal, regional, mode of production [e.g., fair trade, organic, or sustainable], cooperative ownership, or other loyalties). Such transactions are not accounted for by conventional economic modeling, which assumes consumers are isolated and determined to increase individual economic benefits. Moreover, such sticky transactions are often marginalized by economic approaches that promote national efficiencies over regional capacity-building.

Recognizing relational commerce also helps broaden the impacts discussion beyond pure economics. Sociologist Cornelia Flora, in particular, has developed and applied a "resource capital paradigm" that lists human connectivity as one of seven forms of "capital," including natural, human, cultural, financial, built, and political capital (2004). While some people may recoil at the idea of having their social interactions considered a form of capital, placing social interactions and community commitments within a resource framework may help certain audiences understand the importance of social connectivity.

Economically speaking, the productive benefits of social capital are enormous. Research attributes many positive outcomes to stronger social capital: reductions in transaction costs (Putnam, 2000; Rydin & Holman, 2004; Sabatini, 2009); career success, product innovation, reduced turnover rates, entrepreneurship, and learning (Adler & Kwon, 2002); reduced high school dropout rates (Coleman, 1998); and higher rural quality of life (Peters, 2017). Further, an individual's or firm's place within a network can predict certain rates of innovation (Powell, Koput, & Smith-Doerr, 1996), financial success (Shipilov & Li, 2008), better jobs and faster promotions (Burt, 1992), and societal power and influence (Brass, 1984).

At a community development level, civic engagement is strongly correlated with economic development. In fact, in his study of Italy, Putnam argues that civic engagement is not a function of wealth, but instead that economic development and effective government are consequences of social connectivity and capital (1993). Since the economic multiplier is a measure of how many times a dollar "turns over" inside a given geography before leaving, one would expect that the stronger the sense of community connectedness, the greater the likelihood that financial transactions will cycle money among community members (Meter, 2011).

This evidence suggests that local economic development is correlated with, if not also dependent upon, community development and social connectivity (social capital). It is, therefore, possible to make a solid case for estimating economic impacts by measuring connectivity, particularly in regards to local food systems development, where so much is predicated on social connections and community commitments.

Measuring Connectivity and Showing How to Strengthen Multipliers Through Network Analysis

Although the authors of this essay inserted language into the Toolkit introducing SNA as an alternative methodology for assessing economic impacts, resource constraints meant this theme could not be fully developed in the first edition. SNA assesses the extent and strength of relationships in a given network. However, there are very few studies, to date, using SNA to focus on economic relationships, and very little support for characterizing and increasing social capital as a development strategy.

The primary components of an SNA are linkages and nodes, where nodes represent individual people or entities (such as a business or a website) and linkages are the relationships between any two nodes. These can be portrayed both qualitatively, as a map of network connections, or quantitatively, as analytics. For example, estimating which nodes offer the strongest connectivity, calculating how efficiently information can be transmitted through the network, or estimating the closeness of the connections across the network are all possible outcomes of an SNA.

SNA practitioners typically focus on three dimensions for assessing the strength of network interactions:

(1) Does this social or commercial connection involve financial exchange?
(2) Does the respondent routinely share information with this connection?
(3) Would the respondent turn to this connection when advice or support is desired? (Goldenberg & Colasanti, 2017; P. Ross, personal communication, July 4, 2013)

If questions are well crafted, researchers may learn a great deal about the degree to which feelings of trust and respect are reciprocated in a given network.

Data are collected largely first-hand, through surveys and interviews, and then the study team determines the resulting metrics using software that quantifies the character of network relationships (Borgatti, 2002; Borgatti, Everett, & Freeman, 2002). Likely indicators include total spending inside and outside of the defined region, number of suppliers and number of customers inside and outside the defined region, relative size of those various accounts, plus any number of social indicators, such as trust, commitment, and reciprocity, and which entities trade with other entities or do not. Simply viewing a network map can lend significant insights into how to leverage relationships to open up additional markets or supply chains. One may learn that a seemingly well-connected person is only weakly trusted, or vice versa (Dunne & Shneiderman, 2013). Possible pathways for competition and/or collaboration also become visible (Klimas, 2015).

Furthermore, because SNA extends beyond financial exchanges, it gives voice to many of the visions and values that underlie local food systems work in the first place. By making social and commercial networks visible, SNAs help illuminate the mechanisms by which economic multipliers are built.

