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# The Economics of Local Food Systems

## A Toolkit to Guide Community Discussions, Assessments and Choices

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# Introduction: The Economics of Local Food Systems, a Toolkit to Guide Community Discussions, Assessments, and Choices

As consumers across the Nation express a growing interest in a closer connection to their food producers—whether through access to more localized markets and/or shorter supply chains—cities and regions have begun to regard the expansion of local food marketing activities as a critical component of their economic development strategies. Rising demand for locally produced, source-identified, and differentiated food products has generated a plethora of new and spinoff businesses in many communities, which aim to increase the range of and accessibility to local food items for both retail and wholesale customers. In turn, this emergence of local food businesses has sparked a groundswell of financial support and interest from private foundations and public agencies on the assumption that the development of local food systems contributes to positive economic outcomes, especially with respect to local economic development and improved farm viability. Unfortunately, given the nascent nature of local food demand growth and the scarcity of available data, relatively few of these efforts have been guided by rigorous assessments.

In response, the United States Department of Agriculture (USDA) has formed new initiatives and programs to develop new markets and support existing markets so that producers and their communities may leverage these new opportunities. Specifically, the USDA, Agricultural Marketing Service (AMS) has managed the Farmers Market Promotion Program (now expanded to the Local Foods Promotion Program), with great expectations of positive outcomes, but no standardized approach on how to evaluate market and economic outcomes. As a result, a team of regional economists and food system specialists were assembled through a project hosted by Colorado State University (CSU) to develop a Toolkit comprised of food system assessment principles and economic indicators a community may expect to share. Given the real-world projects, experiences, and applied research of the CSU-led team, the Toolkit is grounded in practices that are credible and useable within the economic development discussions guiding communities. The goal of this Toolkit is to guide and enhance the capacity of local organizations to make more deliberate and credible measurements of local and regional economic activity and other ancillary benefits.

## Roadmap to the Toolkit

The Toolkit 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 preliminary stages of an impact assessment and includes framing the system, relevant economic activities and assessment process as well as collecting and analyzing relevant primary and secondary data. For those seeking a more robust economic impact assessment, 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 analysis.

Module 1, *Framing Your Community Economic Assessment Process: Defining the Parameters of Your Local Food System*, discusses the key steps that a community should follow when initially undertaking a community-based economic assessment or planning process. In this module, you will first learn how to organize an effective team and identify the parameters of your study and priority issues. Leading questions are provided to guide you through the process of building a team and appropriately scoping your project. Next, the module will guide your team in identifying the goals of your food system assessment as well as a few key questions the study will answer, serving as a guide for data collection discussed in modules 2 and 3. Lastly, the module provides examples and discussion of visual schematics of food systems to support a better understanding of the complex planning and implementation process of a community economic impact assessment. These schematics are useful for the project team during the planning process as well as for members

outside of the team during the outreach process of the project. The activities outlined in module 1 are essential for a successful assessment because thoughtful discussion and understanding of the economic outcomes appropriate for and expected by stakeholders will catalyze an effective community process.

Module 2, *Using Secondary Data Sources*, provides an overview of the key secondary data sources (data that someone else has obtained and compiled into an ordered, meaningful format) that have proven useful in performing local food system assessments as well as a guided set of questions to help you utilize this data in your own assessment. This module is intended to make it easier for your assessment team to identify and access the available datasets, determine the datasets that are likely to be most useful in your project, and evaluate key strengths and drawbacks of each data set. It is also important to understand what is available already before investing resources into primary data gathering.

Module 3, *Generating and Using Primary Data*, provides a detailed description of how to gather primary data (data that you collect yourself) in order to conduct your economic impact assessment. Primary data collection may be needed if no secondary data exist to answer your research questions. The module begins by guiding you through the identification and definition of three guiding components of data collection: dimensions, variables, and attributes. Dimensions are the broad questions you want to answer; variables can be thought of as a set of questions on a survey or interview; and attributes are the individual responses to those questions. The module then provides guidance on the three primary approaches in determining the study sample (i.e., the people or organizations who/that will be asked to respond to your questions). Lastly, the module provides a detailed description of data collection methods and techniques for coding qualitative and quantitative data so it is ready to use in analysis.

Module 4, *Engaging Your Community Process with Data*, provides guidance on how to reflect on and analyze the data gathered, by characterizing trends, changes, and sectors that warrant further attention and exploration. This module begins by discussing how to develop a shared project team mission centered on key data findings from modules 2 and 3, providing discussion points for the leadership team on how to examine initial data and findings and use those findings to revisit the discussion from module 1. The module then discusses how to prioritize data and the common methods used to reduce data into thematic findings of interest to general audiences. Lastly, the module discusses some methods to present your initial findings to the community, including suggestions for estimating potential economic impacts and engaging community members before undertaking the full scope of an economic impact analysis (modules 5 and 7).

Module 5, *Analyzing the Linkages and Contribution of Local Foods to Local Economies Through Input-Output Analysis*, provides the

***This diagram llustrates the concept of a local multiplier.***

reader with a brief background on the rationale for and basic principles of economic impact studies. The module begins with a discussion of the ways in which local food system expansion can be thought about in the context of economic impact studies. Next, the module presents the important economic impact concepts of linkages, leakages, and multipliers to give you a basic understanding of exactly what these indicators can tell us about our local food system. The module then provides you with a basic education on input-output modeling, a type of analysis that tracks the interdependence among the producing and consuming sectors of an economy, and the most commonly used method to conduct economic impact studies. Moving into a more technical discussion, including an interactive video guide, the module provides the reader with guidance on choosing the appropriate study area and scenarios as well as the related implications for multipliers. The module ends with a discussion of the limitations of input-output analysis.

Module 6, *Addressing Opportunity Costs in the Analysis of Economic Impacts Across Local Food Systems*, focuses on understanding two key assumptions of input-output models which are fundamental in properly estimating and interpreting the economic impact of local food sales increases on local (or regional) economies: (1) the "no resource constraints" assumption on the supply side; and (2) the "no opportunity cost of spending" assumption on the demand side. The module first discusses the assumption of no resource constraints – i.e., increases in local food production likely reflect changes in land use, the reallocation of existing uses of agricultural land. The discussion then moves to the assumption of no opportunity cost of spending – i.e., farmers directly marketing their crops to local consumers constitutes a positive local economic impact, but may also result in negative impacts due to lost sales (consumer spending) in other sectors of the economy (typically, the wholesale and retail sectors). This module provides detailed examples of how a modeler can correctly incorporate these key concepts into his/her input-output analysis.

Module 7, *Advanced IMpact Analysis for PLANing Analysis to Understand the Economic Impact of Local Food System Initiatives (IMPLAN)*, provides technical and detailed information on how to modify input-output models so as to more accurately reflect conditions in your community or region. This is the most technical module and recommended for users with expertise in the field of regional economics and input-output modeling, or those that have recruited a partner with such expertise to their team. The focus of this chapter is on a specific data package and software platform, IMPLAN, as it is the most widely used when exploring economic impacts. The module begins by discussing why a team might want to modify IMPLAN for its economic impact study. The discussion then moves into a tutorial of how to modify IMPLAN, including the data you will need. The chapter concludes by walking you through how to approach the team's impact assessment, providing examples along the way. Although there are few who may need this information directly, it may guide the use of technical assistance partners who support teams by providing a roadmap of best practices.

## Purpose of the Toolkit

This Toolkit reflects the intention of the USDA AMS to expand its current role as a technical assistance provider to food system practitioners, economic developers, and community stakeholders. We expect this effort will support more appropriately targeted financial investments, as this Toolkit is designed to help communities' better measure the expected economic impact of planned local food system activities, and thereby support better-informed policy and regulatory decisions on the local, State, and Federal level. Furthermore, the customized nature of these assessment strategies can be expected to help identify and support the development of specific economic, infrastructure, or regulatory needs that correspond with the entrepreneurial ambitions and social/environmental priorities of individual communities related to food production, manufacturing, and distribution.

To set the stage for your community to frame and implement its economic impact assessment, this introduction motivates the need for the following set of modules by presenting many of the reasons that communities decide to undertake this process. The module(s) of value and interest will

***Urban Gardens, such as this one in Denver, CO, build an awareness of the importance of locally grown foods.***

vary depending on the stage and expertise of the assessment team. This Toolkit is meant to be used in its whole or in parts, but does not necessarily need to be utilized from start to finish, dependent on the background of the assessment team. Each module is intended to stand alone, but later modules assume knowledge of and findings from prior modules.

In the remainder of this introduction, we present key drivers that, in our team's experience, have typically catalyzed food system community discussions. These drivers (some economic, some not) are important to consider since they may influence the assumptions and perceptions that discussion participants bring to the table, and thus, should be explicitly acknowledged when identifying the goals and outcomes expected from a planning process. We provide a brief overview of recent U.S. economic development concepts, and discuss how recent work in the area of food systems intersects with conventional analysis.

## Why Perform an Economic Impact Assessment?

The most common reason cited for assessing the economic impacts of local foods work is to offer policymakers' specific estimates that will help them consider whether to invest in initiatives that increase local food activity. The findings of an economic impact assessment, for example, might suggest that investing in a specific sector would create a certain number of jobs, or generate a certain level of additional personal income. While this type of method has been used for decades by economic development specialists to evaluate the cost effectiveness of capital investments, most municipal/local governments and community planners have only recently begun to view agricultural and food systems as an important engine of economic development and sought to link their economic development and assessment work to local food systems activities.

Beyond providing impact estimates to local policymakers, economic impact assessments allow you to better determine which types of food system interventions are likely to be most appropriate, cost effective, and result in the priority outcome(s) that your community desires. For example, by conducting a careful asset mapping exercise of pre-existing community assets, members of your assessment team may find that there are existing assets that can be deployed without additional investment. Several communities across the country provide a compelling example in their investment in employees who support "value chain facilitation" (i.e., building relationships between farmers, processors, and distributors) rather than building new food hubs (i.e., local food aggregation and distribution businesses). Your leadership team may be able to take advantage of lessons learned from the asset mapping by encouraging related local businesses to build new linkages with each other, forming business clusters that lend permanence to your work

and increase local economic multipliers. By measuring existing business clusters on the front end of your implementation activity, and measuring how they change or take root over time, your local foods assessment work can be used to increase local economic multipliers rather than simply as a measurement tool.

Economic impact assessments are also helpful in guiding the initiation and implementation of socially or environmentally driven goals. Such assessments can help you identify core dynamics in your community's food system, which in turn can help you identify what can be done to support the development of a food system that aligns more closely to desired community interests and values. For example, community planners and stakeholders may want to use assessment tools to develop interventions related to boosting farm viability, preserving farmland, or creating additional value-added manufacturing capacity at the local/regional level.

Finally, by knowing what economic conditions were like at the onset of a project or at a particular phase, you will be better positioned down the road if you wish to measure the economic impacts of any future proposed development. Measuring the success of your effort will also enable you to show funders, participating stakeholders, or other investors how their investments have made a difference over time, increasing your credibility as a source of valuable data and enabling you to exert greater leverage over local policy decisions. For example, if a new grocery store sold $200,000 of locally raised food in its first year, you could say that the store generated $200,000 in sales (local benefits). However, if your economic impact assessment determined that the local economic multiplier for this store was 1.3, you could also claim that the store yielded $260,000 in economic impacts as these initial earnings were recycled back into the community.

## Evolution of Food System Policy Drivers and Issues

Some of the most common reasons for advancing programs that support local foods are that local food production:

- Provides incentives for entrepreneurship and innovation;
- Expands consumer choice and fresh food access;
- Improves negotiating power to local producers;
- Supports rural economic revitalization; and
- Protects the food system against severe shocks through decentralization of production.

Beyond a beneficial impact on local farm economies, food systems efforts are thought of as one area to empower such potential, providing a more varied set of agricultural products intended for local, domestic, and export markets. By helping to maintain key food supply chain infrastructure such as processing facilities and distribution hubs, these food system efforts support the portfolio of built capital invested in rural communities and economies. As one example of resiliency, if natural disaster or other infrequent events disrupt food supply chains, having food production assets in a more dispersed set of locations may benefit the public.

Despite increasing concentration, small and mid-sized farms still represent the vast majority of farms in the United States, and continue to play a key role in rural America – where economies are dependent on the farm and agribusiness sector as key economic drivers. Several studies have noted consumers' concerns about prices received at the farm-gate (for example, the USDA, Economic Research Service (ERS) food dollar series) and have reflected that local food systems may support increased willingness to pay and drive more consumers to buy differentiated, source-identified products at a variety of direct-to-consumer (i.e., farmers markets) or intermediated (i.e., grocery stores, restaurant) markets.[1] Alternative market outlets can also lead to higher value propositions for producers unable to access increasingly consolidated mainstream channels.

1 Onozaka, Y., G. Nurse, and D. Thilmany McFadden. 2011. "Defining Sustainable Food Market Segments: Do Motivations and Values Vary by Shopping Locale?" A*merican Journal of Agricultural Economics*. 93:2:583-589. This study found that the definition of local was influenced by the channels where consumers sourced their produce, which in turn, influenced their willingness to pay for locally labeled products. So, local as a label may be closely linked to the marketing channels rapidly emerging alongside conventional retail food systems in the United States.

The evolution of food system practices in recent years towards a more decentralized system has created many new opportunities, both economic and non-economic, but thus far, most local food initiatives are in the early stages of development and are not yet fully realized. Accordingly, any discussion of the potential for food system innovations must be realistic about using anecdotal evidence to support projects or programs that are significantly larger in scope than what has already been "piloted" in their region or similar areas.

Though there are many purported positive outcomes ascribed to local and regional food system efforts, more rigorous assessments are needed to evaluate realistic goals and achievements. For example, many believe the length of food supply chains affect other public issues, such as the environmental impact from transportation and processing of products affecting climate change. However, there is emerging evidence that a rigorous assessment of the distribution system may yield surprising information about how sustainable alternative food hub models may be, and encourage communities to consider partnering with existing institutions where possible to avoid potential inefficiencies (for example, backhaul using current food bank routes, sharing commercial kitchen space with other local food systems enterprises). This same argument may hold for intended economic benefits.

## Takeaways

As the purpose of this Toolkit is to help you and your team think about how to evaluate the economic impacts of local food systems, or of particular initiatives, it is useful to introduce how general principles of economic development are used in public policymaking. Community-based economic impact assessments are most commonly conducted to inform policymakers and economic development officials about the potential benefits of local initiatives.

Projects should always begin with a broad discussion of the fundamental questions and priorities that community stakeholders would like to see addressed as a result of the assessment process. Some of these same questions and goals will almost certainly be revisited midway through the implementation of the assessment to ensure that the desired priorities and goals are being met.

Economic development officials, local policymakers, and community planners are increasingly interested in examining the many benefits offered by local and regional food systems. These benefits may result from shifts in economic development principles and practices, augmented by changes in consumer and investor behavior. As stated earlier, users of this Toolkit need not begin with the first module and proceed one phase at a time. We suggest users review the whole Toolkit and then move among modules to align with the stage of discussions in their community, or address the specificity of economic measures required for the decisions to be considered. Users will benefit from reviewing different modules throughout planning discussions as new circumstances arise, as new expertise is brought into the assessment process, or as clarification of the shared vision of the community process is needed.

# Module 1 — Framing Your Community Economic Assessment Process: Defining the Parameters of Your Local Food System

Module 1 outlines the key steps your community should follow when initiating a community-based economic assessment or planning process. A key first step, and the overarching theme to this stage, is identifying the potential short- and long-term outcomes that may arise from an assessment, no matter how comprehensive an assessment your resources allow you to conduct. In this module, you will learn how to:

- Articulate the planning decisions or investments the assessment will inform;
- Identify more specific goals or objectives of your study;
- Identify the scope and potential outcomes of your project;
- Organize an effective and inclusive team for your assessment;
- Determine an appropriate timeframe;
- Examine available resources to conduct this assessment and assess if they are adequate to meet your goals; and
- Utilize visual schematics to engage community members.

We've provided leading questions to guide you through the process of building a team and appropriately scoping your project. The questions answered in this module will serve as a guide for data collection discussed in modules 2 and 3. Although less rigorous in nature, the activities outlined in module 1 are essential for a successful assessment because thoughtful discussion and understanding of the economic outcomes appropriate for and expected by stakeholders will result in an effective community process.

As indicated in the introductory section, this Toolkit's mission is to enhance the capacity of local, regional, and statewide organizations to scope out relevant information, identify priorities for improvement, and conduct place-based measurements of local and regional economic activity. Given our team's experiences in leading such community-based economic impact assessments, we believe there are some key steps for initiating that process that will increase the probability that it will yield an effective and successful set of measures and promote broad community acceptance and engagement. The intention here is to advance the development of a useful analysis as a basis for well-informed, community-based decision-making and strategic planning. Potential outcomes of a well-designed and implemented process are wide ranging, and may include:

- New investments in food system projects such as a community garden, commercial kitchen, or public lands repurposed to food production;
- Updated policies to address barriers to food system innovation such as enterprise zones, redefined zones for farm-based food marketing, or scale-appropriate food safety guidelines; and
- Coordinated planning for community food initiatives such as food recovery from farms and markets, a virtual food hub, or a community branding campaign.

## Structuring the Assessment Process to Enhance Success

The success of your project will be dependent on two key initial efforts: organizing an effective team and identifying the study's parameters and priority issues.

### Assembling Project Team Members

To construct a solid leadership team for the study, it is essential that the team incorporate a broad range of skill sets, expertise, and perspectives. We recommend consideration of the following when assembling your team:

- Does your project team include team members with expertise in examining local food system issues from a variety of perspectives; e.g., the importance of geography (rural vs. urban

food issues), scale (small vs. large enterprises), and market orientation (different segments of the supply chain)?

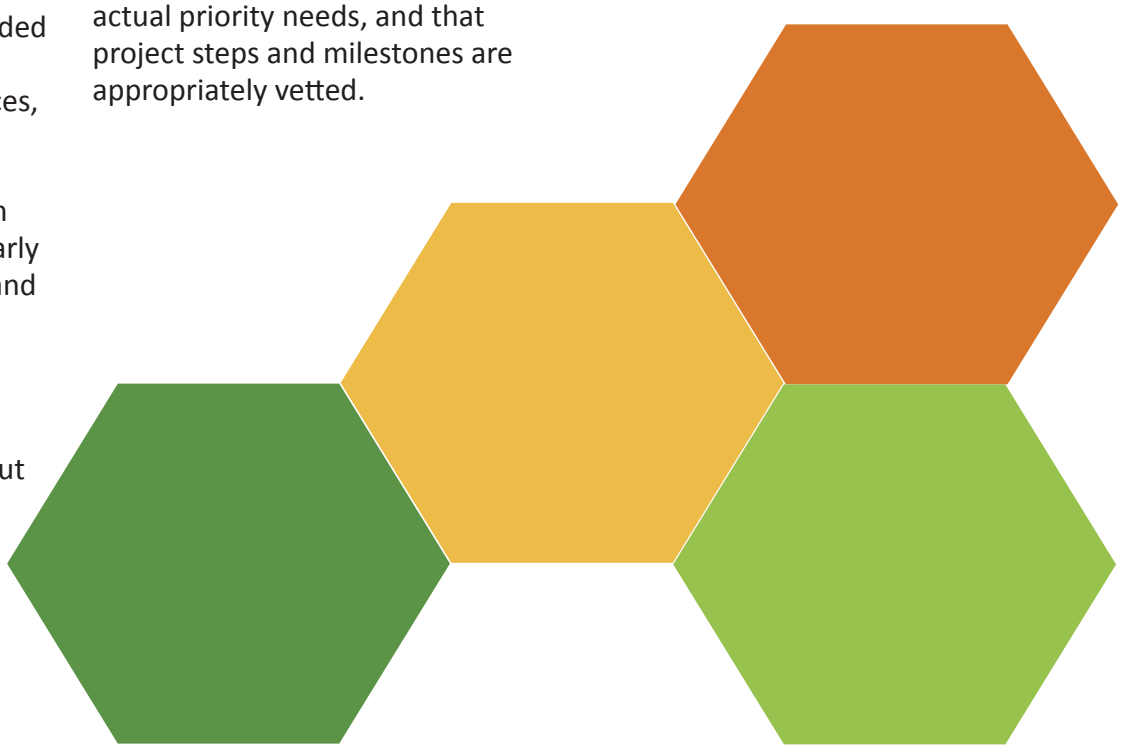
- What are the specific skills and experiences of each prospective team member? Ideally, a good project team should include a range of demographic characteristics along age, gender, and ethnicity/racial lines. Also, each team should contain a person who is good at process, someone who is savvy about public relations/ media, someone with legal/planning expertise, and an analytical/research-oriented person,
- Is there one person who can serve as the overall project coordinator? This is an essential role as this person will be charged with periodically evaluating whether the project is on track to carry out its intended mission, is effectively engaging external audiences, is adhering to internal project timelines, and is properly engaging all team members, including regularly communicating progress and next steps.

Technical assistance partners (those who are not directly involved in the food industry but have expertise, resources, or networks) are also key players in this process. In many cases, these technical assistance partners naturally emerge from the ranks of the leadership team. However, it may be necessary to contract or hire such personnel as well, either for facilitation, data gathering, in-depth analysis, or any combination of the above. These partners should be a part of ground-level organizational efforts, and be available for the majority of meetings to gain the context necessary to serve the project well.

The members of the advisory panel generally consist of a group of key stakeholders brought together to provide feedback on the project's process, implementation, and findings. How you specifically decide to use your advisory partners may vary, but in all cases, it is beneficial to arrange for broad community representation within the membership of the advisory panel. This will assure that the scope of the study and the desired measures and outcomes correspond to the community's actual priority needs, and that project steps and milestones are appropriately vetted.

## Primary Reflections on Constructing a Leadership Team and Recruiting Partners

- Do the collective abilities of the project leadership allow you to effectively frame, inform, and interpret a food system assessment?
- Does the leadership team incorporate a diversity of opinions and experiences, thereby ensuring that these are reflected throughout the planning, data collection, and analysis process?
- Are the members of the leadership team/advisory panel flexible enough and is the planning/implementation process iterative enough to allow for interactive learning and refocusing as findings are uncovered and shared?



## Case Study: Northern Colorado Food System Assessment

In the case of the multi-county Northern Colorado Food System Assessment, the leadership team drew upon the expertise of both individual, county-based advisory groups, and an overarching steering committee (drawn from leaders of the counties' advisory groups), see figures 1.1 and 1.2. Each county group met with the assessment team monthly to give feedback on different elements of the project; feedback was compiled, and then the leadership team (with representatives from each county) decided on refinements or next steps that considered each advisory group's interests and concerns. This governing structure allowed for better coordination across the regional effort, and enabled the leadership to get more focused feedback and integration of each county discussion.[2]

### Figure 1.1: Boulder County, CO, Project Advisory Team[3]

**Boulder County Project Advisory Team (PAT)**

| Name | Business /Organization | Agriculture Group | Sub Group |
|---|---|---|---|
| Famuer Rasmussen | Farmer | Agricultural Producer | Crops Farmer |
| Amy Tisdale | Red Wagon Organic Farm | Agricultural Producer | Market Farmer |
| Larry Moir | American Pride Coop, Mead | Equipment/Supplies | Ag Products/Services |
| Jay Knutson | John Deere | Equipment/Supplies | Farm Machinery |
| Michael Brownlee | Local Food Advocate | Food Access & Security | Food Access Experts |
| Edwina Salazar | OUR Center, Excecutive Director | Food Access & Security | Non Profit |
| Heath Harmon | Boulder County, Director of Health Programs | Food Access & Security | Public Health Experts |
| Robin Bohannan | Boulder County, Director of Community Health | Food Access & Security | Public Health Experts |
| Wendy Moschetti | Livewell Longmont | Food Access & Security | Public Health Experts |
| David Bell | Parks & Open Space, Ag Division Manager | Land and Water Resources | Boulder County |
| Jim Reeder | Open Space Mountain Parks, Manager | Land and Water Resources | City of Boulder |
| Andy Jesick | Mountain Valley Cannery | Processing and Distribution | Commercial Processing |
| Doug Bene | City of Longmont | Processing and Distribution | Economic Development |
| Erin Fosdick | City of Longmont | Processing and Distribution | Economic Development |
| Cindy Torres | Manager, Longmont | Processing and Distribution | Farmers Market |
| David Baum | Boulder County Dept of Health | Processing and Distribution | Public Health Experts |
| Hugo Matheson | The Kitchen | Processing and Distribution | Restaurateurs, Chefs |
| Rodney Smith | Backpackers Pantry | Processing and Distribution | Restaurateurs, Chefs |
| Jeff Walentine | King Soopers, Store Manager | Processing and Distribution | Supermarket, Food |
| Audrey Sheridan | | Members of Public At Large | Medical professional |
| Jim England | | Members of Public At Large | |
| **Food System Assessment - Staff/Partners** | | | |
| Adrian Card | Boulder County | Agriculture Extension Agent | |
| Dawn Thilmany McFadden | Colorado State University | Professor, Agriculture and Resource Economics Department | |
| Sarah Powell | Colorado State University | Graduate Student, Agriculture and Resource Economics | |

***Source: Northern Colorado Food Assessment***

### Figure 1.2: CO Food System Assessment Steering Committee Representatives[4]

**Food System Assessment - Steering Committee Representatives**

| Name | County | Agriculture Group |
|---|---|---|
| Erin Fosdick | Boulder County | Economic Development |
| Heath Harmon | Boulder County | Food Access and Security |
| Jim Reeder | Boulder County | Land and Water Resources |
| Audrey Sheridan | Boulder County | Member of Public |
| Andy Grant | Larimer County | Agricultural Producer |
| Jason Kraft | Larimer County | Agricultural Producer |
| Susan Singley | Larimer County | Agricultural Producer Non-profit |
| Alex Barnett | Larimer County | Member of Public |
| Emily Prisco | Weld County | Agricultural Producer |
| Juan Velez | Weld County | Agricultural Producer |
| Douglas Rademacher | Weld County | Board of County Commissioners |
| Tony Miller | Weld County | Equipment, Financial |
| Brad Wind | Weld County | Land and Water Resources |
| Steve Stewart | Weld County | Processing and Distribution |
| **Food System Assessment - Staff / Partners** | | |
| **Name** | **Represents** | |
| Linda Hoffmann | Larimer County | Food Assessment Project Lead, Director Larimer County Planning/Building Division |
| Brenda Gimeson | Larimer County | Larimer County Rural Land Use Center |
| Geniphyr Ponce-Pore | Larimer County | Larimer County Economic Development |
| Adrian Card | Boulder County | Agriculture Extension Agent |
| Dawn Thilmany McFadden | Colorado State University | Professor, Agriculture and Resource Economics Department |
| Sarah Powell | Colorado State University | Graduate Student, Agriculture and Resource Economics |
| Martha Sullins | Colorado State University | Director of Colorado State University-Extension's County Information Service |
| Matt Robenalt | Fort Collins | Exec. Director, Fort Collins Downtown Development Authority |
| Gaye Morrison | Weld County | Director, Communication, Education & Planning, Dept of Public Health/Environment |
| Bobbie Puckett | Weld County | LiveWell Project Coordinator |
| Pam Smith | Weld County | Livewell Active Community Environment Technical Advisor |

***Source: Northern Colorado Food Assessment***

2 For more information, visit: http://www.larimer.org/foodassessment/
3 Ibid.
4 Ibid.

## Identifying the Study Parameters and Priority Issues

The questions posted below are meant to help you understand your particular social and geographic context and to help you refine your goals in light of resource constraints on the type of analysis that is appropriate and possible. The reality of your situation (i.e., financial, human capital) will limit your data access and analysis. Answers to these questions will help you identify what you want and how you might move forward. Before customizing and defining the scope, there are some guiding questions we suggest that the community discuss at the beginning of the process.

### Setting the Stage

- What is the goal of the study?
  - Is it being conducted to generate interest in investment in local foods? Target an education, research or outreach program? Change or revisit a key policy? Are you conducting an integrated evaluation of distinct (or overlapping) activities or are you focused on a single activity?
- Who is the primary audience?

### Who is at the Table?

- Which stakeholders are currently involved?
- What food system sectors do they represent?
- What business models are represented and how does this matter?
- What networks of relationships are represented and how are they related?
- Who else should be at the table? What sectors are not represented? If they are not responsive to requests/ recruiting, how can their perspective be considered?
- Do you have the requisite expertise in your team or do you need to hire a facilitator and/or analyst?
- Does the racial and cultural diversity of your assembled stakeholders reflect the composition of your community?

***Northern Colorado Food Assessment, Spring 2010. More information on project at:*** http://www.larimer.org/foodassessment/

### Expected Outcomes

- How will you measure success?
  - The keys to creating good measurements are a clear purpose and a clear set of goals. If the leadership team is unified around a common purpose, and trusts each other enough to communicate openly, many of the measurement questions that seem most challenging at first become less difficult. One of the simplest ways to assess the degree of progress that has been achieved through local food initiatives is to identify, define the parameters of, and measure movement

in key system "levers" that members of the leadership team believe are necessary for shifting existing dynamics in the local food system.

- Who cares about your results?

## Study Scope

- What are the geographic boundaries for the study?
  - Political boundaries such as States and counties may make it easier to collect data, but they do not necessarily reflect commerce/commuting patterns in local and regional markets. Reviewing the project goals and intended audience for the study should help inform the choice of boundary conditions.
- Are there other agencies or organizations working on similar initiatives?
  - Will that influence your project's scope of work? Are there opportunities to combine efforts?

## Timeframe

- What is your timeframe for this study?
  - The timeframe is very important as it has the potential to limit the scope of your assessment significantly.
  - Relevant questions that should be incorporated into your planning and scheduling process to reflect decisions on your timeframe include:
    - Do you need to talk to farmers? When would they likely have free time?
    - Do you seek a snapshot of current conditions, or are you trying to identify long-term trends?
    - Are you trying to meet a political deadline, or a funder's mission, funding priorities, or timeline?

## Resources

- Does the scope of your study align with the resources available?
  - Your team may need to reduce the project's scope if available resources are scarce. Narrowing the scope of the project to ensure that what you do is done well is better than sacrificing quality.
  - A preliminary assessment that does a good job on a smaller scale may yield the additional resources to complete a larger scope of work.

## Goals of Your Community Food Systems Assessment

The above questions are part of the general process of identifying goals, which of course includes the challenge of assigning boundaries to what will be part of your work and what will not be part of your work. Your team will likely experience some frustration, perhaps even arguments and disagreements, in the course of developing your framework and asking the questions we supplied above.

While it is unlikely there will be complete agreement among the group, you should acknowledge at the outset the need to identify some common goals. This can be difficult. Let's consider an example that connects economic and non-economic objectives. You may find divergence among your team about keys areas of interest and evaluation. Some may be most interested in natural resources and agricultural infrastructure threatened by land use decisions and trends. This is an issue commonly considered by academic researchers interested in what is called "welfare" economics. Other members of the team may be more interested in post-production outcomes such as strategies to reduce food waste streams, or transform them into productive inputs for other activities. Still a third group may be more drawn to the prospect of a detailed study that facilitates understanding of the existing organizations,

regulations, and policies within the community that support or influence the food system. Creating a "parking lot" to hold other questions or insights for further study, or to convince stakeholders to release additional resources to the team because of the relative importance of those ideas, can often be a useful device to ensure that all ideas and feedback are honored and captured in community discussions, and that disparate interests and perspectives are acknowledged and, hopefully, reconciled in developing the study's scope and approach.

Nevertheless, you and your team members will likely need to explicitly or implicitly determine the following aspects of data collection.

- **Geographic Scope:** The geographic scope of the region's boundaries may be dictated by jurisdiction, organization, interest in participation, data availability, resources, and relevancy. Many studies have used political boundaries, such as a State or counties, to define a region, as this is how data are frequently organized and reported. For instance, if you decide to study the area between where food is produced and where that food is consumed in your community, often called a "foodshed," that follows a watershed or other boundaries, you may find that is difficult to find data categorized in this way, resulting in you having to make the closest possible approximation.
- **Level of Analysis:** In terms of the economic activity, the research team also must specify the segment of the food supply chain that will serve as the focus of their analysis. Will they examine retail-level sales or farm-level sales or both? How will they avoid double counting?
- **Economic and Non-Economic Interconnections:** Audiences may be interested in specific economic estimates; however, they may also be interested in broader economic relationships, and perhaps even non-economic connections. Any effort to measure spillover or indirect impacts of establishing local food markets and integrating supply chains (also called value chains when their mission aligns with community food system goals) should be clear about the definitions and data needs for establishing the relationship between the project objectives and these other economic and non-economic objectives. What approaches might be used to ensure that this work fosters the creation of relevant inter-organizational relationships that advance the broader goals of the study?

You may also find it helpful to provide some time to discuss the general context of your study; i.e., examine how food system conditions or participants have evolved. Issues worthy of consideration might include the following:

- Are economic relationships changing within existing or new food marketing channels:
  - Do farmers, ranchers, and food producers have adequate access to appropriate markets for their product mix, scale of production, and location?
  - Do things seem less fair in terms of prices and returns to food system participants?
    - Specifically, are food dollars and commercial activity aligned with resource investments, human capital efforts, and innovation?
    - Is there anecdotal evidence from community members that market structure and negotiation power appear to affect their terms of trade in the markets in which they operate?
    - Is there concern about control in the hands of people outside the community?
    - How would you characterize the existing working relationships between the organizations with which you work? (Please note that such "coordination constraints" may inhibit your data collection, as well as your goals).
  - Does the nature of food enterprise ownership matter in your discussion of localized systems?
    - Are locally owned businesses necessarily better than corporate entities?

- How will you determine whether size, organizational, or ownership issues are important to your assessment?
  - What type of economic development models are considered desirable? Which are common in your community? What barriers might exist to shifting the status quo?
- What might the outcomes be of changes to existing economic development/ business practices? How would these changes reverberate throughout the community?

The discussion of these issues will be very place-based and specific to your community, but to inform the discussion, you may want to share a little information on key changes that have served as catalysts for local foods system expansion elsewhere. Since such conversation can be quite time-consuming, it's important to agree at the outset on how much time to provide for this discussion. Make sure that assigned individuals take notes on each portion of the discussion and that information emerging from the conversation is captured in such a way that relevant ideas and topics can be slated for discussion later in the process, as warranted. Above all, remember that your work will be useful to members of your community and to other local food planners and stakeholders across the Nation, so make sure to document your action and reflection steps.

***A visual schematic, such as this one for the Crossroads Farmers Market in Takoma Park, MD, helps stakeholders to better understand the project.***

## Using Visual Schematics to Engage Community Members

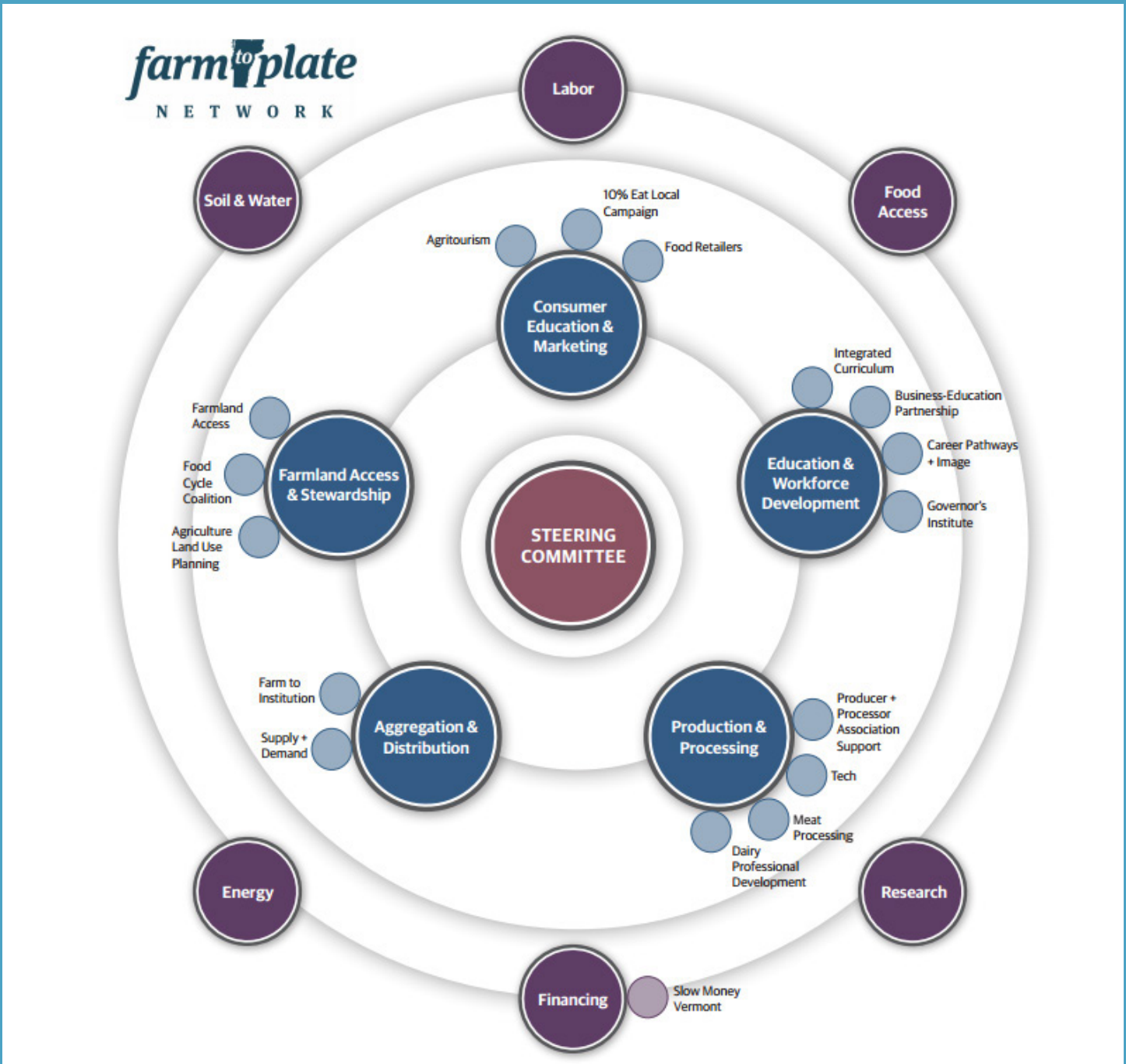
Visual tools can support enhanced understanding of complex planning and implementation processes, including the likelihood that graphics will:

- Illustrate crucial relationships, issues, and gaps;
- Establish boundaries about what sectors, issues, and stakeholders will and will not be considered and studied; and
- Provide a means for succinctly communicating project ideas and intentions to community stakeholders.

To help capture the relevant scope of activities, stakeholders, and topics that affect—and are affected by—the food system, we offer a few helpful examples of visual schematics that integrate key economic sectors, farm and food activities, relevant local organizations, and relationships among food supply chain players. We have deliberately chosen to showcase alternative ways for ordering and displaying food system information so that

## Case Study: The Vermont Farm to Plate Network[5]

### Figure 1.3: Organizational Structure of the VTF Farm to Plate Network[6]




*Source: Courtesy of Vermont Sustainable Jobs Fund*

5 For more information, visit http://www.vtfarmtoplate.com/network.
6 Ibid.

In 2009, the Vermont legislature tasked the Vermont Sustainable Jobs Fund, in consultation with the Sustainable Agriculture Council and other stakeholders, to increase economic development in Vermont's food and farm sector, create jobs in the food and farm economy, and to improve access to healthy food. Accordingly, the network embarked on an 18-month process that resulted in the development of a 25-goal, 10-year strategic plan to strengthen Vermont's food system. This comprehensive process represents one of the best national examples of a coordinated approach to a food systems assessment. Here, we want to highlight the incredible network that resulted from the process, and how they have organized themselves to work to meet the goals laid out in the plan.

The 25 goals are exceedingly ambitious, and a major factor in meeting these goals is a well-planned network, divided into working groups with specific strategies and actions. The network is led by a steering committee, which provides overall network governance, see figure 1.3. The steering committee is coordinated by the Vermont Sustainable Jobs Fund. The other members of the steering committee include the chairs from each of its five working groups, the co-chair of the food access cross-cutting team, the Secretary of Agriculture, the Secretary of Commerce, a representative of the Vermont Agriculture and Forest Products Development Board, and a representative of the Vermont Food Funders Network. Together, this committee is responsible for coordinating an annual gathering of its members, identifying gaps in strategies, developing processes for learning, and shaping the evolution of the network.

The initial network involved 125 organizational members and has grown to exceed 350 organizational members over 3 years. Members include organizations such as farms, farm enterprises, food system trade associations, co-ops, public agencies, nonprofit organizations, private funders, and community groups. Members convene as working groups, cross-cutting teams, and task forces to achieve network goals.

As with many networks, particularly those of this size, ensuring continuous communication between members is a major challenge. To address this issue, they created the Vermont Farm to Plate website which features thousands of relevant resources and acts as the network's communication and coordination platform. Members can log in and find each other as well as access meeting notes and report updates from each of the working groups, cross-cutting teams, and steering committees.[7]

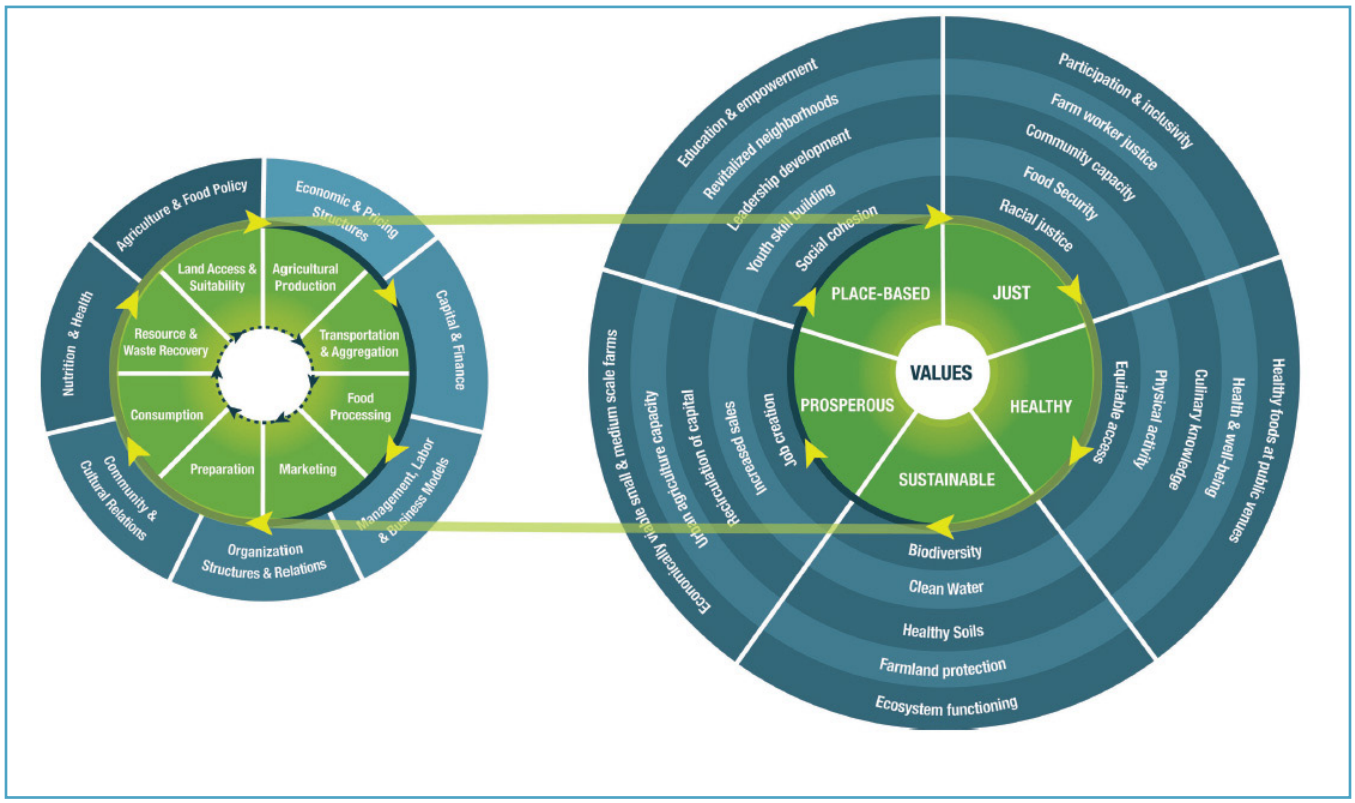
7 For more information, visit: http://www.vtfarmtoplate.com/network.

community stakeholders can decide for themselves which option seems to align most closely with their specific interests and priorities.

Figure 1.4 illustrates the relationships between agriculture/food industry sectors, social values, and key public issues. The left circle incorporates key sectors commonly measured within the food system and shows the influence of key public sectors on that set of issues. For example, agricultural production both impacts and is impacted by agriculture and food policy. The right-hand circle adds the community-based values and how those characteristics interact with the food system, as well as investments in community assets.

*A Framework for Assessing Effects of the Food System,* released by the National Academies in early 2015, provides another schematic that integrates similarly diverse factors, including the full food system, dynamics, appropriate analytical methods, and the domains of effects. Figure 1.5 aligns figure 1.4's ideas with the steps a project team should track throughout the assessment process—problem, scope, scenario, analysis, synthesis, and report. However, figure 1.4 and 1.5 may be overly broad for evaluation projects focused on economic and market outcomes, so exploring schematics that allow your project to narrow in on a more specific set of factors may be of value.

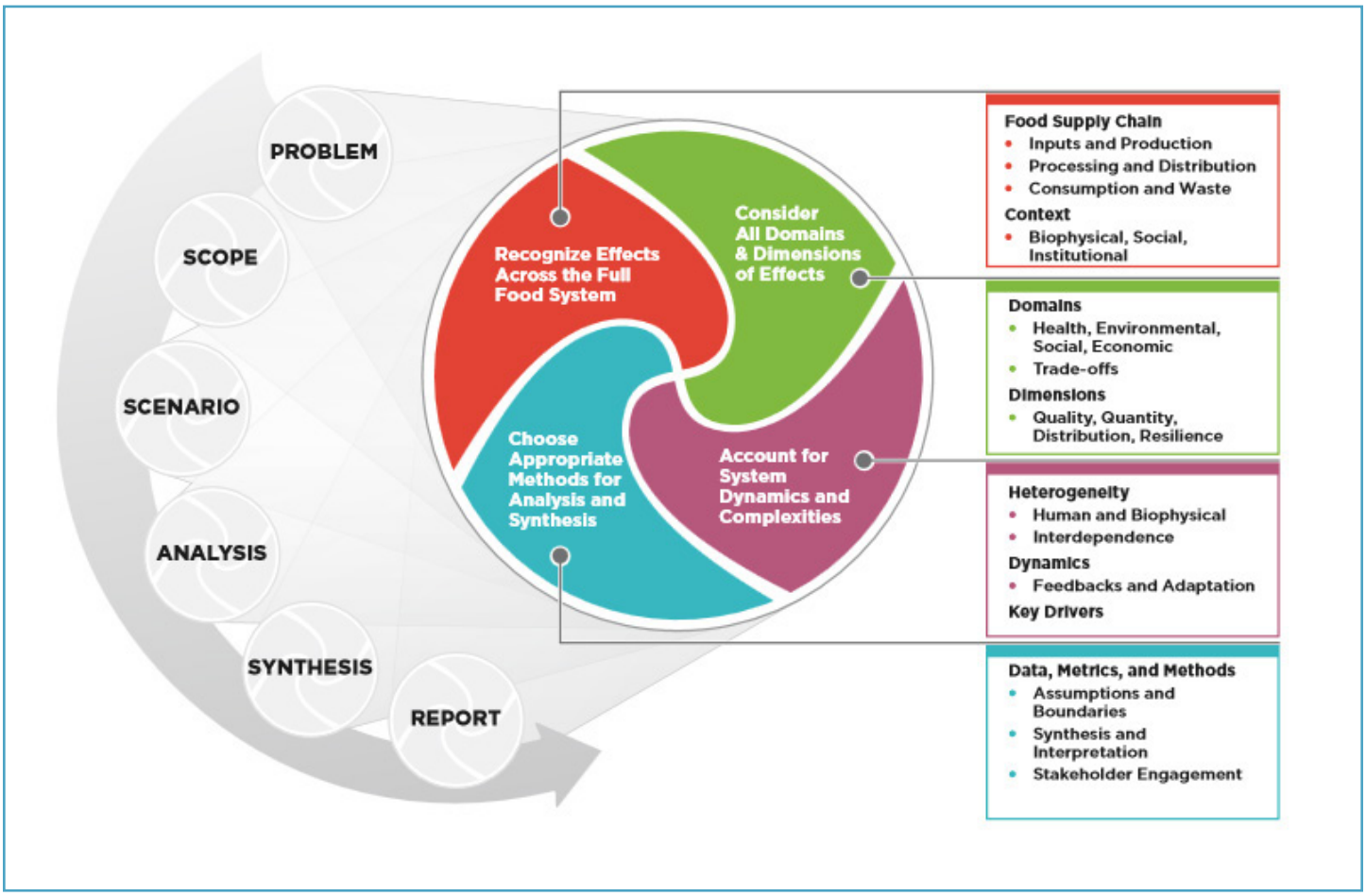
**Figure 1.4: Community Food System Framework by Activity, Environment and Macro-Forces[8]**




***Source: University of Wisconsin-Madison.***

8 The University of Wisconsin-Madison. The framework also borrows from conceptualizations presented by the C.S. Mott Group at Michigan State University and Virginia State Cooperative Extension, in "A Community-Based Food System: Building Health, Wealth, Connection, and Capacity as the Foundation of Our Economic Future" Bendfeldt, E.S., M. Walker, T. Bunn, L. Martin, and M. Barrow. May 2011.

## Figure 1.5. Assessment Analytical Framework[9]

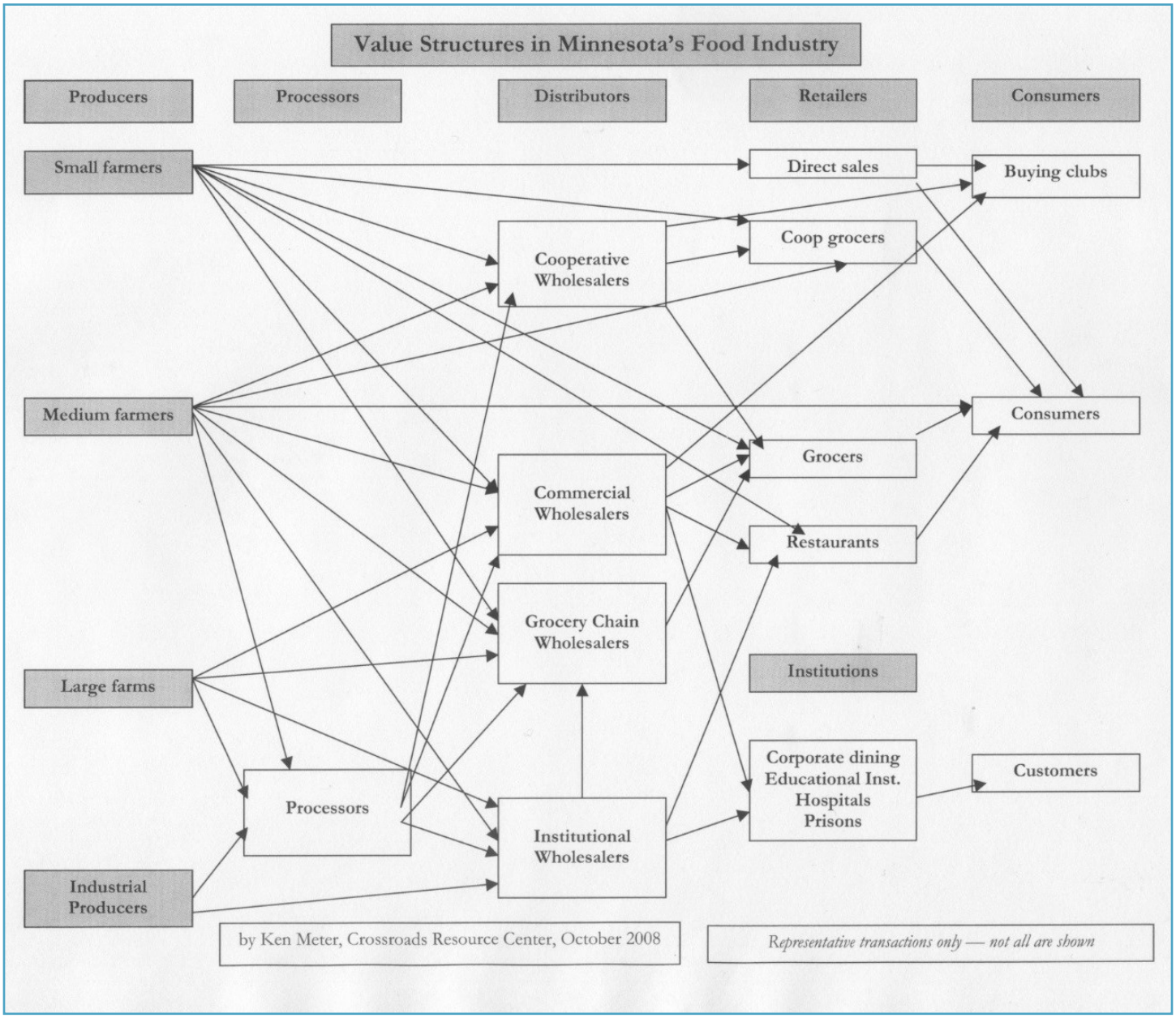



***Source: National Academies Institute of Medicine Report.***

Figure 1.6 illustrates the food system with an emphasis on networks and relationships throughout the supply chain that are responsible for most of the commercial activity and impacts that may be of key interest to an economic assessment. These elements may be more important for communities looking to bolster farm access to markets, consumer access to local foods, and more fully leverage existing assets and infrastructure. It also may highlight people and organizations that should be part of the planning process. Finally, mapping these connections may be an effective team-building exercise for initial meetings.

9 National Academies Institute of Medicine Report, http://iom.edu/Reports/2015/Food-System.aspx.

## Figure 1.6: Values Structure in Minnesota's Food Industry[10]

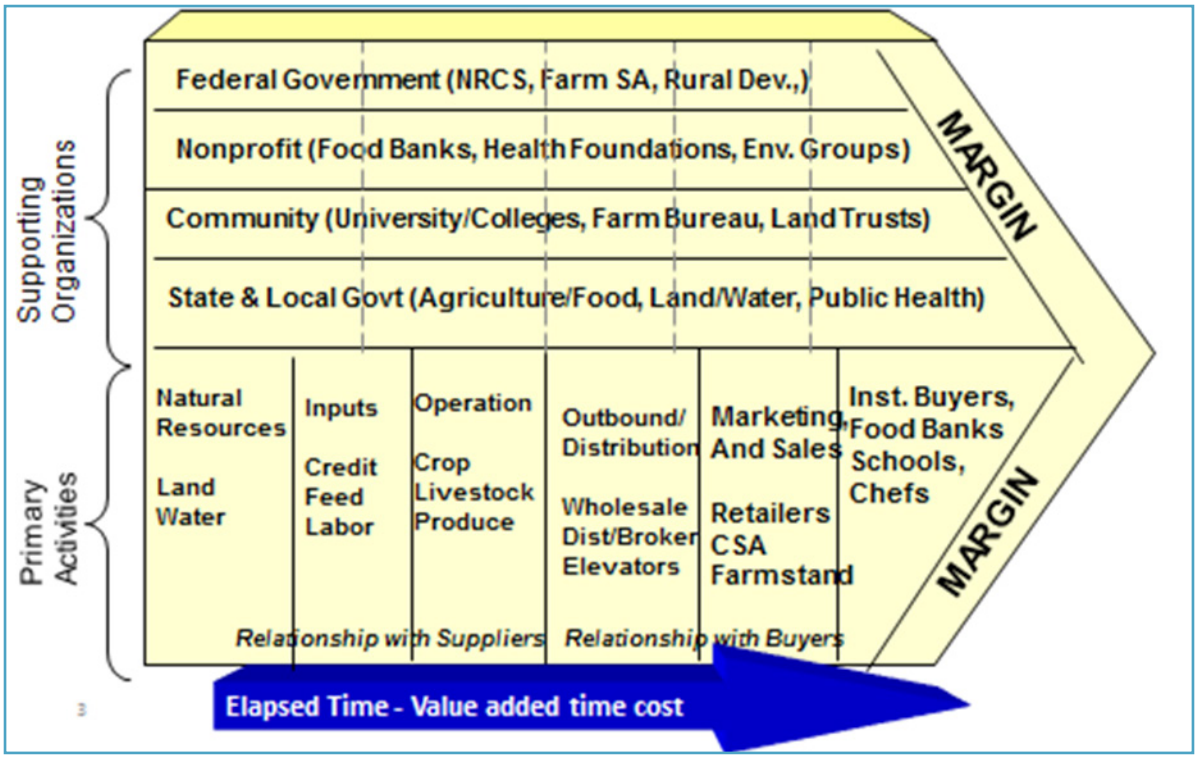



***Source: Ken Meter, Crossroads Resource Center.***

10 Ken Meter, Crossroads Resource Center, October 2008, http://www.crcworks.org/

Figure 1.7, like figure 1.6, includes many aspects of the resource providers, supply chain, and buyers that catalyze markets. However, it also incorporates supporting organizations, policymakers, and technical service providers that can intervene to support these businesses and/or industry sectors to strengthen local food system interactions.

**Figure 1.7: Michael Porter's Value Chain Concept with a Food Systems Focus[11]**




***Source: Northern Colorado Food System Assessment.***

It is important to recognize that no single visual depiction of your community's food system is the "right" depiction. By definition, different members of your assessment team – and your community – will find different types of system imagery attractive because of their varied interests, experiences, and perspectives. Therefore, there is nothing wrong with using a variety of graphic displays to motivate discussion, appeal to different audiences, and help recognize the variety of perspectives that might be important, but not represented.

In summary, use these graphics to appeal to diverse audiences and help individuals from different perspectives recognize how the project team is focusing the project. It may be of value to ultimately choose one graphical schematic that you can revisit throughout the assessment to orient team members to common concepts and activities, and to communicate externally with stakeholders.

One very common strategy for new groups considering food system assessments is to identify examples from other States or communities that are similar in size, focus, or goals to emulate or from which to learn. While this

11 Northern Colorado Food System Assessment, http://www.larimer.org/foodassessment/

is typically very helpful, it is not recommended that you attempt to simply mimic the assessment in your own community without first going through the many questions and steps outlined in this module that will increase the relevance and potential impact to your unique community.

So, with a thoughtful process to develop an effective team, appropriate and realistic scope of assessment, and place-specific schematic of key sectors, stakeholders, issues, and/or market dynamics, the team should be prepared to proceed to the next steps of the process: data compilation and collection.

## Takeaways

The key messages of this module are that, although there are some best practices to follow in assessing your community's food system conditions, opportunities, and direction, perhaps the greatest priority is to make the process community-driven by framing a team and approach that is thoughtful, inclusive, and driven by community-identified priorities. Some quick questions to revisit before moving to data collection, community deliberations, and further analysis are:

- Is there a clear set of planning program decisions, policy changes, or public investments the assessment will help to guide? Are the issues impactful enough to engage a significant part of the community?
- Is the scope of your project inclusive yet focused? Is it realistic given your resources and timeline?
- Is the team that will guide, conduct, and communicate about your assessment appropriate given the scope and key areas of interest? Is the team diverse and inclusive enough to identify and add context for the set of food system issues being explored?

# Module 2 — Using Secondary Data Sources

Module 2 provides an overview of the key secondary data sources (data that someone else has obtained and compiled into an ordered, meaningful format) proven useful in performing local food system assessments. In this module you will learn how to:

- Identify and access the available datasets;
- Determine the datasets that are likely to be most useful in your project;
- Evaluate key strengths and drawbacks of each data set; and
- Decide when collecting primary data is necessary.

In module 1, you launched your local food system assessment by forming an effective and inclusive team, and identifying the study's parameters and priority issues. Now you are ready to find data that will help you to better understand the detailed workings of the food system, identify prevailing conditions and trends, test your assumptions, and help you to build a strong case with local officials.

There are two basic ways to obtain data. One way is for your team to collect original data. Such "primary" data can be a rich way of understanding the conditions that exist in your community. Module 3 in this Toolkit will give you an overview of how to effectively compile primary data for community food system assessment purposes.

Unfortunately, collecting primary data can prove to be technically demanding, time-consuming, and expensive. For example, this may require your team to hire one or more skilled researchers to coordinate and conduct data collection, define and test requisite questions and survey protocols, and travel to various locations to conduct the surveys. As a consequence, launching an original data collection process may slow down the work of organizing your local foods effort considerably, even if you are able to collect information without spending a great deal of money. The other way to obtain data is to make use of the wealth of information available from local, State, Federal, and private sources. These "secondary" data sources often provide essential insights rather rapidly and in a more standardized format that allows information to be compared across regions in the country. Accordingly, we recommend exploring available secondary data sources before determining whether or not you will need to collect primary data.

## Existing Datasets Offer a Wealth of Information

Secondary data are often developed with a specific analytic purpose in mind. Even though the original reasons for compiling this secondary data may differ from the objectives you hold for your local food system assessment, these measures may still offer important insights to your team.

Therefore, we recommend that any team planning to undertake a community food system assessment or economic impact analysis should at least explore what they can learn from secondary data sources before embarking on any primary data collection.

To help you take full advantage of available secondary data sources, this module provides an overview of the main data sources that have proven useful in performing local food system assessments and measuring impacts. This module is intended to make it easier for you to identify the available datasets, determine which ones will most useful, and evaluate key strengths and drawbacks. In the U.S., we are fortunate to have a substantial amount of data relevant to agriculture, food systems, and regional economies. Many countries do not provide such comprehensive data, especially at the local level. To facilitate your understanding of data sources relevant to your assessment, we organize this by the sectors of the food system. Please recognize that there is considerable overlap among these sectors. We also list secondary data sources that help to examine broader ecological, social, and economic indicators related to local food system viability and resilience. Finally, two appendixes at the end of the module list specialized datasets that allow you to examine food system dynamics and economic impacts in greater depth, and provide specific examples of how secondary data can be used.

### Case Study: Understanding the Difference Between Primary and Secondary Data

To better understand the difference between primary data and secondary data, let us consider the work of the Bureau of Labor Statistics (BLS). BLS interviews about 120,000 households each year, asking them to keep track of what they spend for everything they purchase. Those surveyed agree to list all of their consumer purchases and report them to the BLS. Since the BLS has established a strong record over several decades as a non-partisan research group that uses solid data practices, respondents have been willing to share detailed information about their household spending (primary data), knowing that it will only be shared and made public as aggregated information (secondary data) without individual identifiers.

The BLS reports this secondary data as the BLS Consumer Expenditure Survey on its website each year.[12] Keeping individual records confidential, it categorizes the survey results by income level, region, race, ethnicity, and other relevant attributes. Thus, as a result of BLS's compilation, you can quickly look up how much money was spent buying food each year by an average household in, say, one particular region of the country. Even though these aggregated numbers reflect regional patterns, not actual spending in your community, they still allow you to calculate a reasonable approximation of the amount residents of your community spend each year buying food. In most cases, using these figures will yield a precise enough estimate for the initial phases of your local food initiative.

## Starting Your Work with Secondary Data Sources

To begin the search for the most relevant and insightful data, it is probably best to reflect on the goals and priorities your team established in module 1. This will facilitate your answering the following key questions:

- Which data will tell a story that moves your food systems work forward most effectively?
- How precise do the data need to be to serve your purpose?
- How recent do the data need to be to be useful and persuasive?
- If the data are a few years old, what may have changed in your community since the data were compiled?
- How close a fit are the readily available data to the questions you are trying to answer?

12 For more information, visit http://www.bls.gov/cex/.

As you address these questions, it will be important to think critically at each step of the process. You may wish to look for descriptions about the origin, scope, and intention of each secondary data set you find on public websites, and consider the strengths and limitations of the data's actual content. This deeper level of analysis regarding data sources will enable you to address the following issues, which will help you determine the quality and accuracy of available information, and its appropriateness for use in your study:

- Who collected these data and for what purpose? Does the source introduce any bias into the data set?
- Is it appropriate for your initiative to use this data set for purposes different from those intended by the creators?
- Does the way in which the data source categorizes information align with how you plan to categorize information in your study?
- How often is this data set compiled? How recently was it reported?
- When you show your findings to local stakeholders, do the data reflect their experiences?
- Are you able to map data you retrieve from a public website?
- Is the data set you are looking at a compilation of raw data from specific respondents, or has it been processed through a mathematical model to represent averages or aggregate numbers?
- How large is the original sample in the data?
- How large is the error[13] in the data set? Does the source explicitly list the error ranges, or offer other explanations that allow you to interpret the degree of error accurately?
- Do the data's accuracy diminish when you study smaller geographic areas, like a neighborhood or a city?
- Can your team identify patterns in available time-series data that would illuminate new trends that may be emerging in your food system?

If the data source you are considering using does not offer you transparent information that allows you to answer such questions, you may want to consider partnering with an expert who is familiar with the secondary data in question, someone who can help you understand the strengths and limitations of each data set.

As part of your food system assessment or economic impact analysis, you will examine the different elements of the food system to learn how each operates, what interconnections exist between diverse sectors, and how money flows through the locale. You will be finding, applying, and interpreting data to provide measures corresponding to the visual diagrams you created through module 1. Accordingly, you may find it helpful to organize your list of data sources so that they fit those categories. At the same time, it is important to keep in mind that there are many interactions between each of the elements of any food system, and that the categories you select for analysis may change as you dig further into the data.

## Data Sources

Several Federal agencies collect data that are likely to be useful in supporting your food system assessment. To make it easier for you to identify relevant datasets from Federal sources, we have developed the following five tables to summarize information about available datasets that are likely to be pertinent to conducting a local food system assessment, including each dataset's characteristics and limitations. These data sources have been grouped into five categories:

- Production Data
- Data Sources on Food Handling, Processing, Marketing and Distribution
- Food Consumption
- Waste Recycling
- Demographic and Economic Contexts

13 When individual observations are analyzed using a statistical analysis to produce estimates, as is the case in many secondary data sets, there is an error associated with the estimates. For example, if you have an estimate of 4 and an error of .5, this means that the estimate is actually any number between 3.5 and 4.5. The error describes the level of accuracy of the estimates.

| Production Sources | | | |
|---|---|---|---|
| **Dataset Source** | **Description** | **Characteristics** | **Limitations** |
| **U.S. Department of Agriculture**<br>Census of Agriculture<br><br>Web address:<br>www.agcensus.usda.gov | The primary source for data covering farm production, land, and farm demographics. It also includes information on farm characteristics by size of farm and sales levels. The Census is compiled every 5 years by U.S. Department of Agriculture's National Agricultural Statistics Service (NASS). | **Unique Feature:** The most thorough survey of farms and farm production nationally.<br>**Comprehensiveness:** Very comprehensive.<br>**Levels:** Counties, congressional districts, States, national.<br>**Accuracy:** Quite high for major commodities and less comprehensive for minor products.<br>**Ease of use:** Relatively easy. | • Five-year increments of time between censuses may make it difficult to keep current with emerging developments.<br>• Considerable data at the local level are suppressed for confidentiality reasons, which may produce gaps in your ability to understand local conditions.<br>• Reported data only reflect conditions of that one year, thus potentially capturing anomalies in the year of study. |
| **U.S. Department of Agriculture**<br>Economic Research Service (ERS)<br><br>Web address:<br>www.ers.usda.gov | USDA-ERS provides many datasets covering farm production (including cash receipts and production expenses), the farm economy, farm practices, food and nutrition, food choices and health, markets, food safety, international markets, natural resources, and the rural economy. At the State and national levels, ERS reports extensive historical data as well. | **Unique Feature:** Excellent data for researchers to draw upon.<br>**Comprehensiveness:** Very comprehensive.<br>**Levels:** States, national.<br>**Accuracy:** Quite high for major commodities and less comprehensive for minor products.<br>**Ease of use:** Relatively straightforward datasets with exceptional detail, but can be difficult to locate on the ERS site. | • Does not provide local-level detail. |

| Production Sources | | | |
|---|---|---|---|
| **Dataset Source** | **Description** | **Characteristics** | **Limitations** |
| **U.S. Department of Commerce**<br>Bureau of Economic Analysis (BEA)<br><br>Web address:<br>www.bea.gov/ | An essential tool for understanding personal income in local regions, including detailed breakdowns of farm income and expenditures. BEA data allow one to financially profile all farms in a given geography. BEA also publishes user-friendly data showing population trends, Supplemental Nutrition Assistance Program receipts, and sources of transfer payments. | **Unique Feature:** Time-series data covering farm income and personal income for each county in U.S. from 1969 to the present.<br>**Comprehensiveness:** Comprehensive compilation of personal income by source, though only by broad categories, such as "manufacturing."<br>**Levels:** Counties, metro regions, economic regions, metro/non-metro areas, States, national.<br>**Accuracy:** Farmers report that the trends shown in BEA data accurately reflect their experiences in the economy.<br>**Ease of use:** One of the most user-friendly data sites available. | • Modeled data from Census of Agriculture and other sources; may differ from USDA-National Agricultural Statistic Service or USDA-ERS data, though personnel from each agency attempt to coordinate data protocols.<br>• Farm income data largely reflect production of major commodities rather than smaller specialty crop farms; and do not cover off-farm income.<br>• No information is provided covering specific marketing channels farmers may use. |

## Data Sources on Food Handling, Processing, Marketing, and Distribution

Listed below are some secondary data sources for compiling an overview of local food handling, processing, marketing, and distribution. You are likely to want to draw upon multiple data sources, combining them carefully to get an overall impression of the food business sector.

| Data Sources on Food Handling, Processing, Marketing, and Distribution | | | |
|---|---|---|---|
| **Dataset Source** | **Description** | **Characteristics** | **Limitations** |
| **Regional or Community-Based Local Food Directories** | If any food initiative in your region has published a local food directory, consult this first to learn what has already been compiled. Many directories have been published through the national "Buy Fresh, Buy Local" campaign coordinated by the Food Routes Network (http://www.foodroutes.org/), or through local Cooperative Extension offices. | It is impossible to characterize the quality of these directories as a whole, since comprehensiveness and quality will vary from place to place, and over time. If such a listing has already been published, this will be important to know to avoid duplication of energies. | • Farmers may be required to pay to be included, which may limit the number of businesses included.<br>• Some directories focus on producers of a particular commodity or production practice (i.e., organic). |

| Data Sources on Food Handling, Processing, Marketing, and Distribution | | | |
|---|---|---|---|
| **Dataset Source** | **Description** | **Characteristics** | **Limitations** |
| **USDA Local Food Directories**<br>USDA Agricultural Marketing Service<br><br>Web address:<br>www.usdalocalfooddirectories.com | A listing of:<br>• Farmers markets<br>• Community Supported Agriculture (CSA) enterprises<br>• Food hubs<br>• On-farm markets<br><br>Data submitted voluntarily by each market or enterprise manager | **Unique Feature**: Most comprehensive national source for listings of farmers markets, CSAs, food hubs, and on-farm markets<br>**Comprehensiveness:** Since businesses post their own information on a voluntary basis, coverage may not be thorough.<br>**Levels:** Farms, locales, national.<br>**Accuracy:** Varies depending on source and how recently a listing has been updated. Though every effort is made to maintain data integrity and accuracy, minor duplication of entries exist.<br>**Ease of use**: Straightforward | Listings are voluntarily submitted by each business or market, so coverage is not comprehensive, and may not be updated frequently. For example, at the time this module was written, the USDA's National Food Hub Directory included 152 listings for food hubs, compared to other national estimates of more than 300. |

| Data Sources on Food Handling, Processing, Marketing, and Distribution | | | |
|---|---|---|---|
| **Dataset Source** | **Description** | **Characteristics** | **Limitations** |
| **U.S. Department of Agriculture**<br>Agricultural Marketing Service<br>Fruit and Vegetable Market News Data<br><br>Web address:<br>www.marketnews.usda.gov/mnp/fv-home | USDA/AMS has provided fruit and vegetable reports since 1915. These data are collected directly from industry sources and disseminated electronically within hours of completion. Approximately 375 separate reports are issued daily, monthly, and annually, which include the following items:<br>• Fruit and vegetable shipments (specific products such as carrots and bananas) are tracked daily through terminal markets, major shipping points, and entry ports, including amount shipped and prices, for both organic and conventional produce.<br>• Pilot-testing of selected farmers market price reports was added in 2014.<br>• Organic price data were recently introduced, and there are plans to include other local food price data in the near future. | **Unique Feature:** Primarily intended for wholesalers wishing to track shipments of produce on a daily basis. Historical trend data available for most commodities from 1998 to present.<br>**Comprehensiveness:** The largest breadth of product, geographic, and market channel coverage available publicly.<br>**Levels:** Specific entry ports and shipping points only. Farmers market pilot limited to a handful of States/sites.<br>**Accuracy**: Presumed accurate for larger shipments. Data are collected through direct telephone and face-to-face contacts with sales persons, suppliers, brokers, and buyers. Reporters collect, validate, analyze, and organize data on price, volume, quality, and condition of produce traded.<br>**Ease of use**: Relatively easy to access with considerable detail available for analysis. | • Data cover shipments arriving at 13 specific collection points, identifying only the State where each shipment was sourced, which may not be the same as the location of the farm that actually grew each product.<br>• Shipping data from locations in any of the 50 States may not show the ultimate destination. |

| Data Sources on Food Handling, Processing, Marketing, and Distribution | | | |
|---|---|---|---|
| **Dataset Source** | **Description** | **Characteristics** | **Limitations** |
| **U.S. Department of Agriculture**<br>Economic Research Service<br>Food Environment Atlas<br><br>Web address:<br>www.ers.usda.gov/data-products/food-environment-atlas.aspx | One-stop website showing maps of specific food-related facilities, prices for specific food items, and issues surrounding food access and food insecurity. Atlas aggregates data from many different sources and provides specific information about hyper-local areas (neighborhoods and smaller geographies, e.g., census tracts). | **Unique Feature**: Maps showing locations of grocery stores, locales that are distant from grocery stores ("food deserts"), locations of farmers markets, farm-to-school programs, direct farmer-to-consumer sales, access to restaurants, USDA Supplemental Nutrition Assistance Program allocations, and much more.<br>**Comprehensiveness**: Very detailed data.<br>**Levels**: Hyper-local to national.<br>**Accuracy**: Sometimes individual entries may be coded improperly.<br>**Ease of use**: Quite visual and easy to use. | Understanding the underlying economic factors often requires reference to other data sources listed herein. |
| **U.S. Department of Commerce**<br>Bureau of the Census<br>County and ZIP Code Business Patterns<br><br>Web address:<br>www.census.gov/econ/cbp | Offers annual summaries of:<br>• Number of firms<br>• Employment<br>• Total payroll<br><br>Data are for key industrial sectors, not including farming, for each U.S. county. | **Unique Feature**: Time-series data covering employment and payroll for industry sectors in each U.S. county from 1986 to the present.<br>**Comprehensiveness**: Comprehensive but not targeted for food system use.<br>**Levels**: counties, zip codes, metro regions, States, and national.<br>**Accuracy**: Often data are compiled by categories that do not offer a thorough overview of food-related business activity.<br>**Ease of use**: Relatively straightforward; now integrated with Economic Census. | • Categories (by North American Industry Classification System, NAICS) are not precisely connected to food system activity.<br>• Confidentiality concerns mean that many industry subsectors do not report data at the county level. |

| Data Sources on Food Handling, Processing, Marketing, and Distribution | | | |
|---|---|---|---|
| **Dataset Source** | **Description** | **Characteristics** | **Limitations** |
| **U.S. Department of Commerce**<br>Bureau of the Census<br>Economic Census<br><br>Web address:<br>www.census.gov/econ/ | Compilations of employment, payroll, sales, and type of ownership data for broad industry sectors. | **Unique Feature**: Collected every 5 years from 2002 to the present.<br>**Comprehensiveness**: Comprehensive but not targeted for food system use.<br>**Levels**: Counties, zip codes, metro regions, States, and nation.<br>**Accuracy**: Often data are compiled by categories that do not offer a thorough overview of food-related business activity.<br>**Ease of use**: Relatively straightforward. | Often data are compiled by categories that do not offer a thorough or more detailed overview of food-related business activity. |
| **Proprietary Datasets** | While proprietary databases listing businesses by industrial category exist, making use of them can often prove to be prohibitively expensive. Dun & Bradstreet and InfoUSA, as two examples, publish directories of all the U.S. businesses they have registered. Many marketing firms purchase these lists at high cost for commercial purposes. Even though access to this list is often available at low cost through a business library, users are usually not allowed to publish what they look up. | | |

## Food Consumption

There are several good sources of data on consumer demand for and consumption of food.

| Food Consumption | | | |
|---|---|---|---|
| **Dataset Source** | **Description** | **Characteristics** | **Limitations** |
| **U.S. Department of Labor**<br>Bureau of Labor Statistics (BLS)<br>Consumer Expenditure Survey<br><br>Web address:<br>www.bls.gov/cex/ | Allows researchers to estimate consumption per person for specific categories such as:<br>• Food<br>• Housing<br>• Meat<br>• Beef<br>• Fresh vegetables<br><br>Data are reported by income level, region, housing tenure, and other categories. | **Unique Feature**: Annual data covering consumer spending per household in the U.S., from 1989 to the present, based on a detailed survey of 120,000 households in the U.S., who report what they spent on various consumer items.<br>**Comprehensiveness**: A very thorough account of household spending.<br>**Levels**: county, reported by region (Northeast, South, Midwest, West), nation, as well as by demographic categories such as income level, age, race, and occupation.<br>**Accuracy:** Detailed survey of consumers with well-established protocols. BLS is considered one of the most neutral and reliable of Federal data sources.<br>**Ease of use**: Easy to access. | • Does not account for different food consumption patterns that may exist among segments of a specific community.<br>• Limited to major categories of food (fresh vegetables, beef, etc., as mentioned above)<br>• Most useful for estimating broad consumer patterns. Trends may be more accurate than specific numbers for a given data point. |

| Food Consumption | | | |
|---|---|---|---|
| **Dataset Source** | **Description** | **Characteristics** | **Limitations** |
| **U.S. Department of Agriculture**<br>Economic Research Service<br>Per Capita Food Use<br><br>Web address:<br>www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system.aspx | USDA-ERS publishes annual compilations of per capita consumption of specific foods (for example, beef, eggs, green peppers, and apples).<br><br>Figures are based on industry reports stating how much was produced, which are then adjusted to account for imports and exports of each product. | **Unique Feature**: Annual data covering per capita food availability in the U.S., generally from 1960 to the present.<br>**Comprehensiveness**: Only major commercial products are covered.<br>**Levels**: National.<br>**Accuracy**: This is not a tally of how much was consumed, but rather how much was available, based on production, import, and export reports.<br>**Ease of use:** Relatively straightforward. | • Does not account for regional differences in food consumption.<br>• More accurate covering trends rather than specific levels of consumption for any given year.<br>• Some important foods are not tallied. |

## Waste Recycling

Making use of food wastes or other compostable products can be a potent way to reduce a region's dependence on imported farm inputs, and thus can have a marked impact on the local economy. Municipalities often keep data on compostable wastes that are collected by local waste hauling services. In rare cases, local government personnel will also measure how much of this waste matter is converted into compost. Some schools or other institutional food services also track the waste they generate. Often this becomes a primary data collection challenge: local food leaders will need to make direct contact with local waste officials to learn what data are currently available, and then to survey composting operations to find out how much new fertility is produced each year.

| Waste Recycling | | | |
|---|---|---|---|
| **Dataset Source** | **Description** | **Characteristics** | **Limitations** |
| **Municipal Government**<br><br>Web site: Check relevant municipal government website(s); contact institutional food service directors. | Municipalities often keep data on compostable wastes that are collected by local waste hauling services. In rare cases, local government personnel will also measure how much of this waste matter is converted into compost.<br><br>Some schools or other institutional food services also track the waste they generate. | **Unique Feature:** If data covering compostable wastes are tracked by municipal officials, this may serve as a reliable source of secondary data to help plan for composting. Otherwise, your local food assessment leadership team may wish to compile its own summaries directly from agencies and waste handlers.<br>**Comprehensiveness:** Variable.<br>**Levels:** Usually a municipality or a food service.<br>**Accuracy**: Variable.<br>**Ease of use:** Variable. | • Quality, character, and scope of local data compilations vary from place to place.<br><br>• Often becomes a primary data collection challenge: local food leaders will need to make direct contact with local waste officials to learn what data are currently available. |

## Demographic and Economic Contexts

In addition to compiling data on the food system, you may well want to compile some basic demographic information about the region you are studying. For example:

- What do the demographics of the farming population in the region look like? Do most farmers have off-farm jobs? What is the average age of farmers in the region, and how does this compare to the entire State? The U.S.?
- What is the average household income level in your study area? Is there any difference in average household-income levels between urban and rural areas? How does this level compare to the entire State? The U.S.?
- How many people rent or own their homes?

The Census offers exceptional detail about questions such as these. Some of these data have also been compiled and mapped in the U.S. Department of Agriculture's Food Environment Atlas.

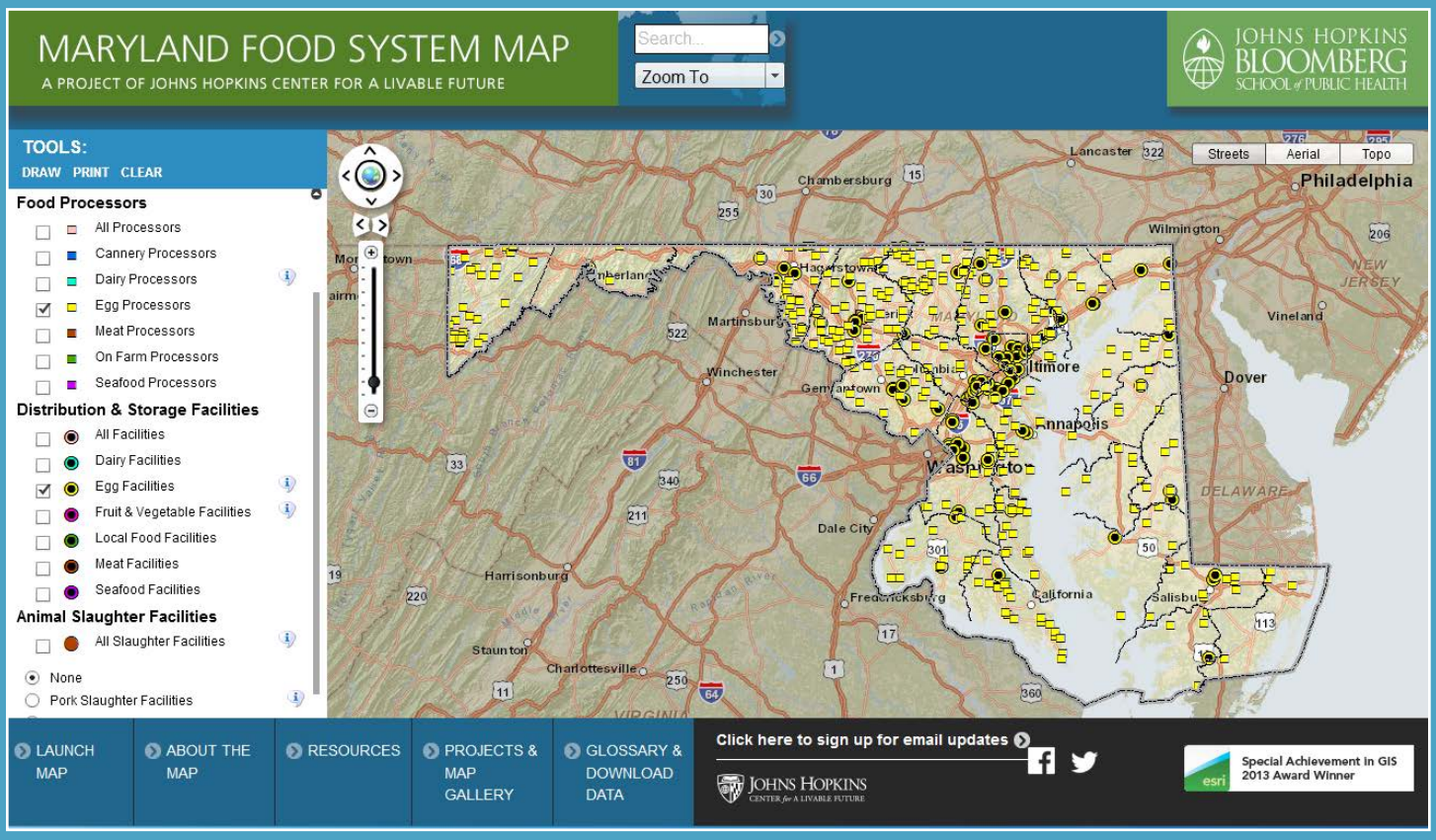
| Demographic and Economic Contexts | | | |
|---|---|---|---|
| **Dataset Source** | **Description** | **Characteristics** | **Limitations** |
| **U.S. Census**<br>American Community Survey<br><br>Web address:<br>www.census.gov | Ongoing statistical survey that samples a small percentage of the population every year, providing communities the information they need to plan investments and services. Although they involve more limited sampling than the 10-year census, they allow more rapid assessment of trends. | **Unique feature**: Based on very close sampling of American households at all income levels and in all states.<br>**Comprehensiveness**: Very comprehensive with detailed demographics.<br>**Levels**: Residential blocks, census tracts, cities, counties, metro areas, Congressional districts, States, and national.<br>**Accuracy**: Variable depending on the sampling method, the geography, and the specific quantity that is being measured;<br>**Ease of use:** Requires some training, primarily because so many datasets are available and the web site can be complicated. | • Limited information about food and farming, but one potential option few have explored is time-use data on food shopping and preparation.<br><br>• Traditionally, the U.S. Census has been compiled every 10 years during the years ending in zero. Recently, however, this has been supplemented by annual surveys, due to quickly changing conditions. |

## Case Study: Maryland Food System Map[14]

The Maryland food-system mapping tool is designed to assist local food leaders and educators with understanding the current landscape of Maryland's food system from farm-to-plate. This interactive, GIS-based mapping tool and database (shown in figure 1.2) does an exemplary job, allowing users to overlay layers of data on a map to examine Maryland's food system including how food is grown, processed, distributed, sold, and consumed. For example, this map shows two complementary, place-based data series, egg processors and egg distributors, which is one example of how you could illustrate potential linkages in the supply chain.

Though your team may not have the resources to create a tool such as this, it provides an excellent example of the types of data that can be compiled and displayed from secondary sources.

**Figure 2.1: Maryland Food System Map[15]**




*Source: Maryland Food System Map, Johns Hopkins Center for a Livable Future*

14 For more information, visit http://mdfoodsystemmap.org/glossary/.
15 For more information, visit http://mdfoodsystemmap.org/.

## Cautions on Using Secondary Data

In general, the strengths and limitations of using secondary data might be summed up as follows:

Strengths:

- Widely available
- Quick to access
- Relatively inexpensive to compile
- Developed according to professional, standardized protocols
- Often provide time-series data useful in identifying patterns and emerging trends as well as comparisons across different areas (cities, counties, and States).

Limits:

- Data compiled at a national scale may not suit local conditions
- Findings should be checked for accuracy with local stakeholders
- Data may not address the questions you wish to answer
- Data may seem more precise than they actually are, and interpretation must be done carefully.

### Data Source Compatibility

Each secondary data source has its own way of sampling and compiling data – as well as its own definitions – each subject to its own assumptions and logistical constraints. For example, the population figures listed for a given county in one source may be slightly different from those in a different source. Or, rounding errors may give slightly different results across data sources. If you are combining data from different sources, be very careful to make sure that these discrepancies do not render your comparisons invalid.

### National Data May Not Be Robust When Pared Down to the Local Level

This is especially true when working from national datasets. For example, per capita consumption of green peppers on a national scale may be lower than for communities where a specific ethnic food is featured. For many policy discussions, these differences may not matter, but if an accurate tally of how many green peppers is needed to, say, feed a Latino community in Texas, close surveying of local residents may be needed.

This issue is especially troublesome when it comes to data on fruit and vegetable production in the Census of Agriculture. Many farmers do not report specialty crop production as reliably as commodity production, and the USDA has also placed higher priority reporting on the larger cash crops, so there are often gaps in this data. Moreover, since the Census of Agriculture uses sampling methods, the survey may only reach commodity farms in any given locale, thus overlooking or undercounting the actual number of vegetable growers.

***Example of community garden and greenhouse in an urban setting.***

Sales figures for local areas are also suppressed to protect the farmer's confidentiality if there are only a few such farms in a region. While it may be tempting to use the number of acres of green peppers produced at the State level, and divide that by the number of acres of land in the local county, this would not be a valid calculation, because there is no reason to assume that data for the local county is an exact reflection of statewide planting patterns.

These are simply examples; in each case, your team may find it prudent to discuss the limits of each data set with local experts, and interpret findings with appropriate care.

### Comparisons Across Time May Not Be Valid

If one has access to time-series data from, say, 1960 to 2014, keep in mind that the structure of the farm economy has changed greatly over that time period. Additionally, data collection protocols may have changed. For example, local food sales were primarily reported as sales direct to consumers in earlier Census of Agriculture questionnaires, but in the most recent, some of those sales were likely reclassified as direct to retail outlets. Thus, one category may have declined (direct to consumers), but that is because of a transfer to a more detailed reporting of how those local sales are sold (through retailers), so local foods may be up, but at least one category may seem to be in decline. Consequently, it may be meaningless to compare "local foods" across these years, unless you are careful to interpret the data within its limitations.

### Comparisons Across Geography May Not Be Valid

A small farm in Texas may be larger than the largest farm in Vermont. Farming in desert conditions is certainly different than farming in a lush temperate zone. "Local food" in New York State may be considered as food that comes from a certain valley, while "local food" in Alaska may be grown several hundred miles away from where it is consumed. Even within one rural region, soil types and terrain may differ so much that it would be unwise to draw comparisons about farm income across the local region.

### In Rapidly Changing Situations, Conditions May Have Changed Since Data Were Compiled

When corn prices rose dramatically in 2011-12, this meant farm income, as reported in the Census of Agriculture, looked significantly higher in 2012 than for the previous Census of 2007. Yet corn prices have begun to fall since then, so 2014 levels of farm income may no longer be as robust as the most current Census shows.

### Be Mindful of Potential Budget Cuts When Considering Public Data Sources

In recent years, the Federal Census has trimmed back the number of data points it reports, and BEA has removed data from its site temporarily, to reduce costs. These are among the most reliable data sources, so consider your strategy with care. It is good practice to store each data set on your own hard drive or cloud in case the data set becomes inaccessible in the future. You may also want to communicate to policymakers the importance you place on specific datasets, to reduce the likelihood of budget cuts.

## Takeaways

- Secondary datasets are often the first source you will consult to get a basic sense of local conditions.
- The U.S. collects and makes available a huge amount of data, from the local to the national level.
- Datasets are highly useful but each has its own limitations, so learn about their strengths and limitations, and interpret with care.
- Different data sources may measure the same quantities differently, and data collection protocol may change over different years, so be careful when making comparisons within and across datasets.
- Local food initiatives have used secondary sets in a variety of ways to provide context for food system assessments or economic impact assessment calculations.

## Appendix 1: Specialized Secondary Datasets

| Dataset Source | Description | Characteristics | Limitations |
|---|---|---|---|
| **U.S. Department of Agriculture**<br>Natural Resources Conservation Service (NRCS)<br>Geospatial Data Gateway (GDG)<br><br>Web address:<br>http://datagateway.nrcs.usda.gov | If your food system assessment team wishes to map watershed boundaries, soil conditions, or other natural resource features as part of planning or evaluation, this is the essential source of data. Healthy soil and clean water certainly affect the economic possibilities for food producers, so this can be quite relevant to your economic planning and evaluation. | **Unique Feature**: One-stop source for environmental and natural resources data.<br>**Comprehensiveness**: Exceptionally detailed mapping data covering most of the U.S. at a localized scale. A separate area of the NRCS website offers technical assistance tools for conservation programs.<br>**Levels**: Local to national levels.<br>**Accuracy**: Very accurate. Based on thorough scanning of aerial maps, field data, etc.<br>**Ease of use**: Relatively easy to access, with a broad array of data sources available. However, professional assistance for interpreting data and mapping is often advised to understand the precision and limitations of the data. | • This data set does not speak directly to economic conditions on farms, but rather covers the environmental and natural resource contexts in which farmers operate.<br>• The finest resolution of this farm data is an area of 30 meters by 30 meters (roughly 10,000 square feet) so very small fields or small-farm regions may not be well represented. |

| Dataset Source | Description | Characteristics | Limitations |
|---|---|---|---|
| **U.S. Department of Agriculture** Economic Research Service (ERS) Agricultural Resource Management Survey (ARMS)<br><br>Web address: www.ers.usda.gov/data-products/arms-farm-financial-and-crop-production-practices.aspx | This annual survey of farm financials provides summaries of important data covering farm production, mostly at the farm operation level.<br><br>Data from these surveys may also be useful for modifying IMPLAN to express local business conditions (see module 7). | **Unique Feature**: Based upon a nationally representative survey targeting about 5,000 fields and 30,000 farms each year.<br>**Comprehensiveness**: Focuses on specific commodities, but also the economic viability of farms, including off-farm income. ARMS states that the survey is "designed to be representative of the Continental U.S., and to support State-level estimates for 15 key agricultural States."<br>**Levels**: Specific farms and categories of farms.<br>**Accuracy**: Based on thorough surveys of U.S. farms.<br>**Ease of use**: Restricted access, though summaries of data are available via USDA-ERS reports posted on their website. | • Appears to be more suited to analysis in key farm States and major commodities.<br>• Greater access for a limited number of researchers engaged in research partnerships with USDA-ERS.<br>• Data collection on "local food" sales started in 2008, but sample size is limited (see Low and Vogel 2011). |
| **Market Maker**<br><br>Web address: https://national.foodmarketmaker.com/ | An Internet ordering platform geared to wholesale trading, Market Maker allows producer to list products they wish to make available, while buyers and consumers may place orders.<br><br>These listings may also be used by researchers to identify farms and food businesses that are engaged in local food trade. | **Unique Feature**: A hybrid blending online directories of stakeholders throughout the food supply chain, a mapping utility and consumer expenditure survey at the State and county levels.<br>**Comprehensiveness**: Market Maker has been adopted by 20 states as of this writing.<br>**Levels**: States, although more localized data are incorporated.<br>**Ease of use**: Quite easy to locate listings of farms and food businesses that have registered with the service.<br>**Accuracy:** Presumed accurate but may require updating. | Since participation is voluntary, farm and business listings cannot be presumed to be comprehensive. |

| Dataset Source | Description | Characteristics | Limitations |
|---|---|---|---|
| **U.S. Department of Agriculture**<br>Economic Research Service<br>National Household Food Acquisition and Purchase Survey (Food APS)<br><br>Web address:<br>www.ers.usda.gov/data-products/foodaps-national-household-food-acquisition-and-purchase-survey.aspx | Provides information about household size and composition, available resources, and acquired food items (and their prices).<br><br>Also includes information on:<br>• Supplemental Nutrition Assistance Program<br>• Income | **Unique Feature**: First nationally representative survey of American households that collects detailed data about low-income household food purchases, and factors that affect consumer spending decisions.<br>**Comprehensiveness**: Includes detailed information from a nationally representative sample of about 4,826 households.<br>**Levels:** National<br>**Accuracy**: Very reliable, robust data set for certain research purposes.<br>**Ease of use:** Easy-to-use reports are available reporting aggregated data, but researchers wishing to access raw data for research have restricted access, requiring a Memorandum of Understanding (MOU) with USDA-ERS. | These data currently have limited utility for local food assessments or economic impact calculations, since findings apply only to the national level. However, the national data may serve as a benchmark to compare local data against. |

## Appendix 2: Examples of Using Secondary Datasets

### University of Wisconsin — North Central Region County Food Systems Profiles Portal

*Covers Indiana, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.* This resource uses public secondary datasets to provide an overview across the North Central food system and serves as a baseline for community leaders and educators to identify opportunities for growth or expansion in regional food systems. Shows a large number of food facilities, demographic characteristics, health, and socioeconomic measures for each county in the North Central region. Similar data could be generated for any region by other researchers.

Web address: http://foodsystems.wisc.edu/

### Vermont Sustainable Jobs Fund — Vermont Food System Atlas

The Vermont Sustainable Jobs Fund developed a food system mapping tool for Vermont, in conjunction with a statewide Farm-to-Plate initiative, that includes marketing organizations, farm input suppliers, farms, distributors, retail food stores, nutrient management firms, food access and nutrition groups, educators, workforce development resources, business planning and technical assistance resources, financing organizations, energy firms, regulatory and public policy bodies. Limited to the State of Vermont, though other States are creating similar platforms and this model could be adapted elsewhere.

Web address: http://www.vtfoodatlas.com/

### Crossroads Resource Center — State and Regional Food System Assessments

Statewide assessments for Minnesota, Ohio, Indiana, South Carolina, Mississippi, and Alaska that combine secondary data compilations and first-hand interviews with wise practitioners. Also featured are regional overviews of the farm and food economy for more than 110 regions across the U.S. These have proven useful for animating local foods activity.

Web address: http://www.crcworks.org

### More Detailed Food Consumption Calculations:

Conner et al. (2012)[16] argue that a local seasonal diet based on USDA Dietary Guidelines would create more revenue than a local seasonal diet based on current consumption patterns. Yet this study found there was no credible method for measuring current consumption of local food on a Statewide level. A subsequent paper (Conner et al. 2013)[17] was able to measure and account for about $52 million in local food expenditures, equal to about 2.5 percent of all food expenditures in Vermont, but estimated that the overall total might be more than twice that amount if more complete data were available; private firms were often unwilling to share local food-trade data.

Peters, et al. (2007)[18] proposed a range of diets (from vegetarian to more protein-intensive) in estimating land requirements for producing local foods; this was then used to develop a spatial model for evaluating local food capacity (Peters et al. 2009).[19]

16 Conner, D., Kahler, E., Berlin, L., & Hoffer, D. (2012). "Economic opportunity in local food systems: Baselines and targets," University of Vermont Center for Rural Studies, *Opportunities for Agriculture Working Paper Series* (2)1.

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

18 Peters, C., Wilkins, J., & Fick, G. (2007). "Testing a complete-diet model for estimating the land resource requirements of food consumption and agricultural carrying capacity: The New York State example." *Renewable Agriculture and Food Systems*, 22 (2), 145–153. http://dx.doi.org/10.1017/S1742170507001767

19 Peters, C. J., Bills, N. L., Lembo, A. J., Wilkins, J. L., & Fick, G. W. (2009). "Mapping potential foodsheds in New York State: A spatial model for evaluating the capacity to localize food production." *Renewable Agriculture and Food Systems*, 24 (1), 72–84. http://dx.doi.org/10.1017/S1742170508002457

# Module 3 — Generating and Using Primary Data

Module 3 provides a detailed description of how to gather primary data (data that you collect yourself) in order to conduct your economic impact assessment. In this module you will learn:

- What to do before you start your primary data collection, including thinking through your local food assessment and its associated measures;
- Sampling techniques (i.e., who will receive the questions you pose), including what each approach entails and the associated pros and cons;
- Qualitative and quantitative data collection methods, including a detailed description of data collection methods, tips to collect unbiased and valuable data, and uses for each approach; and
- Preliminary data analysis techniques.

Primary data are the data that you collect yourself, as opposed to secondary data that have already been collected by someone else. Primary data may help fill in gaps (where no secondary data exist) and/or make your study more precise and grounded in the local situation. Collecting and analyzing data is neither a simple nor inexpensive task. We recommend that you have a team member that has statistical training or hire an expert to assist you with this process.

The content of this module is appropriate at the stage of your project when your team has:

- Defined its scope, specific goals and objectives, timeframe, available resources, and regional boundaries (module 1);
- Used (or tried to use) secondary data to understand baseline conditions, or to estimate the potential economic contribution or impact of your project, but has found that you still need additional data to accomplish the goals of your assessment;
- Examined available secondary data and determined that data do not exist for the specific question(s) you seek to answer, or available secondary data do not reflect conditions in the study area;
- Determined it has substantial time, resources, and expertise to devote to collecting and analyzing primary data. Primary data collection, analysis and interpretation require skill and training. It often costs, at minimum, several thousand dollars to conduct even a small study, as you may need to hire people to test and administer the surveys/interviews, pay for travel, compensate respondents for their time, etc.

## Before You Start

Before you embark upon your primary data collection process, you will need to think through the concept of a local food assessment study and its associated measures. This involves the identification and definition of three critical study components:

- Dimensions;
- Variables;
- Attributes or characteristics.

Prior to initiating your collection of primary data, you will want to make sure you review your team's stated goals, as described in module 1, and make sure that your goals are defined precisely enough that they can be measured. For example, studies interested in figuring out ways to improve community well-being would be difficult to implement, given the complex and broad nature of the term "well-being." Accordingly, you may need to spend some time breaking down the various components of well-being that your study is really interested in identifying. For example, your focus may include one or more of the following factors:

- Economic prosperity;
- Public health status;
- Level of social interaction; and
- Attractiveness and sustainability of built and natural environment.

Next, you'll want to think of indicators for each dimension. These are the signs you would look for to determine that a particular indicator is present or absent. A few examples of common indicators that are of frequent interest to communities engaged in local food assessments are shared below.

**Indicators of Economic Prosperity:**

- Level of vendor viability (for business prosperity);
- Amount of product purchased from neighboring businesses (for prosperity of community economy); and
- Improved food affordability (for household prosperity).

**Indicators of Public Health:**

- Improved access to healthful foods;
- Increased access to nutrition education; and
- Ability to bike and walk to farmers markets.

**Indicators of Social Interaction:**

- Diversity (race, age, gender, ethnicity, culture) of vendors and shoppers;
- Capacity to convene gatherings of community members; and
- Neighborhood participation in market planning and governance.

**Indicators of Environment and Aesthetics:**

- Amount of green space;
- Visual appeal of surroundings;
- Sales of organically and sustainably grown products; and
- Public access to education on recycling and composting.

The bullets above merely represent examples from a large range of possibilities. The key in each case is to choose and define each indicator with care, and create a logical justification for including (or excluding) any particular indicator, making sure that they are tailored to and appropriate for the particular scenario being studied.

## Identifying Key Indicators for Your Community

Although there are some secondary databases being established to make the indicators as well suited to your community's mission and outcomes as possible, it may be necessary to collect data with appropriate questions or measures. Yet, it may be worthwhile to explore what other communities have done, as a means to brainstorm and refine your team's indicators before defining the variables as you solicit information on your region. In a paper justifying the need for a new set of indicators to evaluate the local food system, the Institute for Agricultural and Trade Policy outlines how to translate goals to outcome-driven indicators. They also include a sample survey instrument they believe could be used (or customized) by a community to learn about system-wide indicators of relevance to regional food discussions.[20]

When choosing the data to be collected, it is necessary to establish explicitly the link between objectives and goals, performance indicators and the data types, and variables necessary to generate them. These links have implications not only for data collection, but also for policy. If a policy requires increasing food-industry jobs, but the community is unable to collect the necessary data to assess employment in targeted categories across time, the policy performance cannot be reliably assessed. There is no prescription for selecting data types and variables, These must be based on needs and local circumstances.

## Variables and Attributes/ Characteristics

The next step is to choose which variables measure each indicator. Think of variables as a set of questions on a survey or interview; the attributes or characteristics are the individual responses to these questions.

Determining who will receive the questions you pose, i.e., your study sample, is a very important decision. There are three primary approaches for developing a study sample, each of which is discussed on the following page.

20 For more information, visit http://www.iatp.org/files/indicators-web.pdf.

***Data tools, such as USDA's Census of Agriculture, can be useful in assessing local needs.***

## Census

A census is where you attempt to obtain information from the entire relevant population in the targeted study area. A census will provide you with the most complete picture of your stakeholders; for example: all vendors at a farmers market, all institutional food service operations in your region, all businesses on a given block, all adult residents in a given senior center, all customers of a particular Community Supported Agriculture operation, or all meat processing facilities in your region. The difficulty of obtaining information from each member of a population can vary considerably based on the size of the population and the turnover in membership. For example, it is likely to be easier to contact all vendors at a single farmers market than to contact all employees at a firm with high turnover rate.

## Representative Sample

Short of carrying out an actual census of the targeted population, it may be practical and sufficient to create a sample which you can credibly claim "resembles" the population. One common method used to develop a representative sample is a probabilistic sample method, which recruits members of the population for the sample based on probability targets. To achieve these targets, the most common technique used is random sampling, which requires generating a complete list of possible survey respondents and then selecting individuals at random.

The primary advantage of using a random sample is the ability to credibly generalize results to the overall population: if the sample closely represents the population in your region, it is more likely the results will be applicable to the larger group. For example, if you are interested in understanding whether there is unmet demand for local foods, and you only survey customers who are currently shopping at farmers markets, you may end up with results that do not accurately reflect your entire population. The major challenge of using a random sampling method is that it is often difficult to obtain a complete list of potential survey respondents within the targeted study area.

## A Non-Representative or Non-Random Sample

Under certain circumstances, it may be sufficient or practical to use a non-representative or non-random sample. This type of sampling does not allow for generalizing results beyond the sample, but has many advantages. For example, non-random samples usually involve decreased costs in time, money and effort, as well as the ability to target a specific group of interest (e.g., likely customers of a given market). Here are a few common strategies for undertaking such a sample effectively:

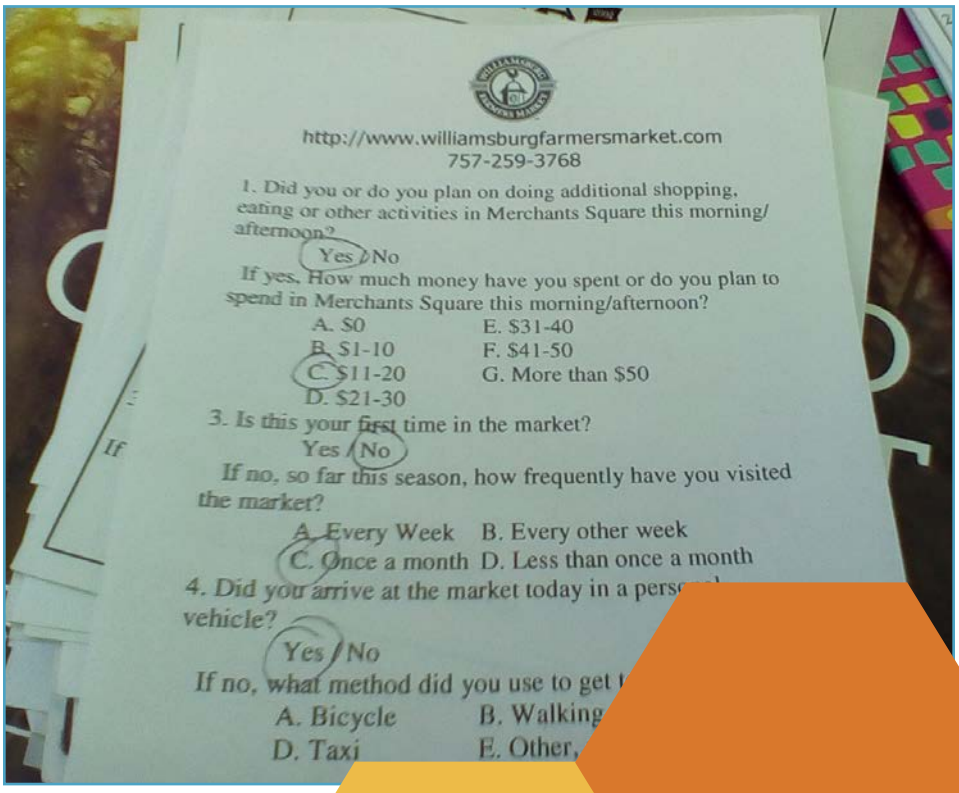
- **Key informants** are those who have substantial knowledge about your subject of interest. Examples include vendors at

a farmers market, farmers selling to farm-to-school programs, or elected officials of your county or State. It would not make sense to ask a random sample of the U.S. population about being a vendor or customer at your local farmers market. It would make sense, however, to ask a subset of participants in a farmers market vendor-training course about their experiences. You will likely gain valuable information from this survey approach even if the sample is not representative. One commonly used strategy for selecting a key informant sample is a technique in which you attempt to ensure that the sample represents the diversity of the population along several dimensions. For example, if you are studying firms, you might look at firmographic dimensions like geographic location, size of business, years in business, products sold, and number of employees. On the other hand, if you are studying a sample of individual people, you may wish to examine demographic dimensions like age, gender, race, ethnicity, and education.

- **Snowball sampling** often goes hand in hand with key informant sampling. Once you identify someone who is knowledgeable on a subject, it can be helpful to ask the subject for suggestions of other people who are knowledgeable and have meaningful experiences or perspectives on the same subject. For example, when learning about a specialized product, you may ask your informant about the people to whom he/she buys and sells product. The size of the sample grows over time as informants identify new contacts.

- **Quota sampling** ensures that the sample resembles the population by establishing quotas or minimum thresholds for segments of the survey population with specific characteristics. For example, if the population of farmers market vendors in your county is 50 percent male and 50 percent female, with the population divided between 75 percent farmers and 25 percent vendors of prepared food, you may decide to recruit subjects for your survey until your sample meets these criteria. While this sample will not be representative of the entire population, this method will still enable you to avoid some degree of bias (e.g., including only males or only non-processed food vendors in your population sample for farmers market vendors). This sampling technique may also be used to oversample minority populations or seek out divergent viewpoints to ensure you hear a broad array of viewpoints.

- **Convenience sampling** selects subjects who are easily accessible. This is a very common method of sampling, and encompasses many possible strategies. It may involve sampling shoppers at a farmers market on certain


http://www.williamsburgfarmersmarket.com
757-259-3768

1. Did you or do you plan on doing additional shopping, eating or other activities in Merchants Square this morning/afternoon?
Yes / No
If yes, How much money have you spent or do you plan to spend in Merchants Square this morning/afternoon?
A. $0 E. $31-40
B. $1-10 F. $41-50
C. $11-20 G. More than $50
D. $21-30
3. Is this your first time in the market?
Yes / No
If no, so far this season, how frequently have you visited the market?
A. Every Week B. Every other week
C. Once a month D. Less than once a month
4. Did you arrive at the market today in a pers
vehicle?
Yes / No
If no, what method did you use to get
A. Bicycle B. Walking
D. Taxi E. Other,

***A common sampling method involves inviting existing customers to fill out paper surveys such as this one.***

days by setting up a booth or standing with a clipboard and asking for participation. It may involve hanging up signs at the local health food stores, or sending an email with a link to an on-line survey to a group of farmers, vendors, co-op members, or another population of interest. The purpose is to obtain a sample with minimal cost and effort.

When using non-random sampling techniques such as those described above, you must be careful to ensure that you obtain a breadth of viewpoints and avoid obvious biases in your sample. To maximize the diverse composition of population samples obtained through non-random means, some researchers choose to administer intercept surveys at markets or stores on a variety of shopping days and times. Similarly, email links can be sent to list serves of various types of farms or businesses. You may also want to adopt the practice of triangulating your findings – i.e., asking the questions from different sources to see if you come up with the same or similar results. For example, you might decide that for any specific response to rise to the level of a significant observation, the same response must be raised by at least 3 (or 5, or 10…) respondents independently in the course of your surveys/interviews. While this technique will not give you a random sample, it may well give you excellent insights about which issues are considered important by individuals in your sample. These opinions may not always be correct, but they are likely to be valuable in giving you information about how stakeholders – or at least a segment of stakeholders – view their food system.

While a great deal of meaningful, insightful, and actionable information can be gleaned from non-random samples if care is taken to minimize bias and discuss sampling limitations, it is important to keep in mind that it is difficult to avoid bias entirely even with the best of intentions. Those stakeholders who enjoy taking surveys or who have stronger opinions about the issue being surveyed are at risk of being oversampled and thus overrepresented, while farmers and other working professionals are often reluctant to participate in time-consuming surveys or interviews. Therefore, it is useful to compare the key attributes of the sample against the distribution of attributes in the entire population, so that you know how well the two groups resemble each other and can identify areas of potential oversampling or under sampling. Additionally, when you have a non-random sample, for some questions it will not make sense to report an average. Reporting ranges of responses, medians, and response categories may be more useful.

## Data Collection

There are two main types of data collection: qualitative and quantitative. Qualitative research collects data detailing the quality of someone's experiences, usually the subject's account of events in their own words, very often in the form of interviews. Qualitative data deals with descriptions and data that cannot be measured using numbers. Quantitative research, on the other hand, deals with numbers and data that can be measured. This type of research counts the frequency with which a given event occurs or response is given; these methods commonly use surveys in which subjects choose answers best corresponding to their experience. Often, statistical analysis can be performed, comparing frequencies and finding relationships among responses. Qualitative methods tend to collect a large amount of information about a relatively small number of subjects (depth), while quantitative methods gather a small amount of information about a large number of people (breadth). Both are very powerful and important methods that often complement each other. One well-established practice is to use qualitative methods to familiarize oneself with an area, and get an idea of what the major issues or themes are, then use quantitative methods to count and correlate the prevalence and depth of these themes in a larger population. In general, unless your research questions are fairly straightforward and simple (e.g., "how much money was spent on…", "how many people attended…."), beginning with a qualitative study is a good idea.

## Case Study: Four Main Types of Survey Variables

- **Nominal:** These variables are categories that have no hierarchy (e.g., high/low, good/bad.). Examples of these include the city/State where you live or were born, occupation, race or ethnicity, type of car you own or transport you use, types of foods you eat or prefer.

- **Ordinal**: These variables contain some degree of hierarchical order. A very common question type that yields an ordinal variable is called a Likert-scale. An example of a Likert-scale is shown in table 3.1. These scales are used to measure agreement with a statement, likelihood of a behavior, quality of a product or service, frequency, importance, and other viewpoints. Often a five-point scale is used, with one equal to strongly disagree, very unlikely, very poor, never, etc. and five equal to strongly agree, very likely, excellent, always, etc. Likert scales typically feature odd numbers of choice options so that the list of ordinal variables includes a "neutral," "no opinion," or "does not apply." It is important to note two key features of these scales. First, they are internally true (my "strongly agree" is stronger than my "somewhat agree"), but your "strongly agree" may be stronger than mine. Also, it is not possible to know the distance between each point of the scale.[21] Nonetheless, these scales are very commonly used in research and yield useful measures of respondents' attitudes, beliefs and intended behaviors.

**Table 3.1: Example Likert Scale**

| Strongly Disagree | Disagree | Neither Agree or Disagree | Agree | Strongly Agree |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

- **Interval and Ratio**. In contrast to ordinal variables, the distance between responses of two other types of variables — interval and ratio — can be measured both internally (for a given person) and externally (between people). Interval variables have no true zero (like year of birth and degrees Fahrenheit), so 40 degrees F is not twice as warm as 20 degrees F. Most numerical variables do have a true zero (e.g., age, income, revenue, profit, expenditure, height, weight), so the ratio makes sense: someone who spent $40 at a market did spend twice as much as someone who spent $20.

21 For more options on Likert scales, see: http://www.gifted.uconn.edu/siegle/research/instrument%20reliability%20and%20validity/likert.html

## Qualitative Methods

Two common qualitative methods are observations and interviews. Observations involve going to an unfamiliar setting (e.g., places of business like a farm, food hub, distributor, manufacturer, or market), then watching and observing what unfolds. There is a broad array of things to look for, such as:

- Participants (who is there, how many, what are their demographic attributes)
- Behaviors (what do they do, for how long)
- Interactions (with whom do they talk, with whom do they work, what is the non-verbal communication happening)
- Physical environment (sights, sounds, climate, location)
- Outcomes (what happens as a result).

Observations are a good starting point for learning about an unfamiliar subject so that you are better prepared to ask informed questions. You can focus like a journalist would on the five W's: Who is present? Where are they? What are they doing? When does this happen? Why does it happen? You can also pay attention to what you learn from your senses: What do I see? Hear? It is useful to write down your immediate perceptions first and to analyze them separately, to reduce the chance that you will only notice what you want to see.

**Figure 3.1: Questions from the Pueblo County Food Assessment Youth Focus Groups**

**Focus Group #1:** Youth group
**Host:**
**Facilitator:**
**Translator:**
*Goals: to learn about youth's ideas and participation in either the food their parents buy or they purchase on their own. Also, to understand what is important to them when purchasing or consuming food.*

- Where do you get most of your food from?
- How much food do you purchase on your own?
- When purchasing food on your own, where do you get most of your food?
- How do you decide where to get the food you purchase on your own?
  - (possible probe: how do you get to where you purchase your food? )
- Where else would you like to get food?
- What are the reasons you do not currently purchase foods at these places?
- Where do you consume most of your food? (e.g., in the car, at home, in a restaurant?)
- What foods would you like to eat more of?
- What would make it easier or more appealing for you to eat those foods?
- How do you decide what foods to buy?
- What concerns do you have about the food you purchase (e.g., safety of the food, ability to prepare and cook the food, etc)?
- What concerns do you have about foods that you would like to purchase?
- What might take away those concerns?
- What is your understanding of local foods?
- What might help you to shop more from local producers
  - (possible prompt: such as shopping at local restaurants or the farmer's market?)
- Are you interested in learning more about health and nutrition?

***Source: Pueblo County Food System Assessment: Public Health & Food Access Report***

Interviews involve asking people a series of questions on the topic at hand. They may take the form of one-on-one discussions, or a group discussion (a focus group). The purpose of conducting interviews – either with an individual or with a group – is to help discover the interconnections of ideas and behaviors that make sense from the perspective of those we interview. It is good to assemble a formal questionnaire and follow it as a general guide to ensure key topics are covered, but it may be necessary to ask additional probing questions to get deeper information on certain themes, or to amend the order or content of questions as new topics emerge. Questions should generally be open-ended, allowing the subject to answer in his or her own words.

As part of a Pueblo County, CO, food assessment, several focus groups were conducted to learn more about youth perspectives on local foods[22]. A set of questions asked of that group are shown in figure 3.1.

22 Moschetti, Hopewell, Sullins, Colpaart and Thilmany. *Pueblo County Food Assessment*. September 2013. Available at: http://county.pueblo.org/government/county/department/city-county-health-department/pueblo-county-food-system-assessment

At the same time, asking people to offer solid details is critical. Often, asking people to tell a story about a "time when" a particular experience happened will evoke more detailed and candid responses than formal questions. If an interview subject is not highly verbal (often true with farmers), it can be useful to bring photos or other artifacts that help prompt more detailed answers, as long as your choice of these items does not telegraph that you are looking for a certain set of answers, or discourage your subject from replying with his/her honest opinion.

In general, the order of questions should follow these guidelines:

- **General to specific.** This order helps to avoid biasing later responses. For example, if you first ask about what foods consumers like to buy at farmers markets, then ask where they shop or what they buy in general, they may already be thinking about farmers markets and answer in those terms, thus skipping over potentially important information about other venues.
- **Most to least important.** Some respondents may have time constraints or become bored with the interview and end it early. It is best to get important answers first.
- **Safest to riskiest.** It is best to open with a safe question to put the subject at ease and in a talkative mood, and leave controversial or risky questions for later in the interview process in case the risky question causes the subject to terminate the interview or become less open.

It is important at the very least to take copious notes during interviews; in fact, professional researchers often record and transcribe their notes for future analysis or hire a transcription service. If you are considering this path, however, please be aware that it can consume a great deal of time and resources to record and transcribe interview notes. Therefore, if your budget is limited, you may wish to pare down your plan for documentation.

## Quantitative Methods

Surveys are the most common method of gathering quantitative data. They involve asking subjects a common set of questions, generally with short or close-ended answers (the respondent chooses from a set of pre-determined options). As a general rule of thumb, the order of questions in the survey instrument should mirror the order used for interviews; e.g., general to specific, most to least important, and safest to riskiest. It is also customary to put demographic questions (age, race, gender, education) at the end of the survey.

Having clear, straightforward instructions is critical when administering surveys. To increase the clarity of the information submitted, it may be useful to word the survey questions so that the respondent is only allowed one answer (i.e., the instruction might say "choose one" rather than "choose all that apply").

It is always good protocol to pilot test the survey with 5-10 volunteers to make sure that the survey captures the type of data you are looking for without creating an excessive burden for the respondent. You will want to ask your volunteers to:

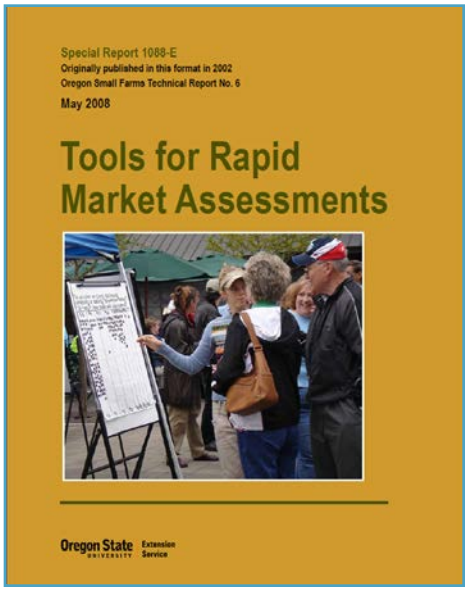
- Take the survey;
- Record how long it takes them to complete it;
- Note any spelling or format errors; and
- Identify any questions that were difficult to understand or answer.

In general, any survey that takes longer than 15 minutes to complete runs the risk of turning off or discouraging potential respondents and/or suffering from accuracy problems as interest often wanes in survey taking. Longer surveys are generally possible only with highly engaged respondents who are motivated and interested in the results. Ask yourself how you will use each question in your assessment. If it is unclear, consider leaving the question out. Spend the time up-front to make sure your

survey instrument provides clear instructions, is easy to complete, and is short enough to maintain respondents' interest. Note that once the survey is sent out, it is impractical to change it because meaningful comparison between the first survey and the "changed" survey is not possible.

## Considering Options for Administering Surveys

### Figure 3.2: Dot Poster Surveys[23]




*Source: Lev, Brewer, and Stephenson, (2008).*

Dot Poster Surveys, also known as Rapid Market Assessments, were developed by Larry Lev and Garry Stephenson at Oregon State University (figure 3.2) to gather information from farmers market patrons, and they have many advantages. These surveys are very simple to administer, responses are easily tallied, and it is possible to get a large number of responses in a short period of time. Respondents report that this method is faster to complete, more fun, and less intrusive than written surveys or face-to-face interviews. The drawbacks are the limited number (usually four or five) and type of questions (simple and closed-ended) that can be asked in this format, and the inability to correlate individuals' responses (to look for patterns in how each given person answers a series of questions). In addition, since all subsequent respondents will see the "votes" of previous visitors, it may introduce bias into the results.[24, 25] Figure 3.3 illustrates an example Dot Poster Survey used at a farmers market.

### Figure 3.3: Dot Poster Survey Example

*Source: Ragland, Lakins, and Coleman, 2011.*

To use this method, your team writes relatively simple, closed-ended questions (with responses in columns) on large flip charts placed on easels. Respondents are given a strip of colored dots (one dot per question) to place on the corresponding answer. Examples of questions asked are:

- How much did you spend at the farmers market today?
- Was the farmers market your primary reason for coming downtown this morning?

23 Lev, Brewer, and Stephenson. (2008). "Tools for Rapid Market Assessments." *Oregon State University Special Report 1088-E*. http://smallfarms.oregonstate.edu/sites/default/files/small-farms-tech-report/eesc_1088-e.pdf

24 For more information, see "Dot Posters: A Practical Alternative to Written Questions and Oral interviews," *Journal of Extension*. (October 1999). http://www.joe.org/joe/1999october/tt1.html or *Analyzing Three Farmers Markets in Corvallis and Albany, Oregon, Oregon State University Small Farms Technical Report Number 2.* (October 1998). http://smallfarms.oregonstate.edu/sites/default/files/publications/techreports/TechReport2.pdf

25 An example of results obtained from this method include: Ragland, Edward, Velma Lakins, and Carlos Coleman. *Results of Dot Survey: USDA Outdoor Farmers Market*, Washington, DC. U.S. Department of Agriculture, Agricultural Marketing Service. http://apps.ams.usda.gov/MarketingPublicationSearch/Reports/stelprdc5093878.pdf

- Have you or do you plan to eat at a nearby restaurant or do additional shopping at a nearby business either before or after this market visit?
- On average, if a specific item costs $1.00 in the grocery store, how much would you be willing to pay in the farmers market for a similar product produced locally?

## Internet Surveys

Internet surveys are becoming increasingly popular, supported by advances in software and popular sites like SurveyMonkey®. Internet-based surveys have the following advantages: relative ease of response, cheaper to administer, no need to pay for travel to specific sites to conduct surveys, and the ability for subjects to respond when they wish. Additionally, many survey platforms compile responses into a spreadsheet for you, and this can save a great deal of time compared to entering the data by hand after all responses have been collected. It is worth noting that all platforms are not created equal. It may be worth paying up-front for a site that supports robust backend features that facilitate data analysis.

However, there are several disadvantages, including the potential for a biased sample towards Internet users and difficulties limiting respondents. You may be interested in learning about sales information for farmers market vendors, and may get responses from farmers that do not utilize these markets. Another challenge is that it is difficult to collect sensitive information – such as total farm sales – through an online survey. Online surveys work the best when this type of information is not required.

## Written Surveys

Paper surveys are either administered in person or by mail. Each has its drawbacks. In-person surveys generally sample the most convenient group (convenience sampling**)** and may be biased (i.e., those who shop at a certain place at a certain time, and enjoy taking surveys). In-person surveys also run the risk of annoying people who came to shop, not take surveys. Mail surveys can be designed to return a representative sample, but tend to have very low response rates. The Dillman Method, consisting of an introductory letter, survey with addressed stamped return envelope, and reminder postcards, is commonly used in mail surveys. Acceptable response rates vary greatly by population.[26] Surveys of employees or key stakeholders should be well over 50 percent, while surveys of customers may be in the 20-40 percent range. When administering surveys to the general public, single digit response rates are not uncommon. Lower response rates are more acceptable with larger sample frames as they result in more overall responses. Be aware that a low response rate can lead to bias if people who are interested enough to respond have different opinions than non-respondents. For some purposes, it is better to aim for a smaller sample but invest in a good response rate, for example, by offering $10 for a returned questionnaire, or entering a drawing for a prize.

## Telephone Surveys

Telephone surveys have many of the pros and cons of mailed surveys. Exclusive reliance on phone books and land lines may create a bias in the sample toward older people, as many younger people exclusively use cell phones. Relative advantages of phone and mail surveys are detailed below.[27]

## Phone Survey Advantages

- Ability to sample selectively to reach sample quotas (a given percentage of females, for example)
- Quicker to complete and have available data
- Survey caller can explain complex questions

## Mailed Survey Advantages

- Lower cost
- Ability to add visual graphics or longer questions
- Individuals can answer at their convenience and speed of consideration rather than meeting the timeline possible with an intercept survey

26 For more information, see: http://faculty.washington.edu/jelmore/articles_online/Dillman-Des%26Admin_Ma.pdf. Here are design guidelines for written and on-line surveys: https://www.une.edu/sites/default/files/Microsoft-Word-Guiding-Principles-for-Mail-and-Internet-Surveys_8-3.pdf

27 Peter Dominowski and Al Bartholet. 1997. *The Listener Survey Toolkit*. Available at: http://www.wksu.org/Toolkit/chapter4/section1.html

## Data Analysis

### Qualitative Analysis Methods

The goal in analyzing responses to qualitative questions is to understand how the respondent sees the situation, what they think is important and why, and what general trends and themes resonate among the entire population or sub-sample of respondents. Qualitative data analysis is generally comprised of four steps: documentation, coding, finding relationships, and corroborating.

#### Documentation

Documentation refers to the overall process of identifying recurring and important themes from your observations and interviews. The process begins with taking field notes during interviews and possibly having those interviews recorded and transcribed.

By reading through your notes and transcripts, as available, you will begin to note preliminary themes, ideas, and significant connections. What you are looking to track and identify are interactions between people, between people and ideas, and between people and places. You should also be looking for evidence of drivers: why people have made the choices they have and why they have become convinced that what they are doing is what they should be doing. Keep in mind that people are different; there are many paths to particular outcomes, and many types of interaction that produce successful outcomes, so expect variation.

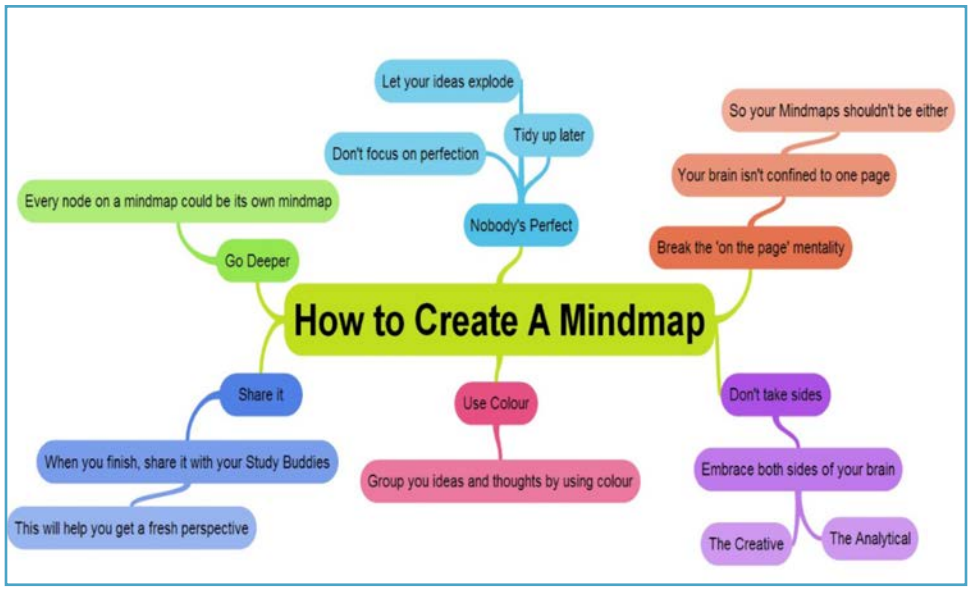
#### Coding

To make sense of your data, you will need to develop a coding scheme. The coding scheme you use should help you to group similar answers and enable you to draw conclusions from the data as a whole. Some of the codes will be pre-set based on interview questions, while others will emerge from the analysis. For example, suppose you asked farmers market managers an open-ended question about why they believed they had difficulty with vendor retention. Each response will be different, but perhaps you can identify some overarching themes that you can then code. In this hypothetical example, potential codes may include: market factors (e.g., not enough customer traffic), vendor factors (e.g., too much vendor competition given the clientele), and individual farm factors (e.g., farms too small to have adequate quantity of product and product mix). Dividing responses between the three codes makes comparing qualitative responses easier, and can facilitate the identification of trends among respondents.

#### Drawing Relationships

Understanding trends in your data is very important. Many people use what is called a mind map to help them see these connections. Write the recurring concepts and key themes identified through your research on a blank piece of paper. Then, by drawing arrows to connect related themes, you often find strong relationships. Note that drawing mind maps by hand is appropriate in many cases, but there are also a plethora of software tools and applications available. Do not fear that these relationships are subjective; they are real, and respecting them is very important. Figure 3.4 gives an example of a mind map.

**Figure 3.4: Example Mindmap[28]**




***Source: Tony Buzan***

28 Buzan, Tony. (1974). *Use Your Head*. London: BBC Books. London School of Economics.

You may also choose to more formally create a data matrix (with codes in columns and respondents in rows) to determine connections and correlations among variables (types of interaction or quality of relationship, for instance). For example, do those who commonly have a high rating on one variable also have a high or low rating on another?

### Corroborating

Results should be triangulated or corroborated with other findings. If, for example, you find a trend in responses from farmers market managers that does not appear in your farm responses, you need to consider alternative interpretations or explanations. Do the farmers market managers represent the same markets as the farmers? Do market managers have access to different information than farmers? Do you have representative samples of both groups? Essentially, if the different sources of information that you have do not corroborate each other, your team needs to do some deep digging and investigation into why this is the case.

## Quantitative Analysis Methods

Quantitative data will need to be coded into a spreadsheet or database software management program (such as SAS, STATA, or SPSS) with the respondents in rows and the variables in columns. It is good to give the variables descriptive names, like "Education" or "Sales Revenue," rather than non-descriptive labels like "Question 4." This will make it easier and faster for you to interpret results.

### Case Study: Making Small Farms into Big Business[29]

South Carolina's 2013 *Making Small Farms into Big Business* provides a good example of a study that sets the stage using secondary data, before filling in information gaps with primary data collection. To create an overview of the economic conditions in the State, the team compiled a variety of data from secondary sources including: the USDA Economic Research Service, the Bureau of Labor Statistics, the Census of Agriculture, County Business Patterns, Centers for Disease Control and Prevention, the National Center for Education Statistics, the South Carolina Department of Natural Resources, and the National Hydrography dataset.

Since these data do not offer a comprehensive view of local conditions, the team also conducted key informant interviews with over 150 practitioners across the State. Questions focused on emergent local foods activity, the State's role in shaping food systems, infrastructure requirements, regulatory barriers to local food trade, and availability of credit. To collect further primary data, the team conducted a survey of specialty crop farmers. This contained a variety of questions useful for both qualitative and quantitative analysis: multiple choice, check-all-that-apply, open-ended questions requiring text answers, and 5-point Likert scales. By corroborating these secondary and primary data, the team came up with a strategic approach that addresses all levels of the State's food system. The result was a $9.85 million investment plan for local foods, announced by State officials in December 2013, which focused on strengthening networks of food businesses.

The first step in analyzing quantitative data is to calculate and report the descriptive statistics. You can do this in a spreadsheet program like Excel or one of the database software management programs mentioned above. Below are some useful tips for generating descriptive statistics by variable type, so that the statistical reports are easy to review and yield meaningful information:

- For nominal variables, where there is no rank order among responses, you will probably find it most useful to calculate frequencies or the volume of responses provided for each question. Frequencies are most typically expressed in a table that indicates the number and percentage of responses. For example, we collected data from 100 farmers, 46 percent of which identified fruit and vegetable production as their primary commodity.
- For interval or ratio variables where differences between individual responses can be measured, you will most likely want to calculate the mean and median in order to detect whether there are

29 For more information, visit www.crcworks.org/scfood.pdf.

any extreme outliers in the sample. For example, if the variable is income and one household earns one million dollars per year, but five households each earn $20,000 per year, the mean household income in this sample of six households would be about $183,000. Citing the mean statistic in this case would not provide a very meaningful measure of "average" household income in this group. Reporting the range (highest and lowest values) as well as the median might also be of interest.

- For ordinal variables, where there is rank order among choice options, it is most common to report either the frequency or mean. Reporting out both the frequency and mean statistics can be helpful, because neither format alone may fully uncover the existence of extreme outliers.

If you have research findings that can be coded geographically, you may wish to bring your dataset to a Geographic Information System (GIS) specialist for mapping purposes. Examining your quantitative data against a geographic landscape can reveal connections between population density, economic indicators, and spatial characteristics that are otherwise difficult to discern, but can be very useful in guiding programmatic and policy decisions. A section of module 4 shows some strong examples of how geographic information can better inform your assessment.

### Bivariate Analysis

Bivariate analyses are most often used to answer questions about differences in responses among various segments of the survey population. By way of illustration, bivariate analysis could be used to compare the means or frequencies of responses by men and women when asked "how much did you spend at this farmers market?" or a comparison of responses among members of different racial or ethnic groups when asked "how welcome did you feel at this farmers market?" In general, you will want to compare means when conducting bivariate analyses of ratio/interval variables, and compare frequencies when conducting bivariate analyses of ordinal or nominal variables. Please note that many statistical programs will calculate the statistical significance of the difference in group responses – i.e., whether the difference in group responses is due to true variation in the data or is an accident of the sample.

## Takeaways

- You may need to collect primary data collection if no secondary data exist to answer your research question(s). Data collection and analysis require expertise and can be costly in time, money, and effort.
- It is often useful to break a complex concept into its dimensions and indicators, then to develop variables to measure the presence or strength of the indicators. These variables form the basis of your data collection.
- While representative samples may permit generalizing results to a larger population, convenience samples often provide useful information from knowledgeable stakeholders at a smaller cost in time and effort.
- Qualitative methods, including observations and interviews, provide a rich narrative of a subject's experiences and are often used to develop deeper understanding of an unfamiliar topic.
- Quantitative methods often use survey results and provide an account of prevalence and correlation of important attributes in a larger sample.
- Mixed method approaches, using both qualitative and quantitative methods, complement each other well and can provide both depth and breadth of understanding.

# Module 4 — Engaging Your Community Process with Data

Module 4 provides guidance on how to reflect on the data gathered, characterize trends and changes, and determine sectors that warrant further attention. This module will help to set the stage to analyze and interpret the more in-depth results discussed in the remaining modules. In this module you will learn:

- The key discussion points and data interpretation strategies to consider when you reconvene the leadership team to discuss initial findings;
- Three common methods to reduce your data into thematic findings of interest to general audiences;
- How to engage your broader community for assistance in identifying key food system trends and understanding basic food system dynamics based on initial data and findings;
- Different avenues and approaches for presenting your key findings to your community; and
- Quick tips for enhancing the substance of your project results and anticipated economic impacts your project might have without undertaking the full scope of an economic impact analysis (as discussed in the subsequent modules).

Now that your team has gathered the requisite primary and secondary data for your assessment, you are ready to reflect on the data gathered; characterize trends, changes, and sectors that warrant further attention and exploration; and set the stage to analyze and interpret results by engaging your project team and community on what they hope to learn and act upon.

The content of this module is appropriate at the stage of your project when your team has:

- Defined its scope, specific goals and objectives, timeframe, available resources, and regional boundaries (module 1);
- Collected requisite primary and/or secondary data (module 2 for secondary data and module 3 for primary data) ; and
- Progressed to examining, analyzing, and discussing those data findings that will best help your community/region, illuminate the condition and structure of its current food system, and subsequently equip community members to make well-informed, positive interventions.

This module will cover the following strategic approaches to data interpretation and analysis:

- Developing a shared project team mission centered on key data findings;
- Engaging public support through unique community trends and indicators;
- Letting the data speak: framing analysis that leverages key findings, supporting improved prioritization, interventions, and outcomes; and
- Using implementation and feedback mechanisms for more focused analysis.

## Developing a Shared Project Team Mission Centered on Key Data Findings

Once you complete initial data collection work in your community or project, it is an appropriate opportunity to re-engage and, possibly, redirect your team's efforts. It may be effective at this juncture to reconvene the leadership team of the project to peruse initial data and findings and revisit these discussion points:

- What have we learned so far? How do we interpret the data we collected? This may include bringing in knowledge outside of the specific datasets (e.g., the collected data shows evidence that select public health indicators have improved in a county and a team member knows about a specific initiative that anecdotally has been working in the same area). How should we begin to craft a story of the findings and prioritize action steps?

- What have we discovered that we still don't know or understand? These can be called information gaps, or data needs – places where additional information can help to tell a story and prioritize action steps
- To which ongoing activities may this study give momentum? These are activities starting up or occurring in the community that demonstrate the importance of a transitioning food system. Is it too late to directly integrate those innovations in the study?
- From which ongoing activities can this study gather momentum? These are activities occurring in the community that underscore the importance of local food system change and demonstrate that both the assessment work corresponds with broader community interests and also has immediate practical implications.

The most important use of your data is to help your internal team understand what's happening in your community, particularly if your community exhibits any exceptional characteristics (e.g., well above-average dollars spent on food away from home, high share of land in specialty crops). It will help you craft a narrative that includes hard numbers and provides sound justifications for the action steps you are recommending, steps that will often require funding from government and private funders. Having solid baseline data in hand allows your leadership team to identify:

- How money flows through your community;
- Which assets you have that need to be protected;
- Where additional investment might provide the biggest bang for the buck (in terms of job creation, improved farm viability, etc);
- The key issues your community confronts; and
- Which actions can be expected to make a lasting difference?

***Cafeteria staff prepare new school lunch menu items at the Yorkshire Elementary School in Manassas, VA.***

Research findings may also help you identify places where the prevailing wisdom is inadequate. Often, groups of people make decisions based on what all can agree upon quickly, since time is such a valuable and precious commodity. In such cases, it is tempting for groups to take action based on assumptions, thinking habits, or an overly simplistic assessment of the issue just to get things moving. For example, a community may believe that investment in a local slaughterhouse would improve the viability of the local beef industry. By putting numbers on paper and gathering information about the number of local animals available for slaughter, the community may realize that the scale of a facility that could be supported by current farm production would result in high processing costs that a local market could not cover. Pursuing this type

of intervention could actually worsen the cost-competitiveness of the region. Similarly, your community might believe that adding a farmers market will increase farm viability, but after looking at a USDA AMS study in which competition zones for customers and vendors at farmers markets are mapped,[30] you may realize there is already too much competition in your region. This may trigger a discussion of how to increase the attendance or vendor capacity at existing markets. By introducing solid economic data or trends, the team may think more critically and test their assumptions.

Critically examining your assumptions and biases against available data can help you see:

- Whether the relationships or conditions you perceive really exist. Quantitative data can form the basis for a potential explanation, but the qualitative data will help to determine how well it holds up given your community's perceptions and experiences;
- Reason(s) behind existing data relationships; and
- Emerging conditions and/or new trends.

As your group works together more effectively, you will gain increasingly potent insights on local conditions and the types of interventions that are likely to yield positive community benefits. By regularly collecting feedback and follow-up data as the implementation of your project proceeds, your team members can reflect together over time on how conditions are changing in your food system, if at all, and whether these changes indicate that progress has been made toward the changes you envisioned.

## Data Analysis and Interpretation: Letting the Data Speak

As you can see from modules 2 and 3, data are increasingly available everywhere, so figuring out how to prioritize the data and findings you collected and craft them into a meaningful story is not easy. Community meetings where preliminary findings are presented can be an ideal place to solicit feedback on particular areas of interest or importance. This step can save time and further investigation can be minimized if findings on some issues are of minimal interest to community stakeholders. Sharing of data is another strategy to keep key influential partners engaged in the work and show your team is making progress. It provides an opportunity to keep people at the table until you are ready to implement programs or policies.

Once you prioritize a focus on data, there will likely be requests for tables, graphics, and analysis that can be quickly and easily interpreted by the broader community. These tools will allow them to catalyze further discussions of next steps and directions for the food system. For instance, the discovery that the share of land in food production for your county has declined by 20 percent, and that zoning prohibits direct agricultural sales on lands zoned as farms, may trigger a discussion about allowing more economic activities on farm land. Or, once a community sees the positive change in health outcomes for a community that adopted Farm-to-School programs, they may choose to invest more broadly in such programs.

Three common methods to reduce data into thematic findings of interest to general audiences include:

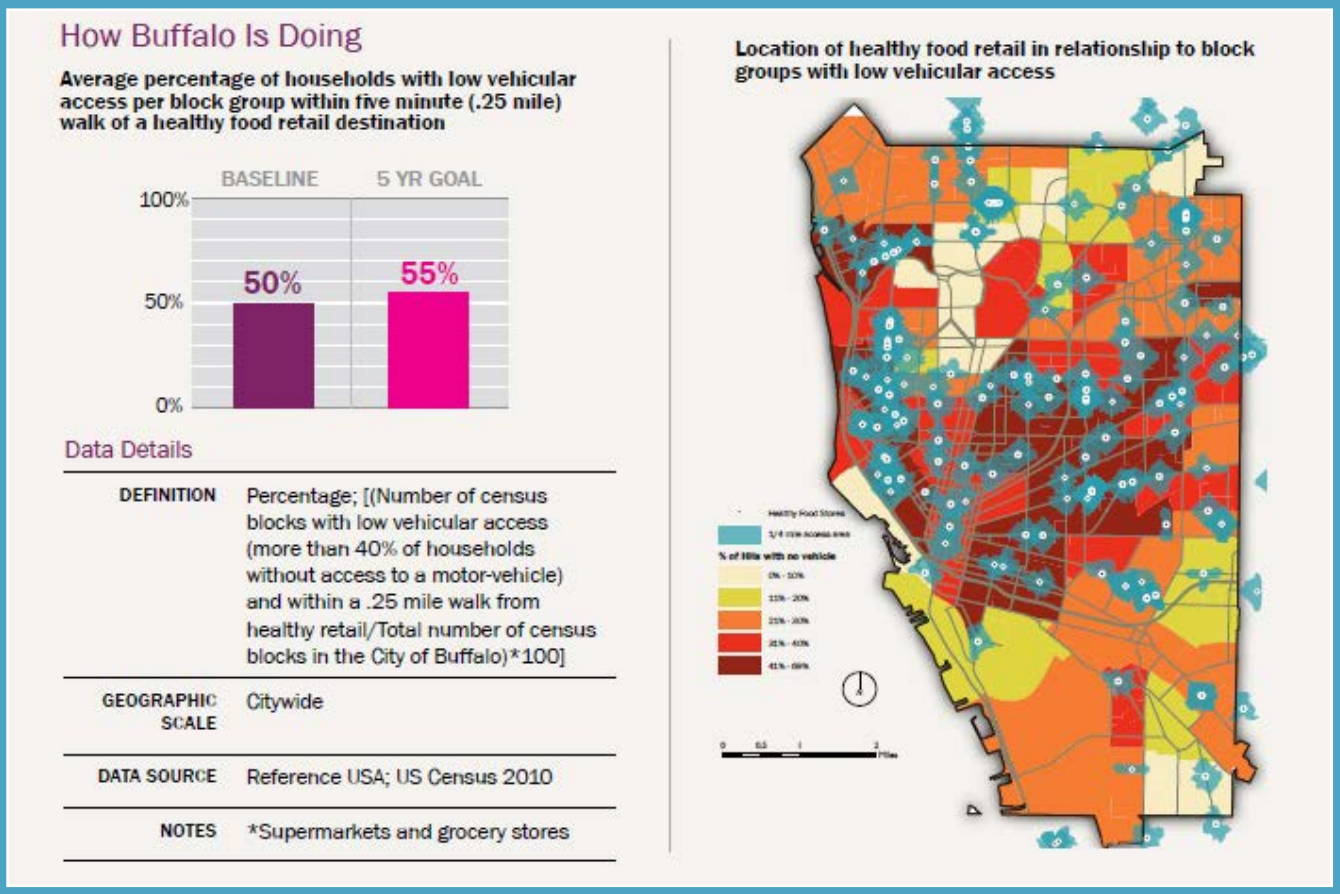
1. Trends in food industry indicators such as land use, consumer buying habits, diet-related health indicators, and market channel sales.
    a. Secondary data can be very useful for these exercises since many of those sources have been available for decades.
    b. Although two points in time may be of interest, a graphic showing change over many years may spur more discussions of important milestones.
2. Comparative analysis showing how the community or region of interest compares to adjacent regions, the State, or the U.S. as a whole.

30 Lohr, L.; Diamond, A.; Dicken, C. and Marquardt, D. 2011. *Mapping Competition Zones for Vendors and Customers in U.S. Farmers Markets*. USDA Agricultural Marketing Service. http://apps.ams.usda.gov/MarketingPublicationSearch/Reports/stelprdc5094336.pdf

## Case Study: Strengthening Buffalo's Food System[31]

This colorful synthesis of data displayed in figure 4.1, prepared by the University of Buffalo's Food Systems Planning and Healthy Communities Lab (2013), provides a visually appealing display of several important pieces of information.[32]

**Figure 4.1: Healthy Food Access in Buffalo[33]**




*Source: University of Buffalo*

By overlaying a Geographical Information Systems (GIS) map displaying the percent of households with no vehicles and the location of healthy food retail stores (including a ¼ mile access area), the communities without easy access to healthy product become readily apparent. This indicator also helps to measure progress on an indicator identified by an external source, the U.S. Department of Health and Human Services' Healthy People 2020 goal of increasing the proportion of people with access to a food retail outlet that sells foods included in "Dietary Guidelines for Americans." Further, this report does an excellent job in making the data definitions, data source, baseline, and goals easily available and understood across a wide variety of indicators. By presenting information in this easy-to-access approach, it builds community support for specific interventions, getting stakeholders quickly onto the same page.

31 For more information, visit http://foodsystemsplanning.ap.buffalo.edu/.

32 Delgado, Cristina, Travis Norton, and Samina Raja. 2013. *Indicators for a Healthy Food and Built Environment in the City of Buffalo*. Healthy Kids-Healthy Communities-Buffalo partnership and the Food Systems Planning and Healthy Communities Lab, University at Buffalo. 20 p.

33 "Indicators for a Healthy Food and Built Environment in the City of Buffalo: Where We Are and Where We Need To Go. Policy Brief #8." *Indicator Toolkit*. October 2013. Food Systems Planning and Healthy Communities Lab. University of Buffalo. See http://foodsystemsplanning.ap.buffalo.edu/wp-content/uploads/2013/10/1.HKHCPolicyBrief8__FINAL10-8-13WEB1.pdf (p. 15)

a. This serves as almost a benchmark for the community and leadership team, and may lead to discussions of other regions to emulate as a goal.

b. Simple column graphs may be the most visually striking way to present data because they show whether the region of interest is higher or lower in an indicator of interest, and, for the broader public, shows the degree of difference more clearly than a list of numbers in a table.

c. Compare your community to other communities using cluster mapping, a technique in which you map regional concentration of related industries in a particular location. More details can be found in the next section.

d. Demonstrate your comparative advantage using a location quotient, a technique used to compare the industrial activity levels among different areas of the country. More details can be found in the next section.

3. After a bit of brainstorming on relationships of interest across the food system, it may be valuable to do some cross-theme analysis to begin showing linkages. Beginning to share these linkages (that may be beliefs but not yet evaluated with data) should catalyze some interesting discussions, especially if long-held beliefs are not verified with statistics. For example, perhaps the data will show that farmers market sales in a county have increased at the same time that expenditures on dairy products and fruits and vegetables have increased. Showing those trends at two points in time on the same graph may draw interest from those interested in both those issues.

## Some Words of Caution at This Stage of Your Process

- Work with your research advisers to make sure that you interpret your findings carefully. One common mistake is to confuse correlation with causality: just because two developments happened within a similar time frame does not mean that one caused the other.

  Not every difference in measurement represents a significant difference – i.e., a difference between two groups that cannot be explained by chance alone. For example, is it really significant to your community that 23 percent of the population is food insecure (compared to 24 percent at the state level)? It may be most effective to highlight those findings that are significantly different (using statistical tests) from different places or points in time by using bold fonts, superscripts, or other designations. That will also help key findings stand out among tables and/or pages of many numbers that may otherwise seem tedious the audience.

Some of the data-related issues that you may wish to reflect on with your leadership team before writing up a report, determining action steps, and presenting any findings to the community are:

- Did your data results – or the distribution of your data — reveal any particular strengths or weaknesses in your methodological approach? If the data do not seem realistic or appropriate, it may be due to the collection methods you used. In future endeavors, you can adapt your methods to collect better data, but for now, you may have to adjust your data analysis to focus on the most reliable pieces collected.

- Can you identify the potential for increased linkages across the resources, infrastructure, and segments of your food system?

- What opportunities or threats in your local food system did you uncover as the results of your initial research? Does that warrant redirecting your initial plans for more in-depth analysis? Community action?

## Cluster Mapping and Location Quotients

Cluster mapping and location quotients are two techniques often used to compare economic characteristics of regions. A cluster is a concentration of related industries in a particluar area, and includes the companies in the industry as well as those who support the industry, such as suppliers, service providers, and government agencies. Two sectors that may be the most visually interesting to map are food processing and manufacturing and agricultural inputs and services. In conducting a cluster mapping exercise, your team is looking to see if there are large groupings or agglomerations of a certain type of food enterprise. Agglomerations of organic and natural foods, seed or feed, and processing plants, for example, would suggest a clear opportunity to further leverage growth in that industry through policy or business incentive programs.

Location quotients are ratios that allow your team to compare the concentration of a resource or activity specified in your study to that of a larger area, such as your State or Nation as a whole. A comparison of location quotients can help to identify industry sectors of opportunity to deepen the contributions of the food system to the broader economy. It is a common goal of local food initiatives to increase the location quotient for food industry sectors. Returning to the example of organic and natural foods above, a goal for a region may be to increase their location quotient by

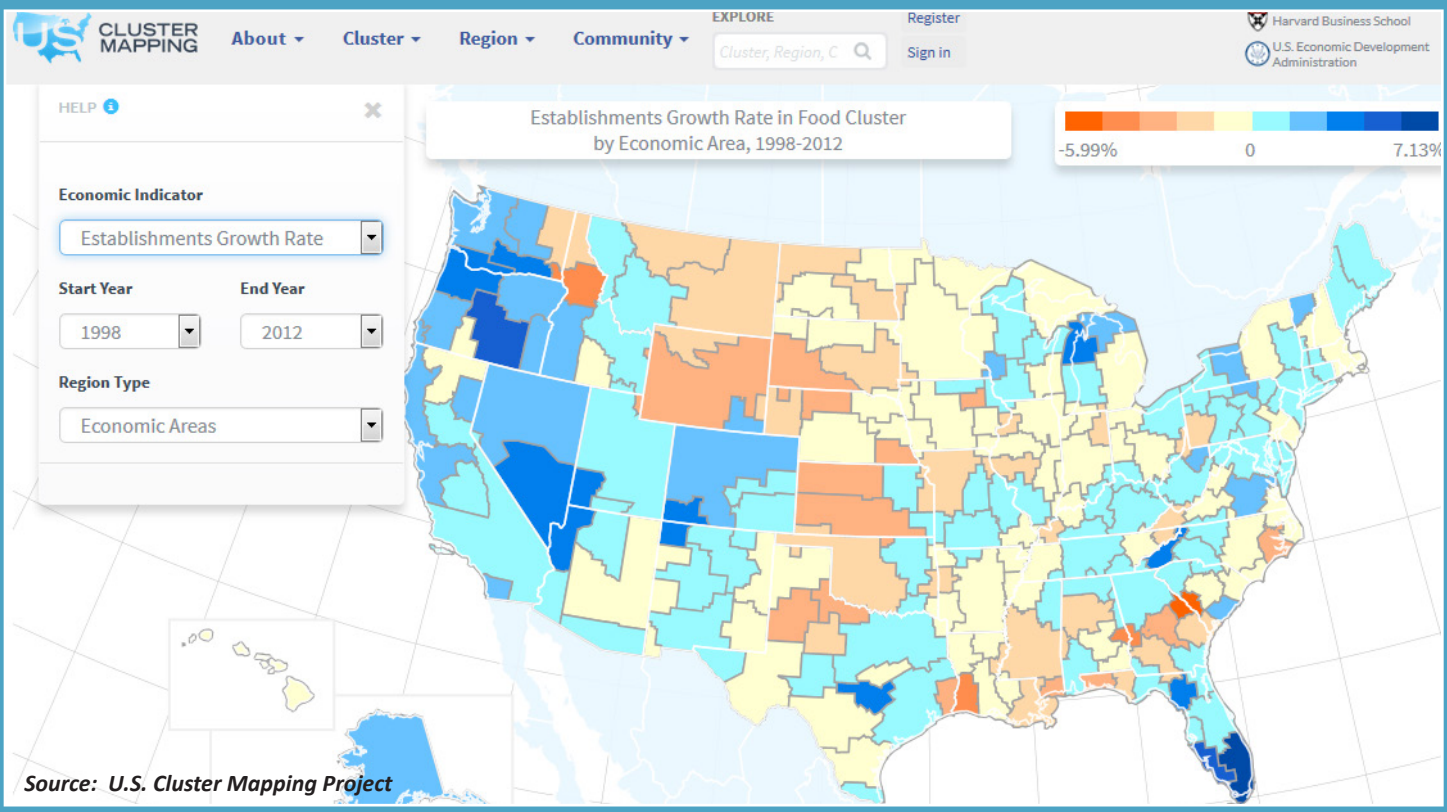
### U.S. Cluster Mapping Website[34]

One of the best sources for data on clusters is the U.S. Cluster Mapping website, a national initiative of the U.S. Economic Development Administration and Harvard Business School that provides open data on regional clusters and economies to support U.S. businesses, innovation, and policy. The website distinguishes between two types of clusters: traded clusters, groups of related industries that serve markets beyond the region in which they are located, and local clusters, which consist of industries that serve local markets. The former would include key base industries like agricultural production, fishing, environmental services, and food processing, while the latter includes local food and beverage and retail activities.

In figures 4.2 and 4.3 that follow, you can see the example of a economic area cluster map for food processing (from the traded cluster) and food and beverage (from the local cluster), illustrating establishment growth rates in these clusters. The differentiated colors, explained in the legend at the top right of each map, are representative of how relatively well or poorly the cluster is doing for establishment growth relative to peer regional clusters. Note, there are numerous indicators that can be mapped across these clusters. So an assessment could focus on geographic comparisons of the region compared to the U.S., compare how one of the agricultural and food sectors compares to another cluster industry, or evaluate how different indicators (jobs vs. firms vs. wage growth) compare in the regional cluster itself.

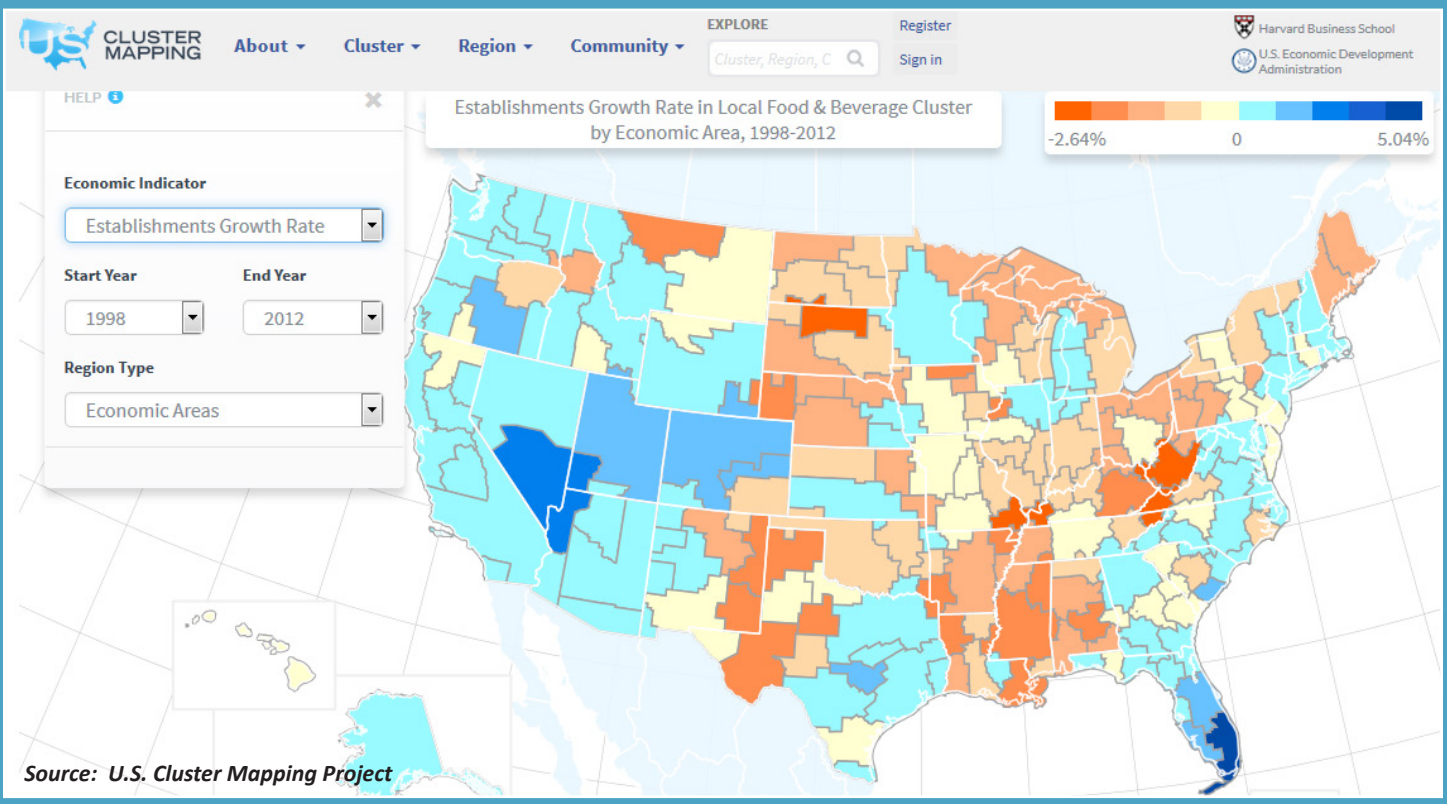
34 For more information, visit http://www.clustermapping.us/.

## Figure 4.2 Establishments Growth Rate in Food Cluster by Economic Area, 1998-2012[35]




*Source: U.S. Cluster Mapping Project*

## Figure 4.3: Establishments Growth Rate in Local Food and Beverage Cluster by Economic Area, 1998-2012[36]




*Source: U.S. Cluster Mapping Project*

35 For more information, visit http://www.clustermapping.us/.
36 Ibid.

connecting local grain growers with organic feed suppliers or organic bakeries to assure that local inputs and ingredients are used whenever possible, and that any coordination that may be needed to spur those business relationships is a priority. The U.S. Department of Labor's Bureau of Labor Statistics (BLS) provides a easy-to-use location quotient calculator that can be used to benchmark your community to a national average (or other regions you have chosen to compare against.[37])

## Engaging Public Support Through Unique Community Trends and Indicators

Perhaps the "anchor" activity of the assessment discussion at this stage will be the point where data, trends, maps, case studies, and emerging efforts in the community are analyzed, shared, and discussed. Module 1 highlighted several ways to organize this discovery (through elements of the food system, network relationships, key issues areas, etc.), but in most cases, it will quickly become evident through group discussion where various activities and issues overlap and bridge to and from one another.

Nevertheless, the results of your data will seldom point to specific targets, action steps, and outcomes without integrating a broader group of motivated local stakeholders. At this stage, it is often helpful to directly engage the assistance of community members in identifying the key trends and understanding the basic dynamics of the local community. These community-based discussions – and community members' challenges to what you share – can help you understand which efforts are likely to be more practical, and which might encounter greater resistance. To facilitate that discussion, it may be appropriate to share the following results from the earlier phases of the assessment:

- Summarize what was learned through the initial data gathering process, including those findings that were unexpected or unique to the community (compared to the rest of the State or nation)
- Demonstrate the relevance of local food system issues to the community by showcasing relevant activities and programs and showing how they relate to already-identified stakeholder and community priorities. This will help to engage local stakeholders who see their "interests" represented in early phases of the work
- Identify those pieces of information about the local food system that are clearly important, but were unable to be gathered during previous efforts, and see if community members can help contribute more data; and
- Identify short-term actions you could take to strengthen the accuracy of the assessment going forward if there are findings that community members find surprising, non-credible, or curious enough to inspire debate.

Most civic leaders and engaged community members are motivated by a good concise story with emotional impact. The combination of data and a good story line is very persuasive. Therefore, it is highly useful to look for ways of having a visceral impact on your audience in an honest manner, simplifying the elements of the story enough to communicate major points with ease, but making sure to accurately portray (perhaps with visual aids) the actual complexity of food system and supply chain relationships as well as the conditions on the ground.

One way to accomplish this goal is to showcase the most important takeaway observations from your research and analysis—for example, one to five really important things that you learned. Use these lessons as the focal point of your story, beginning with your original research goals and initial expectations, the research methods you used, the results of your data analysis, and finally, the apparent implications of your research results. Walk the reader through the process with enough detail so they understand – and could largely imitate –the study you conducted. Emphasize the key lessons and how you will use them, putting less emphasis on information (questions, methods, and results) that did not really yield any useful information. Be positive and optimistic, yet careful to be truthful about limitations.

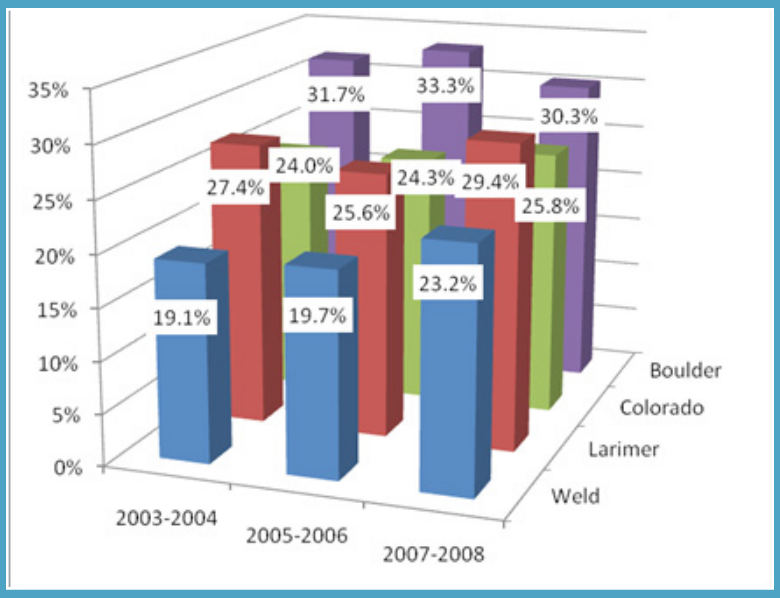
37 Location Quotient Calculator, Bureau of Labor Statistics http://www.bls.gov/cew/cewlq.htm.

## Case Study: Northern Colorado Regional Food Systems Assessment[38]

In a recent Northern Colorado food assessment, one key graphic combined some data from different elements of the food system to create a compelling story around interventions, as well as compare counties in the region to illustrate regional dynamics[39]. This was particularly interesting because LiveWell Colorado, a significant public health nonprofit that collaborated in the assessment, had previously invested in one county with troubling health indicators (Weld).

Since the assessment took place mid-way through their Weld County initiative, the team had the ideas to cross-analyze specific findings related to consumers' stated eating behavior and public health indicators in the region. As depicted in figure 4.4, significant differences in consumption patterns were seen across the counties being targeted in the study. Yet no county's share of individuals who ate five or more servings of fruit and vegetables was above 50%. This finding was surprising to the community members of the assessment team, given that Colorado is considered a relatively healthy State, ranking 8th in the Nation in terms of overall health measures and lowest in terms of obesity prevalence.[40] Despite having the lowest average share of residents reporting consumption of five or more servings of fruit and vegetables/day, Weld County was the only county in the targeted region that saw a consistent and significant increase in the share of individuals who consumed five or more servings per day of fruit and vegetables.

**Figure 4.4: Percent of Individuals Who Ate 5 or More Servings of Fruits and Vegetables**




*Source: Northern Colorado Food Assessment*

**Table 4.1: Comparing Health Metrics from the Northern CO Food System Assessment***

| | Diagnosed with Diabetes | | Overweight, BMI* 25.0 to 29.9 | | Obese, BMI* > 30 | |
|---|---|---|---|---|---|---|
| | 2007-2008 | Change from 2003-2004 to 2007-2008 | 2007-2008 | Change from 2003-2004 to 2007-2008 | 2007-2008 | Change from 2003-2004 to 2007-2008 |
| Boulder | 3.0% | -0.7% | 35.1% | 7.3% | 14.4% | 3.4% |
| Colorado | 5.3% | 0.8% | 36.3% | 0.2% | 19.4% | 2.8% |
| Larimer | 4.6% | 1.3% | 35.2% | -0.5% | 17.1% | 5.0% |
| Weld | 5.5% | 1.3% | 36.5% | -5.2% | 24.0% | -0.3% |

*Source: Northern Colorado Food Assessment*

**Note: Body Mass Index (BMI) is defined as weight in kilograms divided by height in meters squared (w/h**2).*

38 For more information, visit http://www.larimer.org/foodassessment/.
39 Ibid.
40 For more information, visit http://www.americashealthrankings.org/CO.

After discussion with community stakeholders, there was interest in exploring whether investments by LiveWell Colorado to increase access to produce (one reason there may have been this reported increase) also had some health outcomes. Table 4.1 shows diabetes rates across the same three counties were stable or increasing, but that Weld County showed improvement in a more short-run indicator of moderate obesity. Although extreme obesity was still significantly greater than the region and Colorado, even its rate of growth had flattened. The discussions focused on how the region could proceed to develop market relationships and programs that assured that those increased servings of fruits and vegetables were more likely to be sourced from the many producers growing and redirecting to regional markets in Weld and surrounding counties.

## Presenting your Findings to Community Stakeholders

For a broader public audience, many assessment teams compile a four-page summary of key findings with compelling photos and graphics, and hand it out to constituents. Here, an attractive format is essential.

In addition, you may also want to publish issue-specific summaries that run from 5 to 20 pages. These may be visually appealing, or they may focus on tables of data, depending on the issue and the audience. One example would be a fact sheet for local decision-makers illustrating the potential benefits and drawbacks of investing in a produce aggregation business.

In addition to the publicity methods discussed above, you can also seek broader and more interactive engagement with community members by posting your database or blog on an electronic portal, inviting comments and feedback, and responding to posted comments from the general public. Depending on the issue and the interests of your audience, these resources may consist of lists of farms and food businesses, more detailed statistical tables, or additional tailored fact sheets about a specific topic. Computerized databases have the additional benefit of becoming the "go to" place to turn for a solid understanding of local conditions. One example of such an effort is the Maryland Food System map housed at Johns Hopkins (see module 2 for additional information about this case study). This visualization of a region can give your food initiative considerable power. The concise and accurate analysis of local conditions, reinforced by time series data, can help you gain greater presence because of your analytical strength. However, we offer a couple of words of caution:

- A local database is a long-term commitment, and if not maintained, may reflect poorly on your project once the "age" of the data (if not updated) becomes a concern.
- The expense and maintenance of these dissemination platforms can be substantial, particularly if there is not a clear institutional home or community partner.

### Implementation and Feedback Mechanisms for More Focused Analysis Steps

Even if your resources do not allow you to hire an independent consultant to perform an economic impact assessment, you still have the option of generating some broad estimates of economic impact that may help persuade municipal officials to invest in implementing some of your team's recommendations. Posted below are some quick tips for enhancing the substance of your communication to the public about project results and anticipated economic impacts your project might have.

### A Simple Revenue Calculation

One very simple calculation that many previous local food system assessments have used involves determining how much local farm revenue would increase if every local resident purchased more locally produced food. These studies make the assumption that if every household in the study area increased its purchases of locally grown farm products by $5/week, it would generate an additional x amount in local farm revenue.

However, this type of simple revenue calculation suffers from a number of deficiencies and should be employed with caution. Perhaps most importantly, this type of simple calculation does not take into account the concept of opportunity cost – i.e., the cost of an alternative that must be forgone due to the additional purchases of locally grown food. For example, if consumers now spend less money at grocery stores and more money at the farm gate, there may be positive farm-level impacts, but negative impacts to local grocers – also important local businesses/ employers. The following module, module 5, is devoted to a more in-depth discussion of how to employ economic multipliers and opportunity cost concepts in your local food assessment.

## Social and Commercial Network Analysis

Another useful tool for data analysis and interpretation is social and commercial network analysis. Only through commercial and social connections can money recycle within a given community. For example, only if local shoppers are committed to purchasing locally — especially if local prices should rise higher than broader market prices — will local farms and food businesses earn sustained revenue through changing economic conditions.

Analyzing social networks also provides local practitioners a very visceral way of viewing the interactions between diverse sectors of the food system — which are not as separate as any diagram indicates, and, in fact, coordinate with each other daily. One Massachusetts community food processing facility, for example, works with school districts and chefs to create quick-frozen, processed, and ready-to-heat produce items that make it easier to bring local food onto school menus.[41] Similarly, a restaurant or food manufacturer might feature a certain food on the menu because several farms grow the required product nearby, and this food might become a regional specialty over time. As another example, Jeni's, an Ohio ice cream maker, coordinates with several farms to create a buttermilk, sweet corn, and blueberry ice cream made largely with local products.[42]

Network analysis is one way to represent how such connections have been formed, and how strong the connections are. The primary components of network analysis are linkages and nodes, where nodes represent individual people or entities (such as a business or a web site), 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 points represent nodes, and lines represent linkages.

The construction of these network charts, typically with the aid of a computer, allows researchers to determine network structure. The number of connections a node has and the types and/or qualities of those connections largely determine this structure. Initial work on commercial networks suggests that there are three main forms of commercial collaboration that might best lend themselves to measurement: information sharing, economic exchanges, and lending advice and support.

To illustrate, researchers at the University of Vermont used Ucinet, a social network analysis software,[43] to collect and analyze the information exchange structure within local food networks in Vermont. Their goal was to support improved coordination among these organizations by understanding how information-sharing occurs. A major benefit of social network analysis is that it focuses on the patterning of relationships among actors in the network, unlike a multivariate analysis that focuses on a single actor (either an individual or organization). Through understanding communication among networks, relevant organizations can coordinate with each other more efficiently, and management or organization leadership can use their time and resources more efficiently.[44]

41 For more information, visit http://www.fccdc.org/about-the-center/21-food-processing/44-farm-to-institution-project.
42 For more information, visit https://jenis.com/.
43 Analytic Technologies, Social Network Analysis Software. Available for free download: www.analytictech.com/
44 For more information, see: Sun, T., & Kolodinsky, J. (2013). "Information exchange network of local food promoters in Vermont: A social network analysis." *Proceedings of Shanghai International Conference on Social Sciences*. July, 2013. ISBN: 978-986-87417-2-0; ISSN: 2304-2540.

Though beyond the scope of this Toolkit, which is focused on shorter term economic impact assessments, analyzing these social networks can provide insight into longer term economic impacts that may result from local and regional food system activity. For example, improved exchange of information and ideas may facilitate opportunities for entrepreneurship (for example, collaboration on a food hub – a local foods aggregation or distribution business that works to support multiple local food farms/businesses) or improved businesses efficiency.

The main limitation of network analysis appears to be that compiling such a network analysis requires a great deal of trust in the researcher and exceptional transparency, because these data represent a fairly potent view of local foods activity and could be used for other purposes than intended by someone who violates the public trust.

## Takeaways

- One of the primary benefits of conducting a food system assessment is the engagement and awareness that may emerge as the study is framed, data are compiled, and unique aspects of the region emerge from initial analysis.
- "Reducing" the data into visually engaging figures, tables, and graphics, may help the project team and the broader community to better understand and connect how different elements of the system influence one another. This stage may be a key phase to frame programming, investments, and projects that are focused enough to warrant more rigorous assessment.
- Presentation materials should be attractive and easily understood. It may even help to "brand" the assessment effort on all handouts, posters, and other materials. To be most effective in engaging the community, use multiple communication channels, including a webpage, social media, public meetings, open houses, and presentations at food system-related venues and events.
- As you build greater public awareness of your local food assessment work, you will likely attract greater attention and support from key stakeholders in your community or region. This phase of your assessment may be the first time you want to consider how the planning process and community discussions will continue beyond the assessment stage.

# Module 5 – Analyzing the Linkages and Contribution of Local Foods to Local Economies through Input-Output Analysis

Module 5 begins the more technical portion of this Toolkit, and is meant for team members with more advanced economic training. This module discusses how to estimate the linkages and economic impacts of local and regional foods systems in local economies through input-output (I-0) analysis. The module also provides a brief background on economic impact concepts. In this module you will learn:

- How to conceptualize the changes that may be occurring in your study area;
- Basic community economics development concepts;
- The basic terminology and uses of I-O models;
- The content and definitions of industrial multipliers;
- The limits to I-O analysis.

The content of this module is appropriate at the stage of your project when your team has:

- Defined its scope, specific goals and objectives, timeframe, available resources, and regional boundaries (module 1);
- Collected requisite primary and/or secondary data (module 2 for secondary data and module 3 for primary data);
- Begun to examine, analyze, and discuss those preliminary findings with your community (module 4); and
- Involved a technical expert who has a thorough understanding of the terminology and limitations of I-O models and advanced training on conducting an economic impact assessment. Economic impact studies are complex, and expertise is a necessary component to obtain accurate results.

The challenge of quantifying the potential value of local foods production to a regional economy occurs mainly because of the complexity of linkages that typically exist in a community or regionally based food system. Aside from the multitude of supply chain relationships that exist between food producers and consumers, there are a host of additional linkages that exist between food producers and other sectors of the local economy. For example, local grain farmers may sell their output to local livestock producers for use as animal feed, or local produce farmers may sell their merchandise to small-scale food processors, who, in turn sell their value-added food products in local markets. Fortunately, we are able to measure the extent of these complex intra-regional linkages using I-O analysis to generate economic multipliers. An economic multiplier is a single number that captures the economy-wide circulation of activity from an initial financial transaction.

Before we embark on discussing the development of economic multipliers in detail, we must clarify our use of common economic terms to ensure that we clearly understand the implications of our analysis. Often when we think about how local foods contribute to the local economy, three words are used interchangeably: impact, growth and development. For example, the promotion of local foods is said to have a positive impact on the local economy, or stimulate economic growth, or foster economic development. Within the discipline of community economic development, however, these three words have very different and unique meanings, requiring different methods of analysis. The tendency to use them interchangeably can lead to confusion and erroneous policy insights. Consequently, we begin this discussion with a definition of each term and its particular meaning with a community planning context.

Growth is generally regarded as a dynamic concept that looks at change over a period of time. Growth is synonymous with expansion; for example, more jobs, more people, more businesses, or more income. In contrast, development is related to improvement relative to some starting condition; in other words, sustained progress toward a particular goal. This could be movement toward a more sustainable use of resources, enhancing the quality

of life within the community, or creating an environment that is conducive to entrepreneurial activity. Growth is relatively easy to measure, whereas development is more nebulous, not only as a concept, but when attempting to document it. Accordingly, there is an unfortunate tendency to substitute economic growth measures as sufficient indicators of desirable regional development without considering how the community at large shares the benefits of growth, identifying potential winners and losers, and subsequently, evaluating whether the benefits accrued by winners offset or are acceptable given implications or welfare losses expected for some stakeholders in a region.

***Commercial shared-use kitchen located at Basil Doc's Pizza in Denver, CO, October 2015.***

In contrast, the term "impact" tends to be associated with a specific event or change in behavior and can either be static or dynamic in nature. In this Toolkit, and in the majority of economic impact models, we are considering an event or change in behavior that is static in nature – meaning that it takes place once, at a given point in time. To model a dynamic activity, one that is characterized by constant change, necessitates a much more complex model that is outside the scope of this Toolkit. Similarly, we are not providing the tools here to evaluate potential ancillary benefits of local food systems, which may include generating local entrepreneurs and local social capital and reducing local obesity rates.

Impact assessment is generally defined as comparing and contrasting what a community (usually its economy) looks like before and after a particular event or change in behavior. This is often referred to as a shock. The difference in economic activity that occurred prior to and after the event or change in behavior is referred to as the economic impact. For example, a business within the community makes a major investment and hires 50 new workers, or the Federal government provides a grant to encourage the development of a food hub. That event or change will have an impact on the local community and impact assessment is aimed at quantifying that change.

Within the context of studying the local or regional food economy, the terms "growth", "development", and "impact" are quite distinct in terms of what they measure, and how they subsequently influence programs and policy. For example, you might ask if promoting local foods and the institutions that support local foods, a development concept, might better position the community to grow and prosper. Please note that this is a far different question than asking what the impact on the economy would be if residents shifted their spending away from agricultural goods imported into the community toward agricultural goods that are produced in the community. This change in behavior might reflect a shift in consumer spending from a "conventional" (i.e., likely very little local sourcing) grocery store

to a farmers market – a shift that has a specific and measurable impact on the local economy. Documenting "success" or "impact" is fairly straightforward when it involves evaluating the results of a single firm moving into a community (e.g., x number of jobs were created), whereas documenting the success or impact of building stronger networks that enhance collaborative activity is more challenging because the measurable impact is more subtle.

Consider, for example, the difficulty of measuring the impact of such local food system interventions as:

- Helping an existing community supported agriculture (CSA) business avoid bankruptcy;
- Forming a private-public partnership to facilitate the opening of a permanent food market site for multiple vendors;
- Building networks that are vital to facilitating meaningful local food agglomerations (sometimes called clusters); or
- Promoting better access to fresh vegetables as a means of improving public health standards.

Since more localized, typically smaller-scale initiatives do not lend themselves to generating immediate job growth or large sales gains, we are left with the question: how does one best document the success or impact of these efforts on the local community? This is the primary issue we will explore throughout the rest of this module.

## Local Foods and Economic Impact Assessment

One way to think about and document the impact of local food system expansion is within the framework of import substitution. By promoting the purchase and consumption of local foods, we are, in one way, trying to substitute local food production for foods that are imported into the community from other parts of the U.S. or the world. Substituting locally produced commodities for imported items forges stronger regional linkages. In a food import situation, the commodity purchase compensates the grocer, and perhaps a regional distributor, before the bulk of that dollar exits the local economy to pay the original producers.

In contrast, as some of the asset mapping exercises or community discussions guided by earlier modules may discover, a local foods purchase might allow a greater number of local supply chain participants to benefit financially from the transaction. Not only are intermediate sellers in the local community (such as a grocer or a farm market vendor) compensated, but a much larger fraction of the purchase price is typically available to compensate a local producer and, possibly, other locally based distributors or processors. In this manner, stronger linkages are forged within the local economy, reducing the volume of consumer food expenditures that leak out of the local economy.

Import substitution policies are attractive to local food system advocates based on the belief that the creation of stronger community food linkages will support the broader development of allied manufacturing and business service sectors. As with many "new" economic ideas, the notion of focusing on import substitution as a strategy for promoting growth in local economic activity is not a new concept. Indeed, the "Buy Oregon" and "Buy Chicago" and other "buy local" programs date back to the 1920s, and although likely focused on a broader set of consumable goods, suggest some economic development professionals view loyal denizens as one potential opportunity to maintain community based businesses. In the current local foods context, there is evidence that this civic pride expands to include buyer interest in land use, maintaining family farms, quality, and public health dimensions.[45]

Our purpose in drafting a module focused on illustrating methods for analyzing the economic impact of local food systems is to help you and your team adequately account for the impacts of local foods expansion and promotion. As our earlier examples demonstrate, if local foods production and consumption increase, there are economy-wide consequences. Therefore, best-practice measurement of those consequences can help inform local producers, local policymakers, area consumers, and other interested parties about

45 For more detail on such efforts, see Persky, J., D. Ranney and W. Wiewel. 1993. "Import Substitution and Local Economic Development," *Economic Development Quarterly*, 7(1): 18-29.

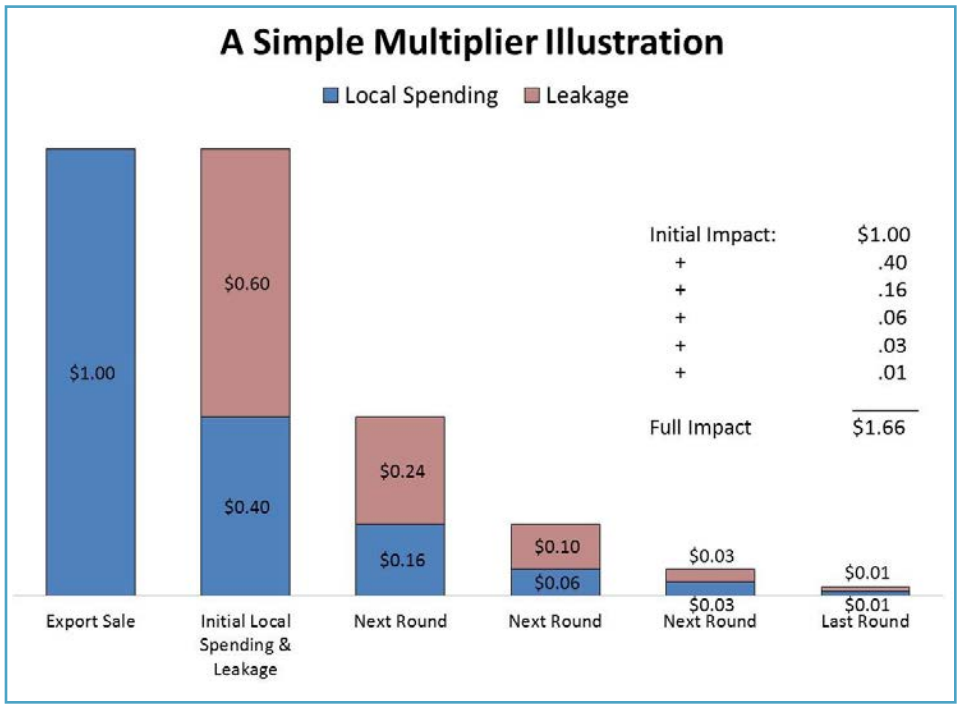
the potential economic gains in a region from local and regional food system initiatives or policy changes.

## Linkages, Leakages, and Multipliers

Let's assume there is an additional dollar of local food sales. This additional dollar could result from a local resident electing to purchase local foods, a tourist buying food at the local farmers market, or a local farmer supplying goods to a farmers market outside their own community. At its core, that increased dollar in local food sales volume represents additional money going to the farmer, which, in turn, represents the direct impact component of I-O modeling. What happens to this additional dollar of sales is illustