

TOOLS FOR ASSESSING ECONOMIC IMPACT: A PRIMER FOR FOOD SYSTEM PRACTITIONERS

JULY 2017





TOOLS FOR ASSESSING ECONOMIC IMPACT: A PRIMER FOR FOOD SYSTEM PRACTITIONERS

TABLE OF CONTENTS

INTRODUCTION	4
Standard Commercial Models	6
Community-based Approaches.	8
Limitations and Caveats	9
OVERVIEW OF ECONOMIC IMPACT TOOLS	11
RIMS II.	11
IMPLAN	13
REMI.	16
LM3	19
Social Network Analysis	22
Regional Finding Food in Farm Country™ Studies	25
Economic Impact Tools Summary Table.	27
CONSIDERATIONS FOR FUTURE STUDIES	28
APPENDIX A: MODEL STUDIES FOR FOODS SYSTEMS STRATEGIES	29
APPENDIX B: TERMS AND DEFINITIONS	30

Authors

Megan Phillips Goldenberg
Principal Partner
New Growth Associates, LLC

Kathryn Colasanti
Specialist
Center for Regional Food Systems (CRFS),
Michigan State University

Acknowledgements

Thank you to our wonderful reviewers, Rachel Bair, Ken Meter, and Rich Pirog, for providing feedback on the clarity and relevance of an earlier draft of this report.

Previous work conducted by Megan Phillips Goldenberg in collaboration with significant partners also informed this work. Of note:

The Economics of Local Food Systems: A Toolkit to Guide Community Discussions, Assessments and Choices with USDA AMS, Colorado State University, Crossroads Resource Center, among many others.¹

Exploring Economic and Health Impacts of Local Food Procurement with Illinois Public Health Institute and Crossroads Resource Center.²

The authors would also like to thank Andrea Sexton of CRFS for communications leadership, Amy Bond-Nelson Moore of Bond Creative for graphic design, Kelsey Grimshaw of CRFS for digital publishing, and Robin Miner-Swartz of Miner-Swartz Editing and Consulting for proofreading.

Support for this work comes from the W. K. Kellogg Foundation.

Suggested Citation

Phillips Goldenberg, M., Colasanti, K. (2017) *Tools for Assessing Economic Impact: A Primer for Food System Practitioners*. East Lansing, MI. Michigan State University Center for Regional Food Systems. Retrieved from foodsystems.msu.edu/resources/tools_for_assessing_economic_impact_a_primer_for_food_system_practitioners

Corresponding Author

For more information on this publication, contact corresponding author Kathryn Colasanti at colokat@msu.edu.

1 Thilmany McFadden, D., Conner, D., Deller, S., Hughes, D., Meter, K., Morales, A., Schmit, T., Swenson, D., Bauman, A., Phillips Goldenberg, M., Hill, R., Jablonski, B., & Tropp, D. (2016) *The Economics of Local Food Systems: A Toolkit to Guide Community Discussions, Assessments, and Choices*, U.S. Department of Agriculture, Agricultural Marketing Service. Retrieved from localfoodeconomics.com/toolkit/

2 Lynch, J., Meter, K., Robles-Schrader, G., Goldenberg, M. P., Bassler, E., Chusid, S., & Jansen Austin, C. (2015) *Exploring Economic and Health Impacts of Local Food Procurement*. Chicago, IL: Illinois Public Health Institute. Retrieved from jphionline.org/center-for-policy-and-partnerships/exploring-economic-and-health-impacts-of-local-food-procurement/

TOOLS FOR ASSESSING ECONOMIC IMPACT: A PRIMER FOR FOOD SYSTEM PRACTITIONERS

► INTRODUCTION

With growth in local food systems, there is an increasing desire to understand the associated economic impacts. As food system practitioners, many of us come to the work motivated by a set of values and goals such as increasing access to healthy food, preserving farmland, or creating entrepreneurial opportunities. These, along with other quality of life improvements, are economic development goals. Economic growth—typically reported as an increase in jobs or sales—is a much narrower measure. And while we, as food system practitioners, may have many ways of judging success, there may be times when we are called to justify or assess food system initiatives in terms of economic growth. Perhaps funders or local government officials are trying to decide which projects to invest in. Perhaps we want to use economic growth arguments to advocate for a project. Perhaps we want to better understand the impact of our work or test the validity of our assumptions. And while economic growth is certainly not the only way to measure success, it is a highly influential measure for many decision-makers, so it is valuable to understand the tools and approaches available to measure or predict economic growth.

One way of looking at economic growth potential is through an economic impact assessment (EIA). EIA estimates aim to quantify the impact of a particular change³—whether a new revenue stream, investment, event, policy, or program—on the local economy in terms of jobs and personal income. EIAs may also

³ Sometimes referred to as a “shock,” “scenario,” or “shift.”

DEFINITIONS

Economic activity: The production, distribution, and consumption of commodities.

Economic growth: An increase in output. For example, increasing the sale of agricultural goods may be an economic growth goal.

Economic development: An increase in quality of life indicators. For example, increasing the sales of healthy foods in low-income, low-access neighborhoods may be an economic development goal.

Shock, scenario, shift: In order to perform an economic impact analysis, a change to the economy must be modeled. This change is referred to as a scenario. These scenarios can be entirely hypothetical—increase consumer spending by 10 percent. Other scenarios can be constructed based on real programming or investments.

Total output: A measure of total revenues generated or sales.

See Appendix B (p. 31) for these and other terms and definitions.

be used to pose future “what if” scenarios by estimating the impact of a hypothetical change. EIAs are useful in particular situations, such as informing the allocation of funds among competing projects, justifying the expenditure of funds on one industry versus another, or identifying how the effects of a one-time investment in a sector will ripple through the economy.

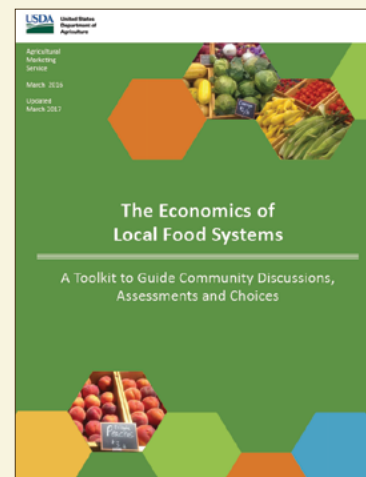
Yet, it’s important to be aware of the limited scope of EIAs. They are simply a snapshot estimation of economic growth at a single point in time after a shock is applied to the initial model. An EIA will not provide any insight into the feasibility of a particular initiative, the demand in the marketplace for a given business, or the impacts on health, prosperity, or social capital in a community. Nor should an EIA be used to assess the total economic value of an industry, which would be estimated through a contribution analysis.

In this guide, we focus on tools for assessing economic growth starting with standard commercial, input-out models—RIMS II, IMPLAN, and REMI. We then shed light on alternative, community-based approaches and their appropriateness for various applications, including LM3, Social Network Analysis, and Regional Finding Food in Farm Country™ studies. Alongside the descriptions of the different tools and models, we describe examples of studies that used those approaches. Terms are defined as they are introduced and included as a complete list in Appendix B (see p. 31). We conclude with some considerations for future studies and a list of model studies (see Appendix A, p. 29) that may serve as reference points for making inferences about your own community food system projects. This primer does not cover the process of commissioning an economic impact study, which is covered extensively elsewhere.^{4,5}

4 Thilmany McFadden, D., Conner, D., Deller, S., Hughes, D., Meter, K., Morales, A., Schmit, T., Swenson, D., Bauman, A., Phillips Goldenberg, M., Hill, R., Jablonski, B., & Tropp, D. (2016) *The Economics of Local Food Systems: A Toolkit to Guide Community Discussions, Assessments, and Choices*, U.S. Department of Agriculture, Agricultural Marketing Service.

5 Pirog, R. & O’Hara, J. (2013) *Economic Analysis of Local and Regional Food Systems: Taking Stock and Looking Ahead*. Michigan State University Center for Regional Food Systems. Retrieved from foodsystems.msu.edu/resources/econ-analysis-brief

RESOURCE: THE ECONOMICS OF LOCAL FOOD SYSTEMS^a



In 2014, the U.S. Department of Agriculture’s Agricultural Marketing Service convened a team of regional economists and food system specialists to develop a best practice tool kit for evaluating the economic impacts of local food system activities. This tool kit can guide and enhance the capacity of local organizations to make more deliberate and credible measurements of local and small-scale economic activity and other ancillary benefits.

The tool kit is made up of seven modules that can be grouped into two stages of food system planning, assessment, and evaluation. The first set of modules (1-4) guides the first stages of an economic impact assessment and includes framing the system, relevant economic activities, and assessment process as well as collecting and analyzing relevant primary and secondary data. The second set of modules (5-7) provides a more technical set of practices and discussion of how to use the information collected in stage one to conduct a more rigorous economic impact analysis using IMPLAN.

Additional information: localfoodeconomics.com/

a Thilmany McFadden, D., Conner, D., Deller, S., Hughes, D., Meter, K., Morales, A., Schmit, T., Swenson, D., Bauman, A., Phillips Goldenberg, M., Hill, R., Jablonski, B., & Tropp, D. (2016) *The Economics of Local Food Systems: A Toolkit to Guide Community Discussions, Assessments, and Choices*, U.S. Department of Agriculture, Agricultural Marketing Service.

Standard Commercial Models

Input-output (I-O) models are the most common, commercial approach to economic impact assessments. 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, in the farm to school supply chain, carrots may be produced on a farm and then sold to a food hub. The food hub could then wash, peel, cut, and bag them for sale to a school lunch program. The raw carrots are an output of the agricultural production industry and an input to the food processing industry. The chopped and bagged carrots are an output of the food processing industry and are an input to the school food service industry. The underlying data that reflects these linked industries is essentially a large and complex spreadsheet embedded in a given software package.

A change in one sector of the economy will ripple through and impact the rest of the economy. To return to the preceding example, if a school starts purchasing from the local food hub instead of

a broadline distributor, this represents a shift in spending. The school's purchase of carrots would be the direct effect (the food hub sells processed carrots to the school). The indirect effect would be the food hub buying more raw carrots from the farmer. Furthermore, new jobs at the food hub and at the farm caused by the school's shift in spending will lead to increases in household income, which in turn may lead to additional jobs in a service sector (medical personnel, for example)—this is known as an induced effect. In other words, the induced effect captures when recipients of the direct and indirect effect spend money in the region included in the analysis. I-O models estimate all of these impacts.

It is important to note that most economic impact models are “backward linking,” meaning they only capture the effects upstream of a change or shift. Using our carrot example, a backward-linking model will not estimate a hypothetical increase in student demand for carrots as a result of the school serving locally grown carrots.

Figure 1: Hypothetical Farm to School Supply Chain

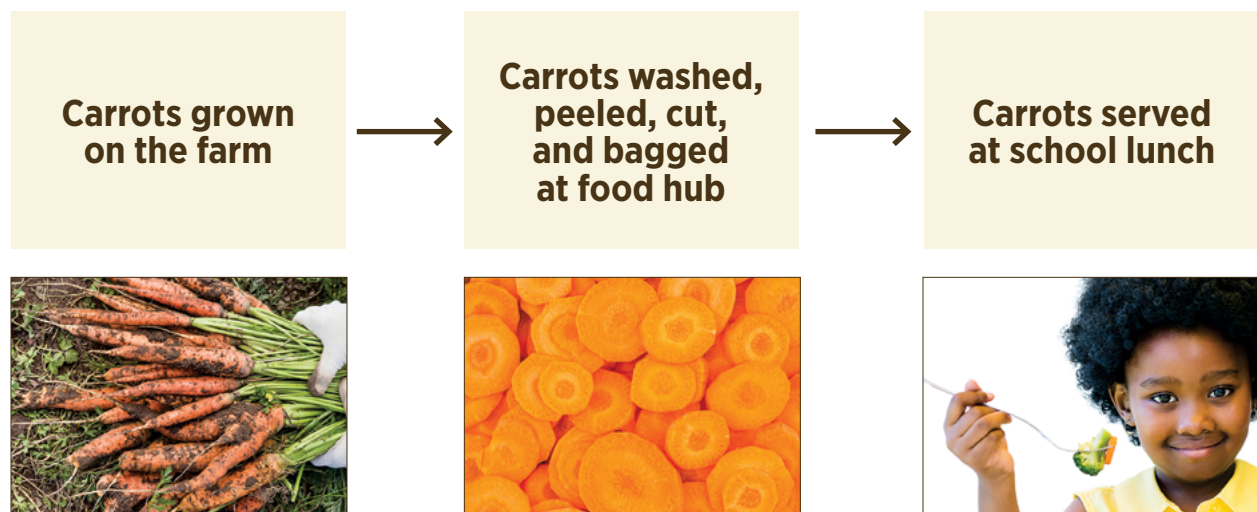
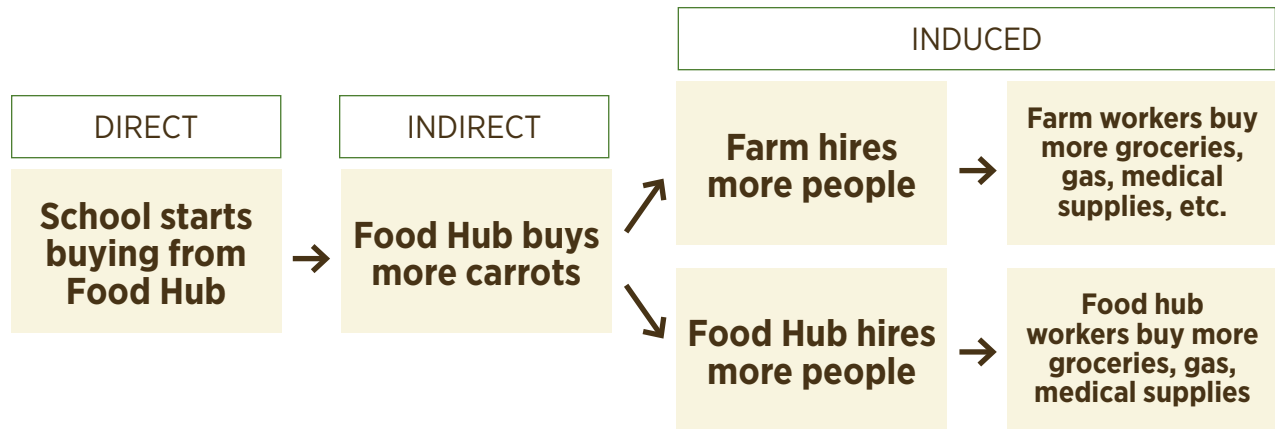


Figure 2: Examples of Direct, Indirect, and Induced Effects



The U.S. Bureau of Economic Analysis (BEA) releases its Benchmark Input-Output Data every five years based on the Economic Census, which collects inventories, receipts, and payroll at the establishment (i.e. individual business) level. Many U.S.-based I-O models rely heavily on this foundational data. The most common of these commercially available models are RIMS-II and IMPLAN. Both practitioners and politicians tend to prefer I-O models because they are easier to use and typically show larger impacts than other models.

Economic simulation models (ESMs) are another approach to economic impact assessment. These models use this BEA benchmark data, and overlay additional data and modeling techniques to produce more robust simulations. These models allow for estimating changes over time and accounting for more changes in the economy. Regional Economic Modeling Inc. (REMI) is the most readily available commercial model for United States counties. ESMs are necessarily more complicated, requiring more time and resources to build, and sophisticated computer software programs to execute.

A contribution analysis is another way of assessing economic activity. Whereas economic impact assessments estimate the effect of a change of some type, a contribution analysis estimates the relative size of a particular, existing sector to the overall economy in a steady state.⁶ A contribution analysis can be conducted with RIMS-II, IMPLAN, or REMI, though IMPLAN is most commonly used.

⁶ Watson, P., Wilson, J., Thilmany, D., & Winter, S. (2007) *Determining Economic Contributions and Impacts: What is the Difference and Why Do We Care?* Journal of Regional Analysis & Policy. 37(2), 140-146.

DEFINITIONS

Multipliers: A quantification of how a dollar spent in one sector will ripple throughout the economy. Multipliers come in three forms, as follows:

- **Direct:** Changes in production at a final supplier as a direct result of a change in demand.
- **Indirect:** Changes in production to additional industries (intermediate suppliers) as a result of the change in production at the first industry.
- **Induced:** Changes in income (and labor spending) as a result of changes in production at the final and intermediate suppliers.

The **total impact multiplier** (or total effect multiplier) is the sum of the direct, indirect, and induced multipliers.

Multipliers can be calculated for contributions to gross domestic product (GDP), number of jobs, or labor income. For example:

- **Direct-effect employment** multipliers are ratios of the total change in jobs to the initial change in jobs.
- **Direct-effect earnings** multipliers are ratios of the total change in household earnings to the initial change in household earnings.

Community-based Approaches

Other approaches call for collecting primary data from the local community, rather than relying on the secondary data embedded in a software model. The “Local Multiplier 3” methodology (LM3) is one example. This method tracks actual sales between businesses to generate an estimation of total impact.

Social network analysis is another alternative, more qualitative approach that uses relative levels of connectivity in a particular community to project relative economic impacts. This methodology assesses the number and strength of connections across individuals or organizations within a given locale or sector. From an economic standpoint, if you assume that the stronger the sense of community connectedness, the greater the likelihood that financial transactions will cycle money among community members,⁷ then social network analysis can be seen as a proxy for understanding the likelihood that investments in a particular community will have a strong multiplier.

A third alternative approach comes from Crossroads Resource Center,⁸ which has developed a standard set of indicators drawn from public data sets. These are not strictly economic impact studies, but they do provide a critical overview of financial flows through regional economies in both rural and urban settings in Canada and the U.S. These studies have proven valuable in informing and animating civic discussions aimed at building community-based food systems.

Additionally, any community, project, or business can evaluate its own economic activity without these codified economic impact models. For example, a farmers market may wish to track its number of vendors, acreage cultivated by farmers, sales by local vendors, etc. Any business or organization tracking sales and employment figures is already tracking its own economic activity. These self-directed efforts can be carried out on an individual-firm basis or through a whole network/association approach, such as the National Farmers Market Coalition and the Michigan Farmers Market Association. Self-directed approaches have many benefits, including ownership of the data and understanding of

7 Meter, K. (2011) *Learning How to Multiply*. Journal of Agriculture, Food Systems, and Community Development, 1(2), 9-12.

8 crcworks.org

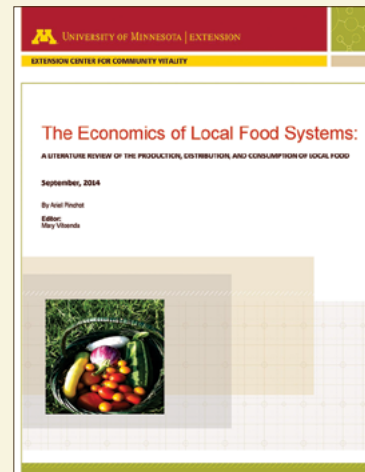
DEFINITIONS

Production function: The mathematical relationship between physical inputs and physical outputs associated with a productive industry. Most models contain generalized production functions based on nationally sourced data. In regard to agriculture, production functions can be generated using farm accounting records or Schedule Fs.

Primary data are those data that are collected firsthand by a researcher making direct contact with a given population.

Secondary data are primary data that are summarized for reporting purposes.

RESOURCE: THE ECONOMICS OF LOCAL FOOD SYSTEMS^b



This report, from the University of Minnesota Extension, is a good resource for learning more about previous research on the economics of local food systems. The report summarizes findings from research to date, describes key gaps in understanding, and offers an extensive annotated bibliography of relevant journal articles and reports.

b Pinchot, A. (2014) *The Economics of Local Food Systems: A Literature Review of the Production, Distribution, and Consumption of Local Food*. Ed: M. Vitcenda. University of Minnesota Extension. Retrieved from extension.umn.edu/community/research/reports/docs/2014-Economics-of-Local-Food-Systems.pdf

organizational-level impacts. Recording this data also continuously lays the foundation for a sound economic impact study at a later time, if needed. (See p. 28, “Considerations for Future Studies,” for further discussion on community-based approaches.)

Limitations and Caveats

All models and approaches for measuring economic influences have limitations. Economic impact assessments are always imperfect estimates, but local food systems are particularly difficult to model precisely. First, for the agricultural sector, the underlying data in EIA models is drawn from large-scale commodity crop farm operations that look very different than small-scale specialty crop farms. For example, the underlying production functions for each industry are dependent on national averages. In the case of fruits and vegetables, these averages are largely dominated by California, where one farm might mechanically cultivate 3,500 acres of processing tomatoes as opposed to a multicrop market farm growing several varieties of tomatoes for fresh consumption. Second, local food systems are likely to vary from place to place, based on the local context and conditions, which is not accounted for in models.

In order to make the underlying data more relevant, primary data must be collected firsthand and handled separately in a chosen model and its respective software platform. This typically takes the form of constructing new industry sectors within the model, which is facilitated in IMPLAN, but limited in other models’ software. The methodology involves making use of an industry sector that is inactive according to local data sets. For example, in northern states, the “cotton” production sector is an array of zeros in county data sets, since cotton is only grown in the southern U.S. However, the cotton sector is still linked to other sectors in the I-O model, based on the agricultural inputs the industry requires and commodity sales channels utilized. Scholars can use these “empty” sectors as a starting point and then insert data that better reflects the sales and expenditures of, say, the local vegetable sector. In this case, a modeler will collect income and expense data from a sample of local farmers and use this primary data to approximate an entire local industry by entering the data into the underlying spreadsheets in the chosen model.

For example, both Gunter (2012)⁹ and Hayes (2010)¹⁰ customized several unused agricultural sectors within an IMPLAN model to represent what would happen if fruit and vegetable producers sold produce directly to schools. Hayes (2010)¹¹ modified the technical coefficients in the production function (see p. 8 for definition) of the new sectors to better match the increased transportation and processing needs of farmers selling to a school district. This type of customization is extremely valuable but is not always done because it requires local data on cost-of-production, or expenses associated with farming, transportation, and processing, which is not readily available, and farmers are often reluctant to share such information. If this local-level data is not available, modifications are likely not worth the time required or may not produce relevant results because the “out of the box” data reflects national, large-scale farmers, as outlined earlier.^{12,13}

The third limitation to economic impact assessments for community food systems is that many local and regional food initiatives are too small to be meaningfully modeled. Within the data sets based on the industrial commodity economy, community food system initiatives simply may not show up as significant. For example, a 2010 study¹⁴ found that even at the city level, a regional purchasing campaign had negligible impact on gross city product. When measuring local purchasing against the totality of economic activity, the effect is exceedingly small, regardless of which model is used. That’s not to say local purchasing efforts aren’t important, especially in regard to economic development goals, but it can be difficult to measure them in terms of economic growth.

Fourth, the application of EIA to model future hypothetical scenarios is questionable because the

9 Gunter, A. (2012) *Rebuilding Local Food Systems: Marketing and Economic Implications for Communities*. Thesis, Colorado State University, Department of Agricultural and Natural Resource Economics, Fort Collins, CO.

10 Hayes, M. (2010) *Farm-to-School in Central Minnesota—Applied Economic Analysis*. University of Minnesota. Minneapolis, MN: Center for Urban and Regional Affairs.

11 Ibid

12 Lazarus, W. F., Platas, D. E., & Morse, G. W. (2002) *IMPLAN’s Weakest Link: Production Functions or Regional Purchase Coefficients?* The Journal of Regional Analysis and Policy, 32(1), 33-49

13 Swenson, D. (2006) *Measuring the Economic Impacts of Buy Local Campaigns in Iowa*. Iowa State University, Economics, Indianapolis, IN.

14 Phillips, M., Thilmany McFadden, D., & Cutler, H. (2010) *Applications and Impacts of Regional Import Substitution Ideals*. North American Regional Science Conference. Denver, CO.

It's important to be aware of these caveats before proceeding with an economic study and consider whether the financial investment in modeling may be better spent on direct infrastructure investments in the local food system, perhaps drawing from existing studies as part of the justification.

data sets assume relatively small shifts in economic activity rather than a move toward a wholly different food system infrastructure, as called for by local food system practitioners. As soon as a shift in production or consumption causes a new industry to emerge (i.e. farmers markets or food hubs), then the models become inadequate without customization. Similarly, all data contained in each model will be outdated by at least 18–24 months, making these models wholly inadequate when modeling an emerging industry without customization.

Finally, I-O models assume perfect supply and demand.¹⁵ That is to say, for example, it is assumed when demand for fresh fruits and vegetables increases, supply increases to meet this demand without prices changing. Furthermore, I-O models assume that unlimited supplies of inputs (e.g., raw materials, fuel, or subcomponents) are available to produce these extra fruits and vegetables. Real-life constraints on input supplies mean actual impacts may be smaller than standard I-O projects. This is a scenario where ESM models are more appropriate.

Community-based approaches also have limitations. Primary data collection is time-consuming and expensive. Furthermore, meaningful estimations depend on high response rates through surveys, focus groups, and listening sessions. Particularly in food systems studies, focusing on small farms and/or alternative production models, farmers and entrepreneurs may not have the required data readily available or may not be willing to share such sensitive data.

It's important to be aware of these caveats before proceeding with an economic study and consider whether the financial investment in modeling may be better spent on direct infrastructure investments in the local food system, perhaps drawing from existing studies as part of the justification. (See "Model Studies" p. 29.) However, if you have concluded that an economic study is appropriate in your situation, then the following guide offers an overview of different approaches and a starting point for identifying the most appropriate approach for your community. In addition, this section provides examples of studies utilizing the different models and approaches. These examples were chosen based on their public availability and relevance to the food and agriculture industry. We also opted for studies based in Michigan, where possible. However, these examples were not necessarily selected based on the strength of the methodologies used, and their inclusion here should not be seen as a recommendation to emulate the approach.

¹⁵ The technical term for this assumption is "market-clearing conditions."

OVERVIEW OF ECONOMIC IMPACT TOOLS

RIMS II

Classification and Description

The simplest and most basic of the economic modeling systems, the Regional Input-Output Modeling System (RIMS II) was developed in the 1970s by the U.S. Bureau of Economic Analysis (BEA) and continues as a “fee for service.” The RIMS II model is essentially just a spreadsheet containing multipliers for a defined region based on national benchmark I-O data. The purchaser must perform calculations; thus the purchaser must build the model. Many analysts have a basic model built in a proprietary spreadsheet and simply copy and paste RIMS II multipliers into their existing template. This technique is appropriate for ballpark estimates and, like IMPLAN, the model is considered static, meaning it cannot account for changes in the economy over time.

Indicators

RIMS II data contains total or final demand multipliers for the following:

- Total output
- Value-added
- Employment
- Labor income

The model also provides direct-effect multipliers for earnings and employment.

Considerations

RIMS II is considered the most transparent model since a community purchases a spreadsheet full of industry multipliers and the calculations are

EXAMPLE: RIMS II CONTRIBUTION ANALYSIS

Economic Impacts of Connecticut’s Agricultural Industry^c

This study documents the importance of agriculture and related industries to Connecticut’s economy. Using direct sales of the agricultural industry for 2007, this study estimates the total economic impact of agriculture through the use of three economic models of the Connecticut economy.

Sector

Agricultural industry

Process

- The study calculates 1) total impact on state output, 2) total impact on state employment, and 3) total impact on value added using IMPLAN, RIMS II, and REMI.
- The study reports the impacts calculated from each model, as well as the average.

Key Findings

- The total output impact of Connecticut’s agricultural industry on the state economy was estimated by the three models to be between \$2.72 and \$3.51 billion in 2007, with an average of \$3.09 billion.
- Based on the average of the three models, the Connecticut agricultural industry generated approximately 20,000 jobs statewide, about two-thirds of which were based on agricultural production.
- Value added by the agricultural industry ranged from \$1.04 to \$1.71 billion.

^c Lopez, R., Joglekar, D., Zhu, C., Guther, P., & Carstensen, F. (2010) *Economic Impacts of Connecticut’s Agricultural Industry*. University of Connecticut. Retrieved from ct.gov/doag/lib/doag/boards_commissions_councils/governors_council/02_UConn_2010_Economic_Impacts_of_CT's_Agricultural_Industry.pdf

performed manually; thus, the methodology is known. Despite this transparency, the underlying production functions used to calculate the multipliers cannot be adjusted and new industries cannot be added. Therefore, the model is not very adaptable for custom lines of inquiry, whether for the local food sector or other sectors not well-represented in the model.

RIMS II is also the least expensive option, with a cost of \$275 for each defined set of multipliers. For example, an organization can purchase multipliers for Wayne County, or the tri-county area (Wayne, Macomb, and Oakland), or the whole Detroit-Warren-Ann Arbor Metropolitan Statistical Area (MSA) (nine counties). Any of these options will produce one spreadsheet and cost \$275. However, if an organization wishes to have multipliers for each individual county in the Detroit-Warren-Ann Arbor MSA, then nine separate orders must be placed, costing \$2,475. Due to this relatively low cost and transparent methodology, RIMS II allows for consistent comparison across regions due to standard protocols in collecting the underlying data.

Although an organization can order nine (or more) separate multipliers for individually defined regions, RIMS II does not allow for these regions to interact with each other, whereas REMI (see p. 16) does. However the region is defined, it is considered a single, isolated region. Because the model is static, there's no way to determine the timeline under which impacts will be realized, and there is no adjustment for price elasticities, labor mobility, or other changes in market conditions. This is also true of IMPLAN. Due to this limitation, RIMS II cannot be used for tax impact estimates.

Although RIMS II can be used for a contribution analysis, it requires a more nuanced discussion of the results. The total output of an industry can be multiplied by its corresponding multiplier (purchased through BEA) to give a total contribution of that industry. If more than one industry is evaluated through a RIMS II contribution analysis, care must be taken to avoid double counting and inflated results.

DEFINITIONS

Elasticity: Sensitivity to changes in the marketplace. The more demand or supply changes in regard to a change in price, the more elastic that item is.

Economic mobility: The ability of an individual, family, or some other group to improve (or lower) their economic status—usually measured in income. Economic mobility is often measured by movement between income quintiles. Labor, household, and firm mobility is the ability of employees and employers to change economic regions. A suburban workforce commuting into a city is one example of this. A corporate headquarters moving to a region with favorable tax conditions is another.

Value-added: A measure of total revenues minus the cost of inputs purchased from another sector.

Data Needs

Since the underlying production functions and industries cannot be adjusted, there is little need to collect very specific localized data. However, like IMPLAN and REMI, an impact assessment is not possible without determining a scenario or change to the economy.

Resources and Time Required

\$275 per region

Multipliers are provided for all industries in the model for the region that is ordered. Regions must consist of one or more counties and must be contiguous.

\$75 per industry

Multipliers are provided for 50 states and the District of Columbia for the industry that is ordered.

Additional Information

bea.gov/regional/rims/rimsii/

IMPLAN

Classification and Description

IMPLAN, which is short for “Impact Analysis for Planning,” is an I-O model developed at the University of Minnesota and commercially provided by MIG Inc. IMPLAN is by far the most commonly used model for Economic Impact Analysis and Economic Contribution Analysis.

Indicators

IMPLAN generates a variety of economic indicators, including the following:

- Total output
- Value-added
- Employment
- Labor income

IMPLAN generates multipliers for every sector, including:

- Output
- Employment
- Income

Generally, people are most interested in total output and direct effects. It is important to note that total output is not a measure of new economic activity, just total activity. Value-added totals are more realistic estimations of new economic activity. Furthermore, employment impacts may just be a reallocation of labor among sectors, versus an absolute creation of jobs, and represent both full-time and part-time jobs.

Considerations

IMPLAN is one of the most widely used models for economic impact analysis. This is because it is relatively affordable and relatively straightforward to use for basic analysis. It is the model most likely to be taught in academic settings. Moreover, advanced users are able to alter the underlying structure of the modeled economy, the data, and the manner in which impacts are calculated. Accordingly, many consulting firms have adapted IMPLAN to create proprietary models. Research institutions are able to estimate impacts of theoretical industries or policies. However, simplifying assumptions can lead to unrealistic impacts.

EXAMPLE: IMPLAN EIA WITHOUT CUSTOMIZATION

The 25% Shift: The Economic Benefits of Food Localization for Washtenaw County and Ypsilanti & The Capital Required to Realize Them^d

This paper evaluates the economic benefits that Washtenaw County and the Ypsilanti area could enjoy through a 25 percent shift toward local food. A 25 percent shift means that for each industrial sector linked with food, a quarter of all nonlocal consumption (households, businesses, and government entities) shifts to local foodstuffs and local food services. This paper does not include primary data, customization, or a proper accounting of opportunity costs—the sales that would be lost as a result of the shift. Further, it doesn't reflect local knowledge or awareness of industry conditions.

Sector

Fifty-two food-related industry categories including primary production, processing, retail sales, and food services, such as restaurants, for Washtenaw County, Michigan. IMPLAN does not include specific categories for food distribution or wholesaling, which results in those associated impacts being embedded in the generic wholesaling and distribution sectors. Greenhouses, forestry, and hunting were included. Cotton and tobacco farming were not.

Process

The actual modeled shock is a 25 percent increase in local production since the sale of these goods and a substitution of imports for this new production is implicit in the IMPLAN model. No customization was performed.

Key Findings

- In 2011, there were 19,549 food-related jobs in Washtenaw County, of which 4,180 were in the Ypsilanti area.
- A 25 percent shift could create 2,193 more jobs for Washtenaw County—1,469 in new food businesses (direct effects), 419 through new local supply-chain spending (indirect effects), and 305 through new spending by local employees in these direct and supply-chain jobs (induced effects).
- For the Ypsilanti area, a 25 percent shift would create 628 jobs—445 directly, 103 indirectly, and 80 induced.

^d Shuman, M. H. (2013) *The 25% Shift: The Economic Benefits of Food Localization for Washtenaw County and Ypsilanti & The Capital Required to Realize Them*. Office of Community & Economic Development. Retrieved from washtenaw.org/government/departments/community-and-economic-development/plans-reports-data/workforce-development/2013/washtenaw-25-shift-paper.pdf

Furthermore, IMPLAN data is a mix of local-level and national-level data, some of which can be out of date. For example, production functions (farm expenditures and purchasing habits) are based on national averages, while consumption functions are based on local and regional data (household expenditures and purchasing habits). While the U.S. Census is comprehensively collected every 10 years (on the decade—2000, 2010, etc.), the Census of Agriculture and the Economic Census are collected every five years (on the 2s and 7s—2007, 2012, etc.). In addition, all data in a new IMPLAN release is going to be at least 18 months old. People like IMPLAN because they can purchase a complete set of data and model all at one time. On the other hand, people don't always like IMPLAN because the data doesn't necessarily represent local conditions.

Data Needs

Mostly complete data sets can be purchased for any county, congressional district, MSA, or state, based on County Business Pattern data and BEA data for any number of years, including historical data. Arbitrary or theoretical scenarios can be modeled with very little, or no, primary data collection.

Alternatively, modeled scenarios for economic impact analysis can be based entirely on a very real situation occurring in the local community, and this can result in more robust and accurate results. A custom approach requires primary data collection. For example, a 10-cent per meal reimbursement program¹⁶ meant to increase school spending on locally grown fruits and vegetables can be modeled by estimating this relative shift in spending. In other words, an IMPLAN analysis could include the impact of increased spending on fruits and vegetables by a school district as well as the impact of a shift in current spending on fruits and vegetables from broadline distributors primarily sourcing from out of state to direct purchases from Michigan farmers. However, since land is often a limited resource, exports from this same sector may need to be constrained. Also, the fruit and vegetable production sectors in a region are typically poorly represented in the underlying data of IMPLAN. Thus, a researcher

¹⁶ For more about the "10 Cents a Meal" program in Michigan, see: Michigan Department of Education, Networks Northwest, Michigan State University Center for Regional Food Systems, Groundwork Center for Resilient Communities, and Michigan Department of Agriculture and Rural Development (2017) *10 Cents a Meal for School Kids and Farms 2016-2017 Legislative Report*. Retrieved from foodsystems.msu.edu/resources/10-cents-a-meal

EXAMPLE: IMPLAN EIA WITH CUSTOMIZATION

Economic Implications of Farm to School for a Rural Colorado Community^e

This article summarizes a study that analyzes the potential positive economic impact resulting from the purchase of local, farm-direct purchases made by a school district in rural Colorado. Gunter and Thilmany develop four scenarios—1) two-county region, gross impact, no customization; 2) six-county region, gross impact, no customization; 3) six-county region, net impact, no customization; and 4) six-county region, net impact, customized sector.

Sector

Farm to School—single school district

Process

- Collected purchase records of farm-direct produce from a Colorado school district.
- Outlined four different IMPLAN scenarios encompassing a range of assumptions.
- Compared direct, indirect, and induced effects for each scenario.
- Primary data on Colorado producer expenditures utilized to customize a sector in IMPLAN for small-scale producers.

Key Findings

- The total impact (sum of direct, indirect, and induced effects) varied significantly across the four scenarios (range from \$918 to \$33,077).
- Creating a custom sector in IMPLAN to represent small-scale producers selling to institutions significantly changed the total economic impact (\$918 without customization; \$7,880 with customization).
- The analyses show that increasing purchases of locally produced foods has a positive economic impact on the local community, but the impact is quite small when the countervailing effect of shifting demand is included.

^e Gunter, A. & Thilmany, D. (2012) *Economic Implications of Farm to School for a Rural Colorado Community*. Western Rural Development Center: Rural Connections magazine, May 2012, pp. 13-16. Retrieved from wrdc.usu.edu/files-ou/publications/pub_6232863.pdf

may want to collect expenditure data directly from area farmers and custom build a fruit and vegetable sector that reflects local growing constraints and market opportunities within the IMPLAN model.

Resources and Time Required

In general, in order for someone to learn how to use IMPLAN and perform an analysis, some basic training and knowledge of economic impacts is required. This can be a major time and financial investment. Here's a breakdown of some of those expenses.

- Basic training is three days in North Carolina; \$1,500 + travel, lodging, all personal expenses
- Individual data sets vary, but include basic access to the software platform. Licenses have to be renewed annually. The following options are for Michigan:
 - A single county: \$800
 - A single county + ZIP codes: \$1,200
 - State total: \$1,100
 - State total, all counties, all ZIP codes: \$6,000
- National total, all states, all counties, all ZIP codes: \$30,000
- Consultation with IMPLAN experts can run \$150+/hour

Most land-grant universities and any number of consulting firms also can perform basic and intricate analysis for a fee, so that the person or organization requesting the analysis does not need to purchase the model or know intricately how it works. Basic analysis without any customization or primary data collection can run several thousand dollars and be finished within a couple of weeks. More complicated analysis, involving primary data collection and industry customization, can cost about \$30,000-\$50,000, and require a year or two to complete.

Additional Information

implan.com

EXAMPLE: IMPLAN CONTRIBUTION ANALYSIS

Estimating the Economic Contribution of Michigan's Food Retail Industry^f

This report looks at what the food retail industry in Michigan contributes to the state's economy, including the payments the retail sector makes to other industries and the public sector and how wages paid to grocery industry employees and suppliers circulate and generate additional economic activity.

Sector

Retail industry

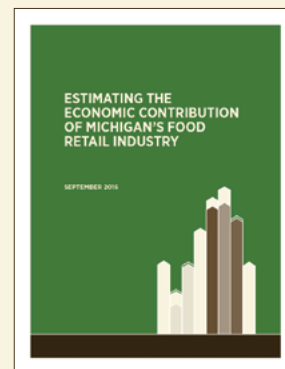
Process

- Used Michigan Department of Treasury 2014 data on industries reporting food sales.
- Defined a retail industry within IMPLAN based on multiple sectors.

Key Findings

- In 2014, the food retail industry contributed an estimated total of \$15.4 billion to the state economy, the equivalent of approximately 3 percent of the state's GDP.
- The total effect multiplier for the retail industry was found to be 1.64.
- The food retail industry is estimated to have directly supported approximately 198,000 full- and part-time jobs in 2014 as well as supported an additional 75,000 jobs through indirect and induced effects.

^f Goddeeris, L. & Pirog, R. (2016). *Estimating the Economic Contribution of Michigan's Food Retail Industry*. East Lansing, MI: Michigan State University Center for Regional Food Systems. Retrieved from foodsystems.msu.edu/resources/food_retail_industry_economic_contribution_analysis.pdf



REMI

Classification and Description

The original model was developed for Massachusetts in 1977. It was then generalized for all states and counties in the U.S. In 1980, Regional Economic Models Inc. (REMI) was founded to build, maintain, and advise on the use of the REMI model for individual regions.

The REMI model is one of the most widely used, commercially available economic simulation models (ESM). It incorporates I-O models, continuous general equilibrium (CGE) models—which have the same basic components as IMPLAN but do not have the same market clearing requirements embedded in the model; econometrics—the application of advanced statistics to economic questions; and, most recently, economic geography—the study of spatial components of economic activities such as migration.

REMI is based in I-O modeling, but allows for more dynamic simulations because price is allowed to fluctuate. Because of this, REMI is favored for analyzing tax and trade policy. Some CGE models, including the CGE component of REMI, can track a shock through time at annual intervals. More recently, REMI has overlaid a spatial component that better estimates transportation effects, interregional trade, and labor mobility. Since the CGE and econometric components of the REMI model better account for constrained resources, such as land and water, they can estimate other types of impacts not possible in RIMS II or IMPLAN. For example, if 25 percent of consumer spending is shifted towards locally sourced goods, the increased demand for manufacturing and agriculture may increase property taxes and house prices as more land is set aside for productive use. As a result, households may migrate out of the region in response to a hypothetical rise in property taxes. RIMS II and IMPLAN would not account for changing prices or migrating households.

Indicators

Necessarily, the structure of the REMI model is much more complicated, yet it still measures the same basic economic impacts:

- Total output
- Employment
- Labor income

EXAMPLE: REMI

Eat Fresh and Grow Jobs, Michigan⁹

This study explores the potential for changes in the marketing practices of Michigan's existing fruit and vegetable producers to improve the profitability of the state's valuable farmland, grow job opportunities across the economy, and improve public health by marketing their products to fresh markets instead of wholesale, processing markets.

Sector

Fruit, vegetable, and potato production sectors

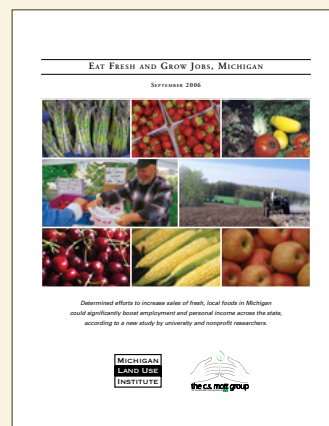
Process

Eat Fresh and Grow Jobs examines six different scenarios in which existing farmers double or triple the amount of fruits and vegetables they sell into fresh produce markets, such as wholesale grocery sales and farmers markets, while decreasing the amount they sell into wholesale processing markets. Scenario planning was largely based on secondary data that reflects the Michigan wholesale processing industry and the New York direct, fresh market industry.

Key Findings

The shift from wholesale processing markets to direct, fresh markets could generate up to 1,889 new jobs across the state and \$187 million in new personal income.

⁹ Cantrell, P., Conner, D., Erickcek, G., & Hamm, M. W. (2006) *Eat Fresh and Grow Jobs, Michigan*. Michigan Land Use Institute; C.S. Mott Group for Sustainable Good Systems at Michigan State University. Retrieved from mlui.org/userfiles/filemanager/274/



However, it produces significantly more information than IMPLAN. REMI organizes more than 6,000 indicators in blocks, summarized into five major categories:

- 1) Output and demand
- 2) Labor and capital demand
- 3) Population and labor force
- 4) Wages, prices, and costs
- 5) Market shares

The addition of economic geography methodologies is reflected in two basic indexes:

- Commodity access index: How productivity will be enhanced and costs reduced when firms increase access to intermediate inputs, and the effects of consumers having more access to consumer goods on their migration decisions.
- Labor access index: Captures the effect on labor productivity and labor costs when local firms have access to a wide variety of potential, appropriately skilled employees.

Considerations

Because the REMI model incorporates several approaches in one model, it allows for more realistic estimations. The model accounts for constraints on inputs and natural resources (land may be taken out of development to support agriculture), it responds to price changes (land diverted to agriculture will drive up house prices and negatively affect immigration), and equilibrates over time, often at annual intervals. REMI models also don't require market-clearing conditions,¹⁷ thus it can report a market failure as a result of the modeled scenario.

REMI is better suited than IMPLAN for capturing the nuances associated with shifts in consumer spending on substitutable goods, such as food.

However, the model is complicated and expensive. The multiple feedback loops make definite correlations and conclusions almost impossible. Basic assumptions can be difficult

¹⁷ One example of a market-clearing condition is "supply always equals demand," which means that in a model with this market-clearing condition, any new production created by the intended scenario will be sold in the market at a fixed price. IMPLAN has several market-clearing conditions built into its formulas which allows the modeled economy to reach a steady state.

to explain. It is the least transparent of the models discussed here. Like IMPLAN, production functions are still based on national averages.

Though REMI models more accurately represent constraints on natural resources, firms' responses to price fluctuations, and labor mobility, they are typically considered overkill for community-based initiatives. Additionally, some studies suggest that despite different underlying structures, there are no significant differences between REMI and IMPLAN multipliers, however other studies suggest that they can be quite different, depending on the industry in question.^{18,19,20} However, REMI's ability to forecast over a 50-year time horizon allows for more realistic conversations about issues with long timelines, such as tax credits for agriculture land conservation.

Data Needs

Like IMPLAN, most of the data comes from the BEA, Bureau of Labor Statistics, and Census, all publicly available data sources. However, REMI uses several supplementary data sources including County Business Patterns, and a variety of historical and forecasting data from mostly government records. Additional data sources and categories are clearly outlined in REMI's supporting documentation.²¹ Single county and multi-county models are readily available, though MSA or other trade region models have to be custom built.

The REMI model can be stripped down to its basic I-O components, and thus, like IMPLAN, can be used for contribution analysis. For any given sector, the total output value can be retrieved and this estimates the total value that sector contributes to the overall economy at a single point in time.

Like IMPLAN, in order to perform an economic impact analysis, a change to the economy must be modeled. These scenarios can be contrived or based on primary data collection. Yet incorporating primary data into the REMI model is much more difficult than in IMPLAN. REMI does allow for some customization.

¹⁸ Lynch, T. (2002) *Analyzing the Economic Impact of Transportation Projects Using RIMS II, IMPLAN and REMI*

¹⁹ Neill, J. (2013) *IMPLAN, RIMS-II, and REMI Economic Impact Models: Comparisons in Context*

²⁰ Galloway, H. (2007) *EMSI's Input-Output Model Multipliers: A Brief Overview and Comparison with Other Major Models*.

²¹ remi.com/products/pi

Certainly, a lot of “scenarios” can be modeled based on primary data and intermediate input demand can be adjusted, similar to other models. However, customization of the underlying intermediate demand is not recommended for novice modelers.

Resources and Time Required

A REMI model can be purchased and used “out of the box.” The company requests about 10 business days to build the model to the defined region and requested industry detail. More time is required for models based on subcounty locales. The REMI models are only recommended for well-trained economists with modeling experience. Depending on the requested configuration, they can cost between \$7,000 and \$70,000. The size of the region and the desired level of disaggregated industries affect the price.

REMI also offers a consulting service that will conduct the modeling and reporting or advise on an as-needed basis.

Customization through the collection of primary data is still recommended for scenario planning, yet adjusting intermediate input demand (or production functions) is much more difficult since REMI doesn’t allow the I-O portion of the model, the multipliers, and the regional purchase coefficients to be altered. Collection of this data can take several years and significant outlays of cash, as discussed above.

Additional Information

remi.com

LM3

Classification and Description

The “Local Multiplier 3” methodology (LM3), devised by the New Economics Foundation in England, is a simpler version of an Input-Output model, geared for use in a civic setting, rather than strictly by professional economists. Instead of a comprehensive snapshot of the total economy, it only tracks how the spending of included entities results in additional spending.

The “3” in the name LM3 stands for three cycles of economic impact. If the tool was applied to community food systems, the first cycle of economic

impact could be the amount of local food purchased by an institution of interest within the geographic region they define as “local.” This initial spending is the direct impact of local food purchasing. Following from this example, the second cycle would be local purchases made by those firms that supplied the institutions with local foods (for example, labor, machinery, and supplies that were locally sourced). The third cycle would be local spending by the employees of those supplier firms, as they bought goods that were sourced locally. Each of these final two cycles include both indirect and induced impacts. The overall economic multiplier is a calculated combination of all three cycles of economic activity.

Figure 3: Cycles of Economic Impact

This hypothetical example shows the amount of money circulating in the local economy in three different scenarios—strong local connections, average local connections and weak local connections. The graph illustrates that a strongly connected local economy will maintain a greater portion of each dollar spent (i.e. have a higher multiplier), whereas, a weakly connected local economy will lose most of a dollar within three rounds of spending.

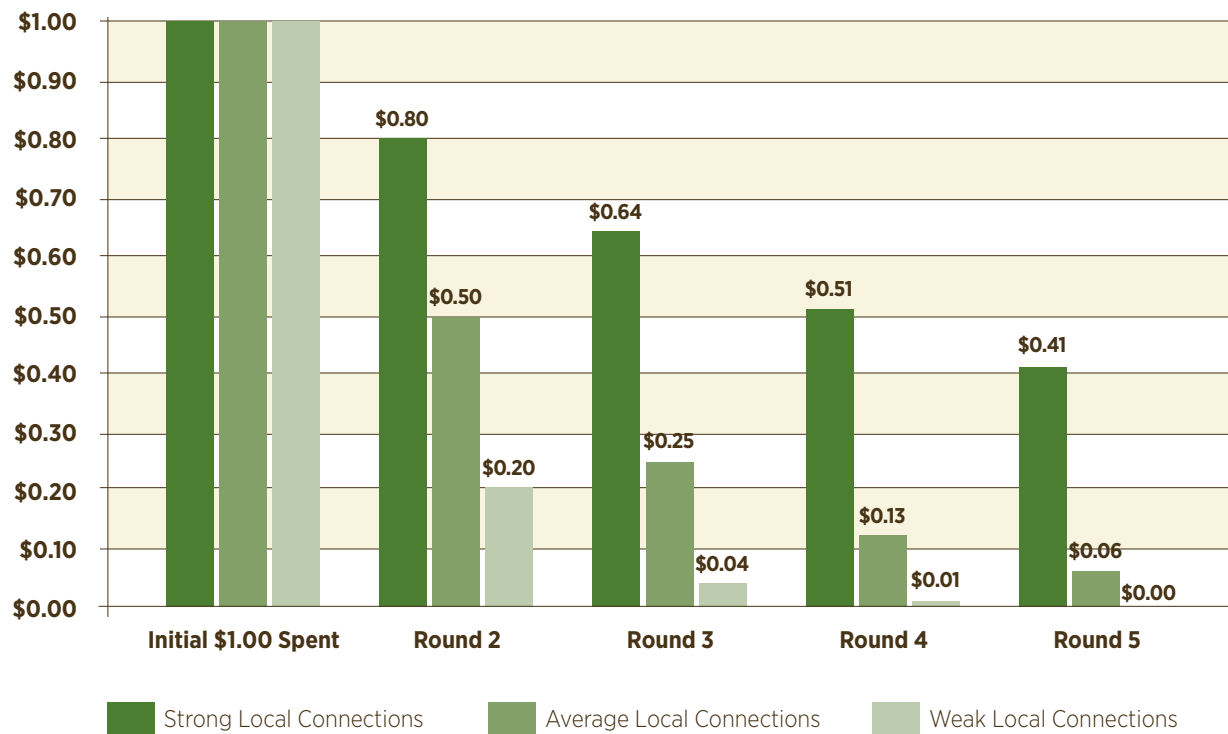


Figure 4: Sample LM3 Scores

In this example, a smaller contract with a local company has a larger total economic impact than the larger contract with a nonlocal company.

LM3	CONTRACTOR 1: LOCAL	CONTRACTOR 2: NONLOCAL
Round 1	£72,000	£120,000
Round 2	£57,600	£20,400
Staff	£24,480	—
Businesses	£33,120	£20,400
Round 3	£24,987	£6,768
Staff	£17,038	—
Businesses	£7,949	£6,768
Total	£154,587	£147,168
LM3	2.15	1.23

LM3 developers propose that these three cycles account for over 90 percent of the economic impact effects approximated by traditional economic impact software, which continue to cycle until they equilibrate, meaning all the money has left the economy of the region in the analysis.²² Since the LM3 model draws upon primary data from the community, it is an interesting alternative to proprietary software that relies on secondary data. This primary data consists of sales and sourcing data procured through surveys.

The New Economics Foundation provides the following illustrative example.²³ A local company, Contractor 1, constructed a sea wall and a nonlocal company, Contractor 2, constructed a parking garage for the Norfolk District Council. In Round 1, the council spends £72,000 and £120,000 with Contractors 1 and 2, respectively. Contractor 1 employs local labor (£24,480) and purchases supplies from other local companies (£33,120), for a total of £57,600 in Round 2 spending. These local companies spend another £17,038 on local labor and £7,949 with local companies, resulting in £24,987 in spending in Round 3. After three rounds of spending, the total amount of local spending attributed to Contractor 1 is £154,587, resulting in an LM3 score of 2.15 (£154,587 divided by £72,000). If the same three rounds of spending are followed

with Contractor 2, the nonlocal company, the total amount of spending is £147,168 and the LM3 score is 1.23. In other words, even though the contract with the local company was significantly less than the contract with the nonlocal company, the economic impact on the region was higher with the local company, because more of the money was spent on local labor and on supplies from local companies.

Indicators

Unlike RIM-II, IMPLAN, REMI, and others, LM3 just produces summaries of spending and an LM3 score. This LM3 score is simply the ratio of initial spending and total spending. It is considered a form of multiplier.

Considerations

The New Economics Foundation, which developed LM3, is dedicated to supporting small organizations and community-based initiatives, thus all of its tools are straightforward and easy to use. Accordingly, the LM3 model is very direct and transparent, and technical assistance is offered based on a sliding-scale fee. Nearly any quantitatively minded community practitioner could execute a study and the calculations. However, it relies entirely on collecting primary data, thus the quality and integrity of the calculations depends on the robustness of the collected data. Collecting robust data can be challenging because many businesses may not have detailed records of their expenses and, even if they do, may be reticent to share that information.

This model is not a comprehensive snapshot of the economy like other models. Inter-industry linkages are not accounted for in this model, thus it cannot be used to estimate the impacts of broad shifts in consumer expenditures or production functions, evolutions in technologies, or policy changes. It is only an estimation of an entity's economic impact through an evaluation of its spending. For this reason, some consider the LM3 model more of a teaching tool than an empirical calculator. Yet, in the Northeast of England, local authorities have used this model to evaluate their local spending.²⁴

²² pluggingtheleaks.org/index.htm

²³ pluggingtheleaks.org/public_spending/index.htm

²⁴ pluggingtheleaks.org/downloads/LM3_newsletter_may08.pdf

Data Needs

The LM3 modeled is based entirely off primary data collection that is sensitive in nature, including company financials, contract obligations, and customer lists.

Resources and Time Required

The LM3 is essentially a survey of suppliers and then summary calculations. The entity pursuing an LM3 study purchases an appropriate level of license (\$37- \$12,000), depending on the size of the entity and the number of suppliers it uses. For example, a very small nonprofit may only pay \$37, whereas a large corporation or consulting firm will pay much more. Anyone familiar with conducting community-based surveys knows the enormous amount of time that associated outreach can take. The LM3 tool assists in this process by providing an online dashboard to collate data, send emails soliciting participation, track progress, and generate reports.

Additional Information

lm3online.com

EXAMPLE: LM3

The Benefit of Procuring School Meals through the Food for Life Partnership: An Economic Analysis^h

The NEF (New Economics Foundation) was commissioned by the Food for Life Partnership (FFLP) to undertake a study of the wider social, economic and environmental impacts of FFLP procurement practices for school meals. The study has been carried out in relation to two case studies: local authority procurement in Nottinghamshire and Plymouth.

Sector

Farm to School

Process

In-depth semi-structured interviews were conducted with all the local wholesalers and a sample of farmers in the case study areas in order to understand the impact on their businesses and the local economy of a school meals supply contract. The following three rounds of spending were tracked:

- **Round 1:** Local authority school meals budget paid to local wholesalers and other direct suppliers.
- **Round 2:** Wholesalers' payments to local growers and farmers in order to meet the school meals contract, plus payments to their locally based employees and services.
- **Round 3:** Growers, employees, and local services spending within the local economy.

Key Findings

Comparing current spending and responding in Nottinghamshire now and prior to a focus on local procurement shows that a total amount of money circulating in the local economy from this source has increased substantially from £181,418 in 2004 to £3,826,688 currently. The LM3 multiplier is 1.19.

^h Knuutila, A. & Kersley, H. (2011) *The Benefit of Procuring School Meals through the Food for Life Partnership: An Economic Analysis*. New Economics Foundation. Retrieved from foodforlife.org.uk/-/media/files/evaluation%20reports/fflp-nef----benefits-of-local-procurement.pdf

Social Network Analysis

Classification and Description

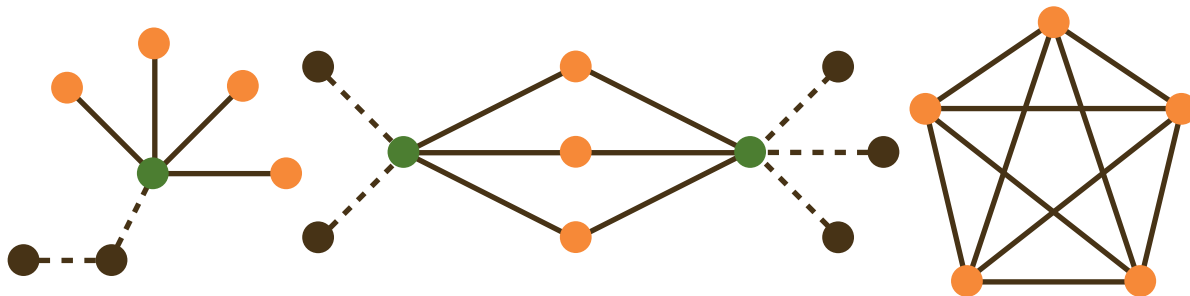
The economic impacts of locally owned businesses increase as they do business with each other. This suggests that local economic development is correlated with community development and social connectivity (social capital). It is therefore possible to make a case for using a social network analysis approach to estimating economic impacts, particularly in regard to local food systems development, where so much of the economic activity is predicated on social connections. Social network analysis (SNA) has frequently been used to assess the strength and extent of relationships in a network, but there are, to date, very few studies using SNA to focus on economic relationships. Under the theory that linear, applied economic models are inadequate for evaluating systems-

based programs, the University of Vermont has applied governance network analysis, similar to social network analysis, to farm to school programs in order to identify high impact leverage points.²⁵

The primary components of a social network analysis 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. Focusing on nodes, how they are connected to each other, and the relative strength of those connections gives rise to network charts where nodes are represented by points, and lines represent linkages.

²⁵ Conner, D. S.; King, B.; Koliba, C.; Kolodinsky, J. & Trubek, A. (2011) *Mapping Farm-to-School Networks Implications for Research and Practice*, Journal of Hunger & Environmental Nutrition, 6(2), 133-152.

Figure 5: Illustration of nodes and linkages²⁶



²⁶ Dunne, C., & Shneiderman, B. (2013, April) *Motif Simplification: Improving Network Visualization Readability with Fan, Connector, and Clique Glyphs*. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (pp. 3247-3256). ACM.

Some social network analysis focuses on the quality and strength of interactions, more than upon the number of interactions. One common approach used in business network analysis, which focuses on business-to-business relationships, is to survey a particular group's network members to learn how they view the strength of their connectivity. Three dimensions are typically the focus: (1) Does this social connection involve monetary exchange? (2) Does the respondent routinely share information with this connection? Finally,

(3) would the respondent turn to this connection when advice or support is desired? If questions are well crafted, researchers may learn a great deal about the degree to which feelings of trust and respect are reciprocated in the network. One may learn that a seemingly well-connected person is only weakly trusted, or vice versa. One may view patterns that show when competition and/or collaboration become possible.²⁷

²⁷ Klimas, P. (2015) *The Structural Face of Competition, Cooperation and Cooptation Inside Business Networks*. *Argumenta Oeconomica*, 1(34) 127-155.

Indicators

The outputs of an SNA depend on the initial study design. Data is largely collected firsthand, through surveys and interviews, thus the resulting metrics are determined by the study team. Likely indicators could be 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 the various account, plus any number of social indicators such as trust, commitment, and reciprocity, and which entities trade with other entities, or not. Simply viewing a network map can lend significant insights on how to leverage relationships to open up additional markets or supply chains.

Considerations

Just as there is not consensus on the definition of social capital, there is not consensus on how to measure it. By its very nature, it is difficult to quantify.²⁸ Social capital theorists are divided in their analysis of how social capital is produced, to whom it belongs, and how to measure it. Furthermore, there is debate around whether social capital has an intrinsic value (a value that is inherently present) or the value is something that can be created. In addition, SNA has only recently been applied to local food systems development and resulting economic impacts. Because of this, study design and approach best practices aren't codified for this topic, but many university-based researchers are interested in applying SNA approaches to new topics.

However, because SNA extends beyond the sheer exchanging of dollars and cents, it gives voice to many of the values that underlie local food systems work in the first place—community development and connectivity. And by making social and commercial networks visible, SNAs illuminate the mechanisms by which economic multipliers are built.

Data Needs

SNAs are typically based entirely on primary data collected through surveys and interviews that are sensitive in nature, including company financials, suppliers, and customers, and relative feelings

²⁸ Ross, P. (2013) Telephone interview with Ken Meter, June 4.

EXAMPLE: SNA

Mapping Farm to School Networks Implications for Research and Practiceⁱ

The Farm to School network in Vermont is presented as a series of relationships between network actors predicated on the flow of financial resources, whole and processed foods, information, and regulatory authority. A discussion of the utility of using network maps to critically examine the leverage points that may drive positive change within and across the system is included.

Sector

Farm to School

Process

Following the Governance Network Analysis methodology, the map places each actor or institution geographically according to its degree of “localness.” Additionally, actors’ and institutions’ centrality to the general set of activities that constitute a local FTS program are coded as being either “core” or “peripheral.”

Key Findings

The network map illustrates the relevance and connections that actors and institutions at multiple scales have to local-level FTS programs. The map's value lies in contextualizing and informing specific discussions about developments in FTS research and policy. In this role, the map will promote more holistically conceived policymaking and more interdisciplinary research that would catalyze greater support for FTS programs from influential actors and institutions within the system.

ⁱ Conner, D. S., King, B., Koliba, C., Kolodinsky, J., & Trubek, A. (2011) *Mapping Farm to School Networks Implications for Research and Practice*. *Journal of Hunger & Environmental Nutrition*, 6(2), 133-152.

regarding all of them. There are situations in which social network data can be collected from various social media sites, but this is not appropriate for the objectives discussed in this guide.

Resources and Time Required

Specialized software and technical knowledge are essential to conducting a robust social network analysis, although some internet-based network analysis tools are available for free. In addition, all the data must be collected firsthand through surveys and interviews. The time and resources required are largely dictated by the extent of the inquiry and size of the network.

Additional Information

Bauermeister, M. R. (2014) *Social Movement Organizations in the Local Food Movement: Linking Social Capital and Movement Support*. Iowa State University, Graduate Theses and Dissertations. Paper 13688. Retrieved from lib.dr.iastate.edu/cgi/viewcontent.cgi?article=4695&context=etd

Meter, K., Goldenberg, M. P., & Robles-Schrader, G. (2015) *The Role of Networks and Social Capital in Economic Development and Community Health*. Exploring Economic and Health Impacts of Local Food Procurement, pp. 125-135. Chicago, IL: Illinois Public Health Institute. Retrieved from iphionline.org/pdf/Exploring_Economic_and_Health_Impacts_of_Local_Food_Procurement.pdf

Regional Finding Food in Farm Country™ Studies

Classification and Description

Regional Finding Food in Farm Country™ studies provide an overview of a region's farm and food economy, using regional income and other public data sets. Intended for a lay audience, the methodology of these studies has proven useful in galvanizing community discussion and activity. These are not strictly economic impact analyses, but rather show income flows over time, and connect these to other demographic, health, and expense patterns. A key source is regional income data compiled by the Bureau of Economic Analysis, one of the primary data sets used to compile production functions used in input-output modeling.

Indicators

This methodology relies on summarizing the following secondary data sources:

- Agricultural production
- Land in farms, size of farms, value of farms, etc.
- County crop rankings
- Farm cash receipts at state level
- Population
- Personal income, household Income
- Personal income by industry, NAICS and SIC²⁹
- Count and percentage of people living below 185 percent of poverty
- Farm income and expenses
- Current personal transfer receipts
- Consumer Expenditures Survey
- County business patterns
- Diabetes rates
- Percent of population that is uninsured
- Physical activity rates
- Fruit and vegetable consumption rates
- Body Mass Index
- Medical costs of diabetes

²⁹ Standard Industrial Classification (SIC) and North American Industrial Classification System (NAICS) codes identify a firm's primary business activity. NAICS is the industry standard, however, some historical records use SIC.

EXAMPLE: REGIONAL FINDING FOOD IN FARM COUNTRY™ STUDY

Northeast Indiana Local Food Network: Phase I Report Toward a Strategic Plan^j

The Northeast Indiana Regional Partnership commissioned this report to explore the feasibility of increasing local food trade in the region and building the Northeast Indiana Local Food Network. The report combines findings from stakeholder interviews and summaries of publicly available data sets.

Sector

Agriculture

Process

An analysis of secondary data on the region's food and farm economy in order to assess opportunities to increase local food trade.

Key Findings

The 12,302 farmers in Northeast Indiana sell \$1.42 billion of food products per year (1989–2014 average), spending \$1.33 billion to raise them, for an average gain of \$88 million each year. This is an average net cash income of \$7,191 per farm per year. Overall, the region's farmers earned a surplus of \$2.3 billion by selling crops and livestock from 1989 to 2014. Yet farm production costs exceeded cash receipts for 13 years of that 26-year period. Moreover, 45 percent of the region's farms reported net losses in 2012 (Ag Census), and net cash income of farming is about the same today as it was in 1969—only \$61 million higher (in 2014 dollars).

^j Meter, K. (2016) *Northeast Indiana Local Food Network: Phase I Report Toward a Strategic Plan*. Crossroads Resource Center. Retrieved from crcworks.org/innetworks16.pdf

Considerations

Since this methodology relies on much of the same data as the commercial EIA models, many of the same considerations apply in regard to the economic, demographic, and farm data. Additionally, Centers for Disease Control Behavioral Risk Factors Surveillance Survey is compiled annually for states and metro areas. Some data are collected less frequently. While historical data is available, changes in sampling techniques make comparisons across time difficult. Ken Meter, the author of these studies, uses the term “farm production balance” instead of “net cash income” (cash receipts less production expenses) since “income” can have a variety of meanings.

Data Needs

Data is drawn from public sources that are readily available on internet sites or in key publications.³⁰

Two specific data estimates are made using simple models:

1. Percent of food purchased from outside each region is calculated using an estimate that is best derived after interviews with key practitioners. Generally, it is assumed that 85-95 percent of each region’s food supply is purchased from outside the region.³¹
2. Similarly, the value of farm inputs purchased from outside sources is estimated using a somewhat more complex calculation. For each production expense category reported in the Census of Agriculture, an estimation is made regarding the percentage of value that accrues to the region itself.

As one example, if a farmer purchases a combine at \$400,000, one might assume that the local dealer sells this at a margin of 2-5 percent and that a percentage of that margin is dedicated to community purchasing either by the dealer or by employees. In a region that manufactures combines, the percentage of local value accrued will be higher. Estimates of retained local value are based on interviews with lenders, economic developers, researchers, and business owners. A plausible minimum value and maximum percentage value for each expense category is estimated. Using these percentages, the total internal and external value created through input purchases is estimated through a simple multiplication. Then a plausible estimate is derived from a midrange result between the minimum and maximum, rounded off to reflect the uncertainty of the estimate.

Resources and Time Required

Ten to 30 hours, depending on the size of the region, experience of the researcher, and how much of the calculation process has been standardized.

Additional Information

See crcworks.org/?=fffc for all Finding Food in Farm Country™ studies that have been completed. At this writing, 126 regions in 39 states have been studied.

³⁰ See crcworks.org/leascope.pdf for detailed list of data sets used, or see studies available at crcworks.org/?submit=fffc.

³¹ Conner, D., Becot, F., Hoffer, D., Kahler, E., Sawyer, S., & Berlin, L. (2013) *Measuring current consumption of locally grown foods in Vermont: methods for baselines and targets*. Journal of Agriculture, Food Systems, and Community Development.

ECONOMIC IMPACT TOOLS SUMMARY TABLE

TOOL & DESCRIPTION	MOST APPROPRIATE USES
<p>RIMS II (Regional Input-Output Model System)</p> <ul style="list-style-type: none"> Linear I-O (input-output) model Spreadsheet based <p>bea.gov/regional/rims/rimsii/</p>	<ul style="list-style-type: none"> Comparisons across regions, or comparing one industry to another Scenarios when no customization is needed Lends basic insights to relative industry strengths and connectivity Projects with limited resources
<p>IMPLAN (Impact Analysis for Planning)</p> <ul style="list-style-type: none"> Linear I-O (input-output) model Web-based interface, exports to spreadsheets <p>implan.com</p>	<ul style="list-style-type: none"> Large region or state level economic impacts at a single point in time Comparing one industry to another, one region to another, or one investment to another Evaluations of well-established industries Projects with moderate budgets and existing baseline data Analyses by professional economic modelers
<p>REMI (Regional Economic Models, Inc.)</p> <ul style="list-style-type: none"> ESM (economic simulation model) Software based <p>remi.com</p>	<ul style="list-style-type: none"> Multi-factor scenarios with price changes, migration, investment, constraints on inputs, etc. Tracking the effects of a shock over time Projects with large budgets for evaluating the impacts of really large investments or infrastructure projects Analyses by professional economic modelers
<p>LM3 (Local Multiplier 3)</p> <ul style="list-style-type: none"> Simpler version of an I-O model for use in a civic setting Web-based interface <p>lm3online.com</p>	<ul style="list-style-type: none"> Inform community discussions and planning processes Time and resources for primary data collection are available Analysis of a single entity or small cluster of entities at a single point in time, and over time Analyses by community-based organizations
<p>SNA (Social Network Analysis)</p> <ul style="list-style-type: none"> Assessing the number and strength of links between businesses Software based 	<ul style="list-style-type: none"> Time and resources for primary data collection are available Analyses by community-based organizations dedicated to long-term goals Doesn't provide numerical evaluations of economic impacts, but can illuminate leverage points for increasing future economic impacts
<p>Regional Finding Food in Farm Country Studies</p> <ul style="list-style-type: none"> A collection of historical trend data from secondary sources Spreadsheet and document based <p>crcworks.org/leascope.pdf</p>	<ul style="list-style-type: none"> Inform community discussions and planning processes Not an economic impact analysis, but rather shows income flows over time, and connects these to other demographic, health, and expense patterns Projects with small budgets requiring basic data to start comprehensive community conversations Crossroads Resource Center specializes in producing a comprehensive data package in a concise format, but all data is publicly available and can be compiled by any community member with basic understanding of economics and data

CONSIDERATIONS FOR FUTURE STUDIES

Commissioning an economic impact study that accurately reflects the unique conditions and needs of your community and maintains credibility is no small undertaking. There are several resources publicly available to support a community through this process, including:

- *The Economics of Local Food Systems: A Toolkit to Guide Community Discussions, Assessments and Choices with USDA AMS*³²
- *Economic Analysis of Local and Regional Food Systems: Taking Stock and Looking Ahead*³³

Any study will be better if baseline data has been collected for some time already since impact calculations can only be made by comparing conditions at two different points in time. Establishing a solid measure of initial conditions is critical. For entities with comprehensive records, this can be done retroactively. For example, a school may decide to use the 2000-2001 school year as their baseline if farm to school efforts were introduced in the 2001-2002 school year. For entities without complete records, the baseline will be the first year in which adequate data is collected. Another option is to set the baseline at zero for the year before new efforts were introduced, though this approach is fundamentally flawed from an analytical perspective and it isn't recommended since a baseline of zero is unlikely. For example, in regard to local procurement, it is important to recognize that some local purchasing had been taking place, prior to the introduction of the new initiative. Not properly accounting for this previous activity leads to an inflated impact number or the gross impact, instead of the net impact.

³² localfoodeconomics.com/toolkit/

³³ foodsystems.msu.edu/uploads/files/econ-analysis-brief.pdf

Using local procurement as an example, the following data items will help construct a baseline for future impact studies:

Basic overview of purchaser:

- Name of entity
- Number of locations that are included in this food service unit
- Address of purchaser
- Total amount of food purchased from all sources
- Definition of "local" used by purchaser

Transaction data:

- Date of purchase
- Vendor (farmer or distributor)
- Item(s) purchased (include SKU code, if appropriate)
- Unit of measure
- Price per unit
- Quantity
- Total cost (price times quantity for each item)
- Local vs. nonlocal designation or code for specific farm
- Farm of origin
- Address of farm of origin

Although it is always a best practice for any entity to collect meaningful data to evaluate its own program's effectiveness towards its own goals, commissioning an expensive and time-consuming economic impact analysis is not the most appropriate next step for every organization or entity. Instead, where possible, organizations should consult the academic literature for relevant examples. Several models are outlined in Appendix A.

► APPENDIX A: MODEL STUDIES FOR FOODS SYSTEMS STRATEGIES

This section lists citations and abstracts (or brief synopses if abstracts were unavailable) for a small set of selected studies on different local food systems strategies that may be useful in drawing inferences for the potential impact of similar strategies in your community. The studies listed were chosen based on public availability, utilization of robust methodologies, and peer review and recognition. It is not a comprehensive list of studies on these topics.

Food Hubs

- Jablonski, B. B. R., Schmit, T. M., & Kay, D. (2015) *Assessing the Economic Impacts of Food Hubs to Regional Economies: A Framework Including Opportunity Cost*. Cornell University: Charles H. Dyson School of Applied Economics and Management. Working Paper 2015-03. Retrieved from publications.dyson.cornell.edu/research/researchpdf/wp/2015/Cornell-Dyson-wp1503.pdf

Abstract. The number of food hubs ('local food' aggregation and distribution businesses) is growing, fueled in part by increasing public support. However, few data-driven economic impact assessments have evaluated these ventures. Using an input-output-based methodology and a unique data set from a successful food hub operation, we measure the net and gross impacts from a policy supporting its development. We estimate a food hub gross output multiplier of 1.75, and employment multiplier of 2.14. However, utilizing customer surveys, we estimate that for every \$1 increase in final demand for food hub products, an 11-cent offset in purchases occurs in other sectors.

Farm to Institution

- Gunter, A. & Thilmany, D. (2012) *Economic Implications of Farm to School for a Rural Colorado Community*. Western Rural Development Center: Rural Connections magazine, May 2012, pp. 13-16. Retrieved from wrdc.usu.edu/files-ou/publications/pub_6232863.pdf

Synopsis. This paper analyzes one of the proposed benefits of mid-scale value chains: the potential positive economic impact within communities when food supply chain activities occurring within a region are increased or shifted to more locally owned and controlled enterprises. More specifically, we will explore the local economic impact of a specific Colorado school district's local food purchasing program using marketing data on purchases, likely suppliers, and the assumed linkages between the community's businesses and the new distribution enterprise.

- Tuck, B., Haynes, M., King, R., & Pesch, R. (2010) *The Economic Impact of Farm-to-School Lunch Programs: A Central Minnesota Example*. University of Minnesota Extension Center for Community Vitality and University of Minnesota Department of Applied Economics. Retrieved from extension.umn.edu/community/economic-impact-analysis/reports/docs/2010-EIA-Farm-School-Programs.pdf

Synopsis. This report answers the question "What is the potential economic impact of farm to school programs in Central Minnesota" in a comprehensive manner. It addresses the issue of what foods are available and can be used in schools. It looks at variability in the pricing structure. It considers various realistic scenarios under which the food would be provided to the schools. Finally, it takes into account economic realities such as decreases in payments to current school lunch suppliers and increases in the cost to provide lunch.

Farmers Markets

- Hughes, D. W., Brown, C., Miller, S., & McConnell, T. (2008) *Evaluating the Economic Impact of Farmers' Markets Using an Opportunity Cost Framework*. Journal of Agricultural and Applied Economics, 40(1), pp. 253-265. Retrieved from ageconsearch.umn.edu/bitstream/45523/2/jaae-40-01-253.pdf

Abstract. Farmers' markets presumably benefit local economies through enhanced retention of local dollars. Unlike other studies, the net impact of farmers' markets on the West Virginia economy is examined. Producer survey results are used in estimating annual direct sales (\$1.725 million). Using an IMPLAN-based input-output model, gross impacts are 119 jobs (69 full-time equivalent jobs) and \$2.389 million in output including \$1.48 million in gross state product (GSP). When the effect of direct revenue losses are included (primarily for grocery stores), the impact is reduced to 82 jobs (43 full-time equivalent jobs), \$1.075 million in output, and \$0.653 million in GSP.

- Rastegari Henneberry, S. Whitacre, B., & Agustini, H. N. (2009) *An Evaluation of the Economic Impacts of Oklahoma Farmers Markets*. Journal of Food Distribution Research 40(3), pp. 64-78. Retrieved from ageconsearch.umn.edu/bitstream/99760/2/Evaluation%20pg%2064-78.pdf

Abstract. The contribution of farmers markets to the U.S. economy has become more significant due to the increased demand for fresh, locally produced products. However, compared to other marketing outlets, the economic contribution of farmers markets often goes unrecognized. This study focuses on farmers markets in Oklahoma and uses the IMPLAN model to estimate the impacts of farmers markets on Oklahoma's economy. The results from this study show that farmers market activities are a vital part of Oklahoma's economy, generating total direct sales of \$3.3 million, with a total economic impact of almost \$6 million.

► APPENDIX B: TERMS AND DEFINITIONS

Dynamic: A dynamic economic model does have a time component, though not necessarily explicating. It allows for conditions to equilibrate over time, such as supply, demand, prices, labor migrations, etc.

Economic activity: The production, distribution, and consumption of commodities.

Economic development: An increase in quality-of-life indicators. For example, increasing the sales of healthy foods in low-income, low-access neighborhoods may be an economic development goal.

Economic growth: An increase in output. For example, increasing the sale of agricultural goods may be an economic growth goal.

Economic impact: The effect of a given change on a defined area. For example, a new farmers market sited in a busy downtown area increases farmer incomes. New food sales generated by the new market is the change, and the increase in farmer income is one potential impact of that change.

Economic mobility: The ability of an individual, family, or some other group to improve (or lower) their economic status—usually measured in income. Economic mobility is often measured by movement between income quintiles. **Labor, household, and firm mobility** is the ability of employees and employers to change economic regions. A suburban workforce commuting into a city is one example of this. A corporate headquarters moving to a region with favorable tax conditions is another.

Elasticity: Sensitivity to changes in the marketplace. The demand for SUVs is elastic. A drop in gas prices will increase demand for SUVs; a rise in gas prices will decrease demand for SUVs. The tendency for such changes to occur is called elasticity. The more demand or supply changes in regard to a change in price, the more elastic that item is. Food is relatively inelastic, regardless of changes in price; people tend to purchase what they want to eat.

Employment: The number of jobs needed to support a given economic activity. Importantly, in regard to economic modeling, employment outputs don't necessarily refer to FTEs, but instead a combination of labor arrangements, including both full-time, year-round jobs and part-time, seasonal jobs.

Labor income: Incomes generated by jobs.

Multipliers: A quantification of how a dollar spent in one sector will ripple throughout the economy.

Multipliers also come in three forms, as follows:

- **Direct:** Changes in production at a final supplier as a direct result of a change in demand.
- **Indirect:** Changes in production to additional industries (intermediate suppliers) as a result of the change in production at the first industry.
- **Induced:** Changes in income (and labor spending) as a result of changes in production at the final and intermediate suppliers.

The **total impact multiplier** (or total effect multiplier) is the sum of the direct, indirect and induced multipliers.

Multipliers can be calculated for contributions to gross domestic product (GDP), number of jobs or labor income. For example:

- **Direct-effect employment** multipliers are ratios of the total change in jobs to the initial change in jobs.
- **Direct-effect earnings** multipliers are ratios of the total change in household earnings to the initial change in household earnings.

Opportunity cost: The value of something forgone or given up in the pursuit of something else. For example, a field that was previously planted in wheat is now planted in carrots. The opportunity cost of that production decision is the potential value of the wheat crop that was not planted.

Primary data: Those data that are collected firsthand by a researcher making direct contact with a given population.

Production function: The mathematical relationship between physical inputs and physical outputs associated with a productive industry. Most models contain generalized production functions based on nationally sourced data. In regard to agriculture, production functions can be generated using farm accounting records or Schedule Fs.

Scenario, shock, shift: In order to perform an "economic impact analysis," a change to the economy must be modeled. This is referred to as a scenario. These scenarios can be entirely hypothetical. For example, some consultants will just increase final demand for agricultural outputs by some arbitrary amount and report the effects this has on the economy. Other scenarios can be constructed based on real programming or investments, such as increased spending by a school district with a new food hub.

Secondary data: Primary data that are summarized for reporting purposes.

Static: A static economic model has no time component. A static model makes a whole host of unrealistic assumptions, including perfect supply and demand, perfect knowledge, no evolutions in technology or production, no population growth, no migration, and no changes in tastes or fashion.

Technical coefficients: Also known as an input-output coefficient, it is the ratio of inputs (raw carrots) needed to produce outputs (bagged, chopped carrots).

Total output: A measure of total revenues generated or sales.

Value-added: A measure of total revenues minus the cost of inputs purchased from another sector.

MICHIGAN STATE
UNIVERSITY

Center for
Regional Food Systems

CRFS envisions a thriving economy, equity, and sustainability for Michigan, the country, and the planet through food systems rooted in local regions and centered on Good Food: food that is healthy, green, fair, and affordable. Its mission is to engage the people of Michigan, the United States, and the world in applied research, education, and outreach to develop regionally integrated, sustainable food systems. CRFS joins in Michigan State University's pioneering legacy of applied research, education, and outreach by catalyzing collaboration and fostering innovation among the diverse range of people, processes, and places involved in regional food systems. Working in local, state, national, and global spheres, CRFS' projects span from farm to fork, including production, processing, distribution, policy, and access.

Center for Regional Food Systems
Michigan State University

480 Wilson Road
Natural Resources Building
East Lansing, MI, 48824

For general inquiries:

LEARN: foodsystems.msu.edu

EMAIL: CRFS@anr.msu.edu

CALL: 517-353-3535

FOLLOW: @MSUCRFS

Email addresses and phone numbers for individual staff members can be found on the [people page](#) of our [website](#).