Applications of Network Analysis

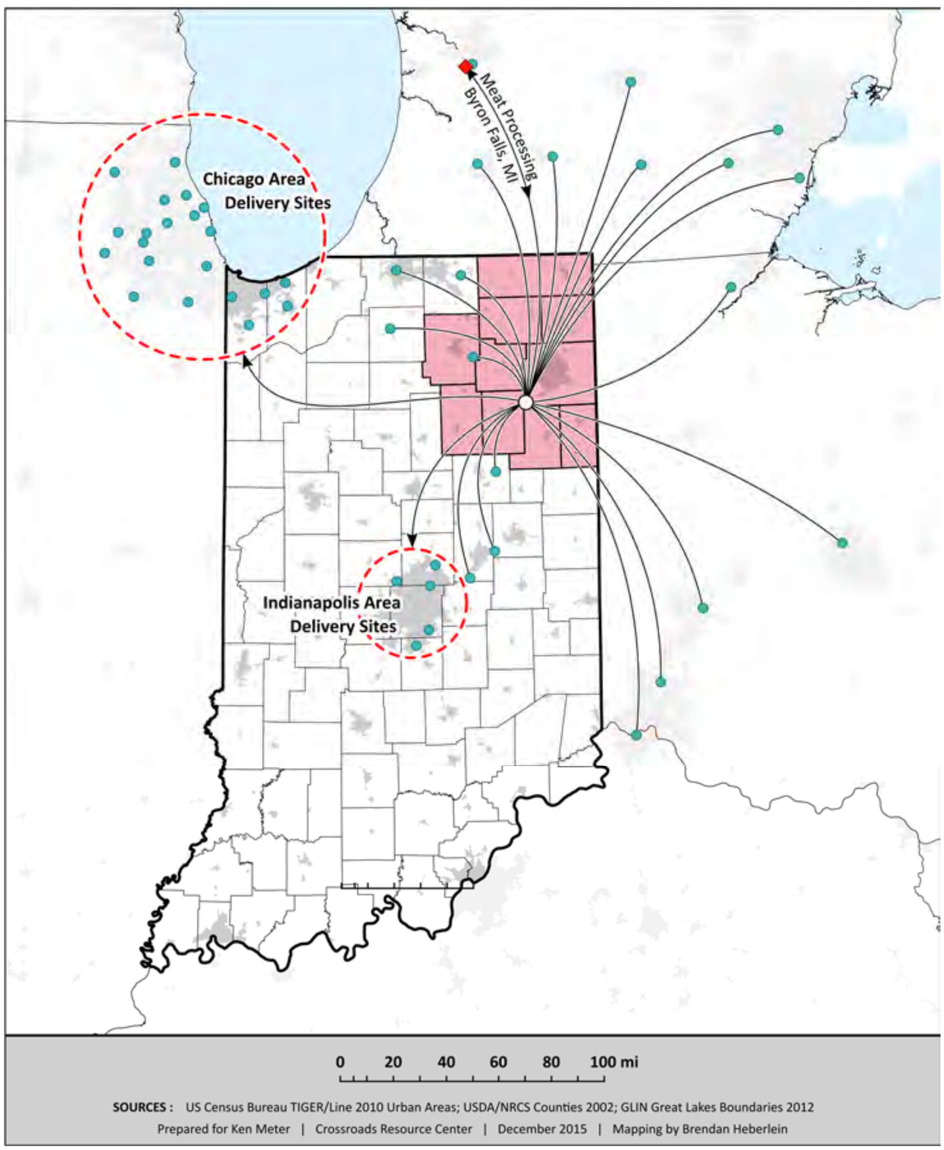
In northeast Indiana, economic development officials in an 11-county region sought assistance as they constructed a regional local foods network. Past experience had led these developers to lose interest in economic impact calculations. Pursuing business-clustering strategies, they had worked diligently for more than two and a half years to engage commodity farmers and processors in collaborating to expand value-added opportunities. In the meantime, the manufacturers lost interest in the discussions, viewing each other as competitors for national markets. A consultant was brought in to suggest alternative strategies. After interviewing several innovative farmers who grow food for regional markets, the connections they had built with household consumers were documented. One farm had assembled 5,200 addresses in its e-mail list, delivering food orders directly to 45 locations. When mapped (see Figure 1), these drop sites showed that locally oriented farmers had effectively built collaborations even as manufacturers refrained from participating, suggesting that strengthening such internal networks offered robust development opportunities (Meter, 2016).

When economic developers viewed these maps, they instantly saw both the strengths and gaps in these farmer networks. These farms were highly profitable because they had adopted intensive production methods and built strong support among consumers with expendable incomes. Yet the map also made clear that the farmers' main customers lived in the metro areas of Chicago, Detroit, and Indianapolis, rather than nearby Fort Wayne. The developers saw that farmers had already built robust business networks that the developers had overlooked by considering farms as outsiders to local business circles. As a result, the developers opted to partner with local farmers, and also to pay greater attention to urban residents, especially in lower-income areas.

In this case, mapping a network produced strong strategic insights, showing where connectivity already existed and where it still needed to be built. While much simpler than a full-fledged SNA, this exercise provided solid insights to developers seeking to strengthen local economic exchange.

This work in northeast Indiana laid the foundation for extending the application of SNA to economic impact discussions. In early 2018, we successfully applied SNA in Maricopa County, Arizona, in collaboration with Paula Ross, a retired researcher from the University of Toledo. We worked at the request of the Maricopa County Food Systems Coalition, which asked us to document the growth in social and commercial networks that has resulted from community foods work. We performed detailed interviews with 33

Figure 1. Map of the Commercial Network of Delivery Sites Developed by Seven Sons Farm near Fort Wayne, Indiana



food system practitioners selected by the council, asking each interviewee to name the five individuals or firms they turned to most for information, advice, or financial trade. The resulting network maps show clearly that farmers who raise food for local markets are relatively isolated from civic leaders, policy discussions, and each other (Meter, Goldenberg, & Ross, 2018). By layering these network maps, we illustrated how local stakeholders could bring farmers into stronger commercial networks. The maps showed that food buyers and nonprofits play key roles in connecting farmers to a broader public and marketplace, and that farmer organizations played a limited role in connecting farmers to social or commercial networks in this marketplace.

Enthusiastically received by Maricopa County Food Systems Coalition members, these network maps formed the basis for strategic recommendations on how to build local food trade, thus building local economic multipliers. In this individual study, we determined that the network maps themselves were more valuable than their associated quantitative calculations. In part, this is because these quantitative calculations are determined through opaque methodologies based on insufficient primary data (echoing our concern about I-O calculations). Thus, our reporting only contained the network maps.

Conclusions and Recommendations

The limitations and costs of performing comprehensive economic modeling, and the lack of transparency inherent in software-generated calculations, suggest that alternative approaches that are easier to measure, comprehend, and communicate will be highly valuable to economic impact discussions at a local level.

When models do not accurately reflect the realities local practitioners face or the values that motivate their work, this leads to heightened concern (from the perspective of local firms or community members) that the money spent modeling might be better spent in actually building the local food system until its size justifies modeling. This is especially true since, in these early stages of development, any dollar allocated to performing assessments is a dollar that could have been spent launching local foods initiatives. In our experience, the most useful and inexpensive way to help groups (1) establish stronger linkages that actively create higher economic multipliers and (2) build infrastructure that creates local efficiencies in local food trade is to make social and commercial networks more visible.

While the USDA AMS's Toolkit acknowledges the need to consider additional values and benefits beyond economic growth, it concluded that alternative methodologies and evaluations were beyond its scope. This essay offers one opportunity to expand that discussion. While SNA is currently a difficult concept for many economic developers or investors to embrace, our professional experience suggests this is an important discussion to open up.

As one research team that used the Toolkit put it, the most valuable question on the data collection survey was about how the study partners could best support the farmers' work. They added that by "dedicating a lot of energy to capturing economic impact assessment data, it became clear that there's more to it [food systems development] than that, economic impacts is an inferior way to measure values. You don't measure all the outcomes of policy work with just economic impact assessments" (J. Weiland & M. Rahe, personal communication, March 2017). Placing more emphasis on additional outcomes, such as social connectivity, and creating additional toolkits to evaluate and improve them is a logical next step for food systems development leaders.

Transparency is also key to building trust among community members. This is the most significant element in building lasting community-based food systems. When local residents can easily procure organic produce from a nearby superstore, it is primarily their dedication to, and trust in, local farms that encourages them to pay upfront for a CSA share, or to purchase food at a farm stand, even if farm gate prices are higher. Showing how networks are constructed and helping leaders to both strengthen this collaboration and build economic exchange are a faster path to building trust —and even to building multipliers—than accepting quantitative data from a black box. Thus we have begun challenging developers to think differently about estimating local economic impacts.

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

Making change through local food production: Calculating the economic impact of your local food project

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Submitted April 11, 2018 / Revised August 20, and September 26, and October 3, 2018 / Accepted October 3, 2018 / Published online January 23, 2019

Citation: 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

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Abstract

Given the growing interest in local food systems and the complexity of modeling the economic impacts of such systems, the Local Food Impact Calculator (LFIC) was created to provide a simple but methodologically sound tool to assist practitioners. In this paper, we cite four examples, along with discussion of each, to illustrate both the use and application of the calculator, as well as to provide additional insights into using the calculator. Readers will learn that economic impact analysis provides information about industrial linkages in the local economy, and how to understand the implied multiplier's value from the LFIC in the context of their local economy. When used carefully, the LFIC can be a useful tool for use in community conversations around local foods.

Keywords

Local Food, Input-Output Model, Economic Impacts, USDA Local Food Systems Toolkit

Introduction

With many people believing that more localized activities can improve environmental outcomes, enhance public health, and increase a community's resiliency to external and natural risks, there has been growing public interest in regionally focused food systems (Martinez et al., 2010; Stickel & Deller, 2014; Thilmany McFadden & Low, 2012). These issues include improving environmental outcomes, providing market access and sustainable financial models for small and mid-sized farms,

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Funding Disclosure
Funding was provided by U.S. Department of Agriculture National Institute of Food and Agriculture Award Number 2014-68006-21871.

enhancing public health, increasing a community's resiliency to external and natural risks, and supporting community-based economic development strategies (Martinez et al., 2010; Stickel & Deller, 2014; Thilmany McFadden and Low, 2012). In recent years, the local foods movement was ranked as a "top story" by several food industry media outlets, including the Packer,[1] a fresh produce news outlet, and the National Restaurant Association's annual What's Hot list.[2] Farmers markets, along with community supported agriculture operations (CSA), roadside stands, and direct-to-restaurant sales, are all growing market niches, where the number of farms engaged in direct-to-consumer marketing grew by 17% from 2002 to 2007, and grew an additional 6% from 2007 to 2012, as measured in U.S. Census of Agriculture data every five years (U.S. Department of Agriculture, 2009; 2014). Subsequently, there is an increasing array of policies and programs targeted to support the development of food system innovations. Yet critics note that such programs are being put forth without adequate evaluation of how local foods will affect market performance and the welfare of key stakeholders, especially the small and midsize farms that many local food buyers may believe they are supporting with their dollars (Onozaka & Thilmany McFadden, 2011).

Quantifying the economic impacts and contributions of local and regional food systems and events within these systems has become more common as both public and private entities attempt to justify a commonly held belief that more localized food systems lead to positive economic gains to the smaller-scale producers and the communities in which they operate. Several challenges remain relatively untouched in regard to local food system research literature and outreach programming. For example, there is little consensus about the definition of local and regional markets (Martinez et al., 2010; Watson, Cooke, Kay, Alward, & Morales, 2017). Moreover, the Agriculture of the Middle research group[3] suggests that evaluating the economic impacts of more coordinated value added activities in local economies will likely vary depending on the ownership, governance, and operational model of the value added enterprise as well as spillovers to other sectors of the economy. Such complexity in defining local and regional markets, and diversity among initiatives, calls for careful development and execution of input-output–based economic contribution analyses. Previous studies on innovations and events within local and regional food systems have taken a more simplified view of the supply chain. Such a view warrants a more careful focus on how, for example, small and medium-sized farmers may produce differently than large-scale commodity producers, as the field moves forward.

Some studies have used input-output models (I-O) and investigated the economic impacts of a more localized food system on market players. However, most of these studies were based on surveys of markets and consumers and used data from sales and financial reports (Brown & Miller, 2008; Darby, Batte, Ernst, & Roe, 2008; Myers, 2006). More recently, studies have evaluated the impact of state-based food promotions using more theoretically based economic models (e.g., Carpio & Isengildina-Massa, 2010). But with a focus primarily on consumers' responses to promotions of local or state-based labels, such I-O studies may neglect supply-side implications related to the restructuring of supply chains. Others have begun filling this gap using a systemwide economic approach, which examines how consumers' response and the restructuring of the supply chain to smaller-scale production affect the welfare of consumers, producers, and agents along the supply chain, who could be the producers themselves (Hu, 2012). It must be noted, however, that each I-O study uses different assumptions, sometimes without the context of actual marketing and business models employed by producers or producer collaboratives, making their results difficult to compare and contextualize.

Increasing complexity of I-O analysis led to the development of the USDA Agricultural

[1] https://www.thepacker.com/
[2] https://www.restaurant.org/News-Research/Research/What-s-Hot
[3] http://www.agofthemiddle.org/

Marketing Service's "The Economics of Local Food Systems: A Toolkit to Guide Community Discussions, Assessments and Choices" (Thilmany McFadden et al., 2016), which guides organizations in regard to the type of data to collect, appropriate methods of data collection, and steps for analyzing the collected data. The AMS Toolkit helps address the issue of assumptions and standardization of methods, leading to comparable I-O results. However, Angelo, Jablonski, and Thilmany (2016) concluded that most organizations involved in local food system development do not have the expertise or data available to reasonably conduct an economic impact analysis, finding that only half of case studies on local food participants reported revenue, and less than ten percent reported detailed expenditure data on costs of goods sold or labor. Additionally, one must invest in the purchase of the IMPLAN data (currently US$800 per county) to fully utilize the AMS Toolkit. For a cooperative food hub that serves four counties, US$3,200 for a single report may be cost-prohibitive.

Therefore, even with refined methodologies in the academic literature and implementation guides to instruct users on developing their impact models, obstacles remain to building reasonable I-O estimates of local food system impacts. The Local Food Impact Calculator (LFIC), a freely available and simple-to-use online tool to estimate the economic impact of a food project, can provide methodologically consistent and comparable results across food projects but at a significantly reduced cost compared with IMPLAN. In this paper, we present four examples of the LFIC, discussing the results and value of its output, and then conclude by discussing the limitations of the calculator.

Literature Review

As noted in the introduction, the economic literature aimed at quantifying the impacts and contributions of local and regional food systems as well as the events of local food systems with input-output models has evolved quickly in recent years, but in a pattern that suggests there is no clear "standardized" approach or trajectory that the field is adopting as a best practice. This literature began with a simple approach, assuming that an increase in business conducted locally represents new spending in the local economy. Next, a layer of complexity was added when it began including spillover effects: the extra money spent in a local community, say at a farmers market, has both direct impacts for the farmers but also for the businesses surrounding the market that might see gains from increased foot traffic and patronage. Researchers also began to carefully delineate exactly how much of the spending in local and regional food systems could truly be considered an impact rather than a more locally derived contribution; that is to say, how much of the spending on local foods is a reallocation of existing income versus import substitution (an economic development method that decreases the importation of items by substituting locally produced goods). Incorporating these countervailing effects into the analysis could act to partially mitigate positive gains in a food system. The most recent innovations in the literature have utilized more complex modeling techniques, such as equilibrium displacement models (EDM) and hybrid models, where the latter combines multiple modeling techniques or modifies existing sectors in commercially available software such as IMPLAN. This evolution of the literature is discussed below.

The most straightforward and simple approach to estimating economic impacts and contributions is to assume that when more money is spent at a local business, spending leads to an economic gain for the community. Brown and Miller (2008) conducted a review of the literature on the impacts of farmers markets and community supported agriculture (CSA), an update of a previous study conducted by Brown (2002). This article highlights many of the studies in which impacts were estimated by taking the money spent at a farmers market, plugging these estimates into the economic impact modeling software IMPLAN, and providing an estimate of the total economic impact of a farmers market, including both direct and indirect impacts to the local community (examples of studies that use this methodology include Henneberry, Whitacre, and Agustini, 2009; Myers, 2006; and Otto and Varner, 2005). An implicit assumption made in these studies is that the spending at the farmers market represents new money introduced into the local economy, which is rarely the case. Another assumption made is that local food producers utilize the same production techniques as commodity-scale producers. Thus, some would argue these studies could both underestimate and overestimate impacts due to the simplicity of assumptions. For instance, the assumption that purchases at the farmers market count as "new spending" in the economy fails to acknowledge the competition that likely exists between the market and the local grocery store. In this case, disregarding this competition leads to an overestimation of the impact. Alternatively, only focusing on farmers market sales ignores the unique production practices associated with local food systems (e.g., they tend to be more labor-intensive) and could underestimate the impact. Thus, more thoughtful and complex scenarios were constructed to more accurately account for the net impacts associated with changes in local food systems.

The next evolution in this field of research added complexity by including spillover effects. Spillover effects of economic activity—the dollars spent within a region that are attributable to a given industry, event, or policy (Watson et al., 2017)—can be defined as either the positive or negative impact of a certain activity to members of localities and economic sectors that are not direct beneficiaries. There are two main types of spillover effects. The first type is when the economic activity of the industry or event in question drives more (or less) money to surrounding businesses, since it serves as a catalyst for patronage. For example, consumers who attend the farmers market located in a downtown shopping district may also frequent shops near the farmers market. The second type is related to the supply chain and occurs when a business or industry gains enough critical mass to induce input suppliers, or output users, to move to the region. With more of the economic activity staying local (or being able to be sourced locally if suppliers move in), the economic impacts or contributions are higher as less money is "leaked" out of the economy, known as "import substitution" in the academic literature.

Most of the research on the economic impacts and contributions of localized food systems has focused on the first type of spillover effects. Lev, Brewer, and Stephenson (2003) and Oberholtzer and Grow (2003) found that people who visit farmers markets end up spending additional money in downtown areas, bringing additional revenue to businesses in neighboring communities. Watson, Thilmany, and Kress (2006) found that the economic contribution of the Colorado wine industry included tourism impacts from tasting rooms and wine festivals, and that these tourism impacts were actually larger than those from the sale of wine. This difference was due to both the fledgling nature of the wine industry and the amenity-rich tourism regions where the wine industry was forming. Hughes, Brown, Miller, and McConnell (2008) studied the economic impact of farmers markets in West Virginia, using a combination of survey data and IMPLAN, to also model spillover effects by including tourism impacts from the market. O'Hara and Shideler (2018) found that increasing direct-to-consumer agricultural sales led to increased restaurant sales in metropolitan counties across four states. The second type of spillover effects, those related to supply chain innovations, have been explored in the context of value chain analysis (Day-Farnsworth, McCown, Miller, & Pfeiffer, 2009; Diamond & Barham, 2011; Matson, Sullins, & Cook, 2013; Stevenson et al., 2011), but have yet to be studied in the economic impact literature.

Including spillover effects helps mitigate the underestimation of effects, while the next innovation, accounting for countervailing effects, mitigates the potential for overestimation. Purchasing local food could simply be shifting purchases from one business to another; it may not fundamentally change the amount of money being spent in an economy (e.g., one consumer shifts her purchases of tomatoes from the local grocery to the farmers market). Similarly, when studying the impacts of increased local vegetable production, acres must shift from one land use to another, since new acreage is rarely created. The studies that take into account the countervailing effects and report net, rather than gross, impacts provide the best guidance for future research because of their consistency with economic theory. Examples of these innovations include Swenson (2006); Swenson (2010); Conner, Knudson, Hamm, and Peterson

(2008); and Hughes et al. (2008).

Swenson (2006 and 2010) use IMPLAN to measure the potential net economic impacts that could accrue to the state of Iowa if it were to increase selected fruit and vegetable production for all marketing channels. The studies suppose that if the farmland used to grow the fruits and vegetables were taken out of corn and soybean production, there would be countervailing supply-side effects from the lost corn and soybean production. Conner et al. (2008) use IMPLAN to study the economic impact in Michigan if residents were to increase fruit and vegetable consumption to the recommended levels by consuming Michigan-grown produce. Like Swenson, they assumed production shifted from existing crop acreage (albeit shifting to higher-value crops). Rossi, Johnson, and Hendrickson (2017) report net impacts of shifting production out of US$1 million worth of commodities and into US$1 million of produce for three regions in Missouri and Nebraska.

In another example, unlike much of the previous research on farmers markets, Hughes et al. (2008) incorporated countervailing demand effects, reporting the net impact of farmers markets rather than the gross impact. The net impact assumed that money spent at the farmers markets was money not being spent at grocery stores. Therefore, all economic gains were due to the larger multipliers for the farming sector compared to the retail grocery sector. (Multipliers are simply the ratio of the total output impact from the analysis to the initial event, or direct impact, being studied. They are a common way of describing the magnitude of change in the economy from an initial local change, like the emergence of local food sales.) Similarly, Gunter and Thilmany (2012) analyzed the economic impact of farm-to-school procurement using a similar approach, attempting to more accurately model local food procurement for a farm-to-school program by assuming demand simply shifts from wholesalers to producers in the region. The same positive shock occurring in the local farming sectors, because of retained ownership and higher returns to the producer, is made negative in the context of the wholesale sector.

Recognizing the complexity of local food systems and their interactions with the economy prompted more complex modeling approaches that allow for more dynamic changes to the economy, such as hybrid models that include modifications to the existing sectors in IMPLAN, and equilibrium displacement models. Because IMPLAN estimates are based on regional and sometimes national averages—and most likely represent past economic linkages—modification of IMPLAN sectors is necessary to accurately capture economic impacts and contributions of local and regional food systems due to unique ownership and operational models. Hughes et al. (2008) modified the farming sectors in IMPLAN to more accurately represent the noncorporate structure of small West Virginia farmers by reducing payments to the property income category and increasing payments to proprietors' income. Gunter and Thilmany (2012) utilized survey data to customize farming sectors to accurately reflect the much smaller and more diversified local food producer who provides most of the marketing and distribution services themselves. Schmit, Jablonski, and Mansury (2016) used survey data on labor time allocations collected from small-scale producers in New York to generate a customized, small-scale, direct agriculture sector for use in IMPLAN analysis.

An alternative to customizing the production data in IMPLAN is to exploit the existing data in IMPLAN's social account matrix, the table of transactions between industries and final consumers of output. The methodology, detailed by Miller, Mann, Barry, Kalchik, Pirog, and Hamm (2015) and Watson et al. (2017), does not require additional data or even segmentation of the local food sector from other agricultural production, although it does require access to IMPLAN or similar social accounting data (e.g., U.S. Bureau of Economic Analysis' RIMS II data). Not having to collect data from producers is appealing, though the consequence is that local foods become defined as any food product produced and consumed within the study region irrespective of the marketing channels used to get the food to its final consumer. (For example, all Michigan apples, whether sold to a Michigan resident at Walmart or the farmers market, would be considered local.) Using this general methodology, Watson et al. (2017) modeled local food systems as an import-substitution phenomenon, where it is assumed that if a local food system were not present in a region, then food would need to be imported and some of the production linkages within the region would be broken. In this way, the local food system potentially both creates more local economic activity by substituting for imported production, and simultaneously increases the local multipliers because more inputs are able to be purchased locally.

While the academic literature does provide important guidance for generating theoretically consistent and empirically sound analyses, the lack of consistency and burden of knowledge and resources required to implement them is significant. Additionally, these burdens make these studies inaccessible to either the local food participant and/or government official seeking validation of a project. The Local Food Impact Calculator was developed as a tool to balance the need for a legitimate and standardized method for estimating economic impacts of local food projects, while managing the costs to those seeking to utilize this form of evaluation. (While the Local Food Impact Calculator is free to use, it still requires time to calculate the appropriate value of the project's impact.)

Local Food Impact Calculator

Building on the existing literature, but with a nod to creating a tool that is simple to use, easily accessible, and methodologically sound, the Local Food Impact Calculator[4] (LFIC) seeks to provide a reasonable alternative to economic impact analysis for non-economists. Following the academic literature, the multipliers used to estimate project impacts were generated using a "local food" production function, computed from the average expenditures reported by farms with positive direct-to-consumer sales in the 2014 Agricultural Resource Management Survey (ARMS), Phase III. (The steps to generate a production function from survey data are detailed in Schmit and Jablonski, 2017, and in Module 7 of Thilmany McFadden et al., 2016, so they are not detailed here.) Since the social accounting data used to generate multipliers varies by region, the multipliers were generated for geographies representative of the types of region contained in the calculator. These regions include three counties defined by population (rural—fewer than 75,000; suburban—75,000 to 200,000; and urban—over 200,000), a multicounty region (a region with a population between 500,000 to 1,000,0000 containing an urban core and surrounding counties), two state-level regions (California, given its unique diversity and productivity in agriculture, is one state; all others are modeled separately), and a multistate region. The regions were constructed using regional purchase coefficients (the proportion of local demand that is supplied locally; RPCs) averaged across five randomly selected regions that fit the definitions used by the LFIC. In the case of the county-level models within the LFIC, county RPCs were averaged to create the respective LFIC county level regions. In the case of the multicounty region, the RPCs from counties that made up five randomly selected medium-sized metropolitan statistical areas (MSAs with a total population of 500,000 to 1 million) were averaged.[5] In this way, idiosyncratic differences that were specific to any one region were averaged out to construct the LFIC regions. The LFIC regions, therefore, represent "typical" or "average" regions for their respective categories. LFIC users are asked to select the region that best reflects the scope of their project. For example, if the local food project is focused on a particular county, users select the county type most similar to the location of the project. However, if the project includes multiple counties with an urban core, then the user is instructed to select the multicounty region. In this sense, the LFIC follows recommended practices from the literature while

[4] Available online at https://localfoodeconomics.com/benchmarks/impact-valuation/

[5] The counties that were randomly selected for small counties were Cortland County, NY; Atascosa County, TX; Franklin County, KY; Dearborn County, IN; and Columbia County, OR. The counties randomly selected for the medium-sized counties were Dubuque County, IA; Ashtabula County, OH; Hanover County, VA; DeKalb County, IL; and Carroll County, GA. The counties selected for the large counties were Cook County, IL; Maricopa County, AZ; Harris County, TX; King County, WA; and Prince George's County, MD. The medium-sized MSAs randomly selected for the multicounty region were Twin Falls, ID; Lafayette, LA; Fort Wayne, IN; Trenton, NJ; and Fort Smith, AR.

maintaining some flexibility to accommodate a variety of sizes of projects.

For simplicity, the user is asked to enter the total sales or value of output generated by the local food project. These are specific values to economists that represent the gross level of economic activity generated directly by the food project. Total sales, also known as value of output, is equal to the sum of the value of all products sold at their retail price (i.e., the price at which they were sold to the final consumer) for the entire season or year (if the organization produces year-round). Alternatively, value of output is the total revenue received by the farmer, vendor, or organization. For example, a farmers market vendor would add up total sales from each market day, across the market season, to calculate value of output for the LFIC. Calculating the net level of economic activity—the value added, as would be suggested by the academic literature discussed above—would require the user to subtract all non-labor, purchased inputs from total sales. As mentioned previously, this data is not likely to be accessible to LFIC users, given that less than 10% of case studies on local food efforts contained expenditure data (Angelo et al., 2016). Nevertheless, the LFIC provides a consistent scenario from which results can be compared given the fixed production, geographic choices, and consistency of data inputted into the calculator.

The LFIC is not meant to replace a well-constructed economic impact analysis conducted by a qualified analyst. Instead, the calculator was created as an educational and informational tool; that is, it is meant to illustrate to the user the level of connectedness one's local food project may have to the region's economy. In this way, this tool can educate the community about the linkages which may or may not exist in a given community. Input-output analysis generates very precise estimates of economic impact, but, because of issues surrounding the underlying data and methodologies (many of which are described above in the literature review), most academics recognize that the estimated multiplier approximates the true impact. Therefore, the precise number is less important than its relative magnitude (e.g., "closer to" 1 or "closer to or greater than" 2). Furthermore, because the implicit multipliers and economic impact results from the calculator are for an average region, they do not reflect the specific characteristics of the project's region. Users thus are encouraged to nuance the values of the calculator in order to reflect actual characteristics of the project's region. Four examples that compare the calculator-estimated values with those reported in the academic literature illustrate how one might adjust calculator estimates based on local conditions. Such adjustments to the LFIC will be ordinal (i.e., greater than or less than the LFIC estimate) and not cardinal (i.e., increase or decrease by a specific amount), primarily because the implied multipliers are not meant to be interpreted as precise numbers. Adjustments can be made by comparing the actual economy in which the food project occurs to the LFIC regions in the following ways:

- Is the actual economy closer to the upper or lower population limit for the region selected? If the local economy is closer to the upper limit, the true multiplier is likely to be higher than the LFIC estimate, as a large population is expected to support a larger, more diverse economy. Conversely, if the local economy is closer to the lower limit, then the true multiplier is likely to be less than the LFIC estimate.
- Is the actual economy within, or adjacent to, a metropolitan statistical area? If so, the local economy serves a region larger than just the local population, so one would expect the true multiplier estimate to be higher than that generated by the LFIC.
- Is the actual economy known for agricultural production—i.e., is agriculture a visibly large part of the local economy? If so, the local economy probably possesses more businesses that provide inputs to agriculture than the "average" region in the LFIC. Therefore, one would expect the local multiplier to be higher than the LFIC estimate.
- Across the regional purchase coefficients for all expenditures in the LFIC, the industry-specific RPCs were remarkably

consistent across regions within the respective categories except for fuel purchases. The amount of fuel purchased that was sourced locally was very dependent on whether a petroleum refinery was located within the region. Therefore, if a local refinery is present, the LFIC will underestimate the true multiplier of the project, as it will not account for local fuel purchases.

Example 1: Kane County, Illinois (An Urban County)

Kane County, Illinois, is located due west of the city of Chicago and is part of the Chicago-Naperville-Elgin, Illinois-Indiana-Wisconsin MSA. The 2010 census counted 515,269 persons living in the county. Swenson (2013) conducted an analysis of two scenarios to depict the economic contribution from local production of 24 fruits and vegetables that could be grown in the region. Scenario 1 depicted the case when all produce was sold only within Kane County; this is an unrealistic assumption, but it provides a calculation of the potential local demand and supply of these fruits and vegetables. Scenario 2 allows for the produce to be sold throughout the metropolitan area (i.e., outside of Kane County), meaning that producers could face additional competition for their produce. This example will focus only on the second scenario.

Swenson estimates that the 24 fruits and vegetables produced in the county would generate US$9.45 million in farm sales, require the use of 2,496 (1,010 hectares) of the county's 148,700 acres (60,177 ha) of harvested field crops, and serve 445,328 individuals. The analysis suggests that the total contribution of this local production to the county economy is US$14.85 million and 103 annualized jobs, adjusted for seasonal employment. This implies a multiplier of 1.57. The multiplier, computed as the ratio of total impact to direct impact, describes how an additional unit of expenditure would affect the local economy. In this instance, US$1 spent on fruit and vegetable production would lead to an overall impact on the local economy of US$1.57 (which includes the initial impact plus the supply-chain purchases and labor income effects). When this scenario is estimated using the LFIC, the total impact is measured to be US$13.26 million, which implies a 1.40 multiplier. It is not surprising that the LFIC underestimates the impact of local food production in Kane County, given that the county's population is high and it is located within the Chicago metro area. Furthermore, a business search reveals that Kane County is home to numerous bakeries that serve the Chicago metro area, as well as an oil refinery. Bakery staff indicate that a large demand for agricultural products exist in the area. All these factors suggest that the local production stimulated by the increased fruit and vegetable production of Swenson's scenario should generate a larger impact than the average economy in LFIC.

Example 2: Old Trails Region, Missouri (A 5-county Region Located Between Kansas City and Columbia, MO)

As reported in Rossi et al. (2017), the agricultural commodities of this region included row crops, commodity cattle production, and commercial orchards; they estimate that 5% of farms in the region engage in direct-to-consumer agriculture. These authors also note that in recent years the region has become a destination for travelers seeking amenity-driven experiences such as orchards, wineries, and bed and breakfasts. Using data collected from a survey of producers selling locally marketed agricultural products, Rossi et al. generate a set of regional purchase coefficients for these farmers and ranchers that they then use to estimate the indirect and total impacts of production across a basket of goods totaling US$1 million in value. These impacts were compared with the same basket of goods produced using the default regional purchase coefficients in IMPLAN. Interestingly, the authors found that local food total sales had a higher impact on the Old Trails economy than conventional agriculture, but employment impacts from local food sales were lower. The total effect of the US$1 million local production scenario in this region, as presented in the article, is US$1.77 million, or a multiplier of 1.77. The LFIC estimates the total impact to be US$1.39 million, which underestimates the economic impacts of the local food system in the region by US$380,000 compared with the Rossi et al. (2017) results. One explanation for the difference in values could be the presence of more supply chain participants in the Old Trails region than in the representative region, since the Old Trails Region is close to Kansas City, MO, which is home to many agricultural processing and distribution companies. This explanation would be reinforced by the presence of amenity-driven experiences in the region such as the wineries.

Example 3: New York State

Schmit et al. (2016) report an economic impact multiplier of 1.87 for local food sales in the state of New York. Using survey data collected from producers selling through local marketing channels in and around the state's capital, Albany, the authors generated a customized industry for small-scale, direct agriculture that is separate from conventional, commodity production. The authors then compared the total outlays across industries between those of small, direct agriculture; non-small, direct agriculture; and the default agricultural sector. They also generated and compared multipliers associated with each sector. They found that the small, direct agriculture sector had higher multipliers for employment and labor income, but smaller total value added and output values when compared to both the default and non-small, direct agriculture sectors. Several factors justify the relatively strong multiplier estimated by Schmit et al. Foremost is the recognition that New York state is the fourth largest state in the United States, so that this large population supports a diverse and comprehensive economy, making it highly likely that inputs are available within the state. Furthermore, the state has a long and notable history of agricultural production and participation in the northeastern regional economy. It is also home to one of the largest and oldest farmers markets in the United States: Greenmarket, which has over 50 locations throughout New York City. Additionally, tradition and land development pressure have contributed to a more regionalized, smaller-scale, and diverse agricultural production system than what is utilized throughout much of the rest of the United States. Such an industry structure would suggest more input availability and higher labor utilization in New York than the average state. It is not surprising, then, that the LFIC estimated multiplier for this scenario is 1.72, less than that estimated by Schmit et al. (2016).

Example 4: Midwest Self-Sufficiency in Fruits and Vegetables (A Multistate Region)

Swenson (2011) analyzed the economic impact and distribution of a proposal to make a six-state region (Minnesota, Wisconsin, Illinois, Michigan, Indiana, and Iowa) self-sufficient in fruit and vegetables; that is, he examined the potential to grow sufficient amounts of fresh fruits and vegetables to meet the six states' consumer demand. Swenson found that US$635 million of fruits and vegetables would need to be grown across the six states, and that gross impact would be US$1.03 billion, implying a multiplier of 1.62. The LFIC estimates the impact multiplier to be higher, at 1.96. One possible reason for the difference in values is that Swenson's model explicitly accounts for countervailing effects such as land availability constraints and opportunity costs associated with producing alternative crops, whereas the LFIC simplistically assumes that land and labor are freely available for producing the additional quantities of fruits and vegetables.

Discussion

As illustrated by the literature review discussed above, and the description of the LFIC, conducting an economic impact analysis for local food systems requires extensive knowledge of the methodology as well as an extraordinary amount of data collection. This data collection is important in order to account for production differences within local food systems, accurately account for substitution effects, and subtract the opportunity costs of inputs. Such knowledge and data are beyond the reach of many local food system projects—either to do themselves or to afford someone to do it for them. The LFIC provides a second-best solution to enable stakeholders in the local food system to evaluate their project using a consistent methodology with reasonable assumptions. In this way, the calculator reflects a tradeoff of accuracy for a more accessible tool.

Users of the LFIC should reflect on how the impacts estimated might actually manifest in their communities. The literature cited earlier provides some key concepts that users should consider:

- Of utmost importance is having a defensible estimate of total sales: the LFIC, like any calculator, will give an impact value for any number entered. If the value of total sales is not believable, however, the impact value is equally invalid. Be sure the sales numbers reflect actual transactions and can be documented. Beyond capturing actual sales, there are best practices in collecting primary data summarized in Thilmany McFadden et al. (2016), should the user need to gather data from vendors, suppliers, or others.
- To what extent are existing local food purchases being redirected to the local food project? The multiplier used in the LFIC does not explicitly net out the substitution effects of other local economic activity that is potentially displaced by the local food production. Consequently, this multiplier (and input-output analysis generally) is not meant to demonstrate the feasibility of a local food project. Instead, the impact value generated represents the gross value of the economic benefit a project has on the community's economy.
- What is the best alternative use of the land and labor involved with the local food system? If the inputs were previously idle or underutilized, then no adjustment is likely necessary to capture lost productivity from these inputs. However, if the inputs were fully utilized, then some consideration of the value of the productivity lost should offset the value of production from the local food project, thereby reducing the multiplier.

It is important to note that there are other economic and nonfinancial benefits that occur when local food systems are expanded. For example, there may be positive externalities or public goods that occur with the introduction or expansion of local food systems (Winfree & Watson, 2017). This would occur when components of local food systems facilitate well-being in the community through stronger social capital, increased innovation, and the creation of amenities attractive to high-skilled and creative people. Additionally, O'Hara and Shideler (2018) found evidence that, in metropolitan counties, increasing direct-to-consumer food sales increased sales at restaurants, but not at grocery and specialty food stores. This correlation suggests that there may be an economic-development rationale for local food systems, although research that includes a broader geographic region is warranted. Neither of these types of impacts is reflected in the LFIC. However, it must also be noted that, in addition to potential benefits, there are potential costs associated with promoting local food systems. One such cost includes the potential for a loss of efficiency in our food production system and a "beggar thy neighbor" mentality where benefits and costs to people outside the sphere of "local" are discounted (Lusk & Norwood, 2011).

Conclusion

The objectives of this paper are twofold: to provide local food system practitioners with an awareness of how economic impact analysis is conducted, and to introduce the Local Food Impact Calculator, a tool that can assist local food system practitioners in estimating the economic impact of their project. Local food multipliers, the common output of economic impact analysis, represent one avenue for understanding how local food systems interact with a local economy. Because of the complexity and expense associated with performing these analyses, the Local Food Impact Calculator is presented as an accessible and methodologically sound tool for use by this audience.

As with any economic impact analysis, the objective should be to understand which other sectors in the local economy are impacted by local food operations. While multipliers are a common output from these studies, and while they may also appear to be precise, food system practitioners should recognize that they are approximations and reflect many assumptions associated with the data and methodology. Thus, they should be interpreted and applied in a prudent fashion. When used carefully, the LFIC provides users with a credible tool to communicate how local foods can contribute to local economic development efforts. Such communication could justify local government investments in infrastructure to support local foods, like a building a permanent farmers market pavilion or connecting an existing facility to utilities so it can support cold storage, accept supplemental nutrition benefits payments, and/or host cooking demonstrations.

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

Where will your dollar go?

Review by Emily Reno*
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Review of *Harvesting Opportunity: The Power of Regional Food System Investments to Transform Communities*, by the Federal Reserve Bank of St. Louis and the Board of Governors of the Federal Reserve System. (2017). Published by the authors; 306 pages. Available for free download at https://www.stlouisfed.org/community-development/publications/harvesting-opportunity

Submitted August 14, 2018 / Published online January 28, 2019

Citation: Reno, E. (2019). Where will your dollar go? [Book review]. *Journal of Agriculture, Food Systems, and Community Development, 8*(Suppl. 3), 179–180. https://doi.org/10.5304/jafscd.2019.08C.012

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To enter the world of food systems means nothing and everything. Ask a stranger on the sidewalk what they think the food system is and they may respond by talking about farmers, community gardens, or perhaps the restaurants that surround them in the neighborhood. Ask a food systems researcher and they may describe a complex web of relationships between those who grow, eat, buy, and distribute food. Food's interdisciplinary nature makes it not only difficult to understand as a concept but quantify as a value to our communities. As a result, traditional lending institutions' criteria for risk assessment may be at odds with what new food ventures have to offer. *Harvesting Opportunity: The Power of Regional Food System Investments to Transform Communities* aims to communicate this message and more through a collection of essays and reports compiled by the Federal Reserve Bank of St. Louis and the Board of Governors of the Federal Reserve System. The in-depth research and case studies about investing in local and regional food systems are broad

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enough to be approachable by the average foodie, but filled with enough detail to serve as assigned reading at the collegiate level, especially for courses in business, finance, and food systems. Through its chapters, the underlying theme of money and food allows the authors to convey a connection between seemingly contradictory stakeholders, such as community development financial institutions (CDFIs) and small restaurant owners.

The first essay illustrates the rising demand for local foods and claims that it is no longer a niche market. Many more consumers, and especially younger ones, are concerned about the sustainability of food production and have lost trust in big consumer brands, and instead want to establish a relationship with the place where their food comes from (even if they cannot meet the farmer themselves). This level of scrutiny requires a simpler list of ingredients, increased transparency, and authenticity (p. 31).

This chapter sets the stage for the rest of the book, which goes deeper into the pros and cons of different food enterprise models, the need for new metrics of wealth creation to evaluate economic activity, the power of organizations to insert equity into the food system through a socially aligned mission, the challenges that local food processors face in meeting high operating costs, the significance of institutional purchasing power and philanthropic investments, and the needs of new farmers. Graphs, tables, appendices, and photos of local farmers emphasize key points and organize complex ideas, which, for those of us who are less familiar with bond markets and grant capital, are helpful as a visual aids. More importantly, case studies highlight real people doing this work and what it looks like when these concepts have come to fruition. For U.S. readers, the endnotes serve as a helpful resource, as the book's content focuses on U.S.-based examples. That being said, the book may not serve international readers as well.

Given my background in sustainable agriculture research, I found the book's content echoing farmers' concerns, such as the volatility of weather and inaccessibility of land. Yet despite my familiarity with what farming looks like in the field, this reading elucidates a vital component of growing: finances. This book opens readers' eyes to a plethora of businesses, nonprofit organizations, foundations, banks, and start-ups across the country that are "getting it right" by plowing ahead despite setbacks in traditional funding sources. Solutions run the gamut from joining an incubator to crowdfunding and renting land or production space instead of buying it, all of which speak to the incredible motivation that drives "food-preneurs." The information is especially valuable for those looking for different investment models to replicate in their own communities.

Given the strengths of this work, there are components that would make it more user-friendly. From the standpoint of someone always looking for a checklist or action plan to move forward, the text reads more like a novel when it could be organized like a game plan. For instance, while most chapters contained a conclusion, few contained a concrete list of takeaways. My favorite chapters were those that did so. In one chapter, the authors provided a list of considerations for entrepreneurs to think about if they are considering participating in a farm incubator, food accelerator, etc. The bulleted list of questions could easily have been replicated in the other chapters. That being said, this book's digital format facilitates direct access to information through hyperlinks.

Another limitation of this book is that reaching a broad audience comes at the expense of providing more in-depth information about the topics included. Each chapter could have been the first chapter of its own book. For this reason, an additional set of resources included at the end of each chapter—going beyond what is presented—would assist readers in turning these ideas into projects in their own communities.

Overall, *Harvesting Opportunity* is an important contribution to the discussion of how food is a medium through which problems of social equity, economic activity, environmental degradation, and political polarization can be ameliorated over both the short and long terms. Indeed, communities are capable of generating wealth by working through issues of food security, availability, and access. The small investments, collectively, we make toward intelligent agricultural practices will achieve that aim.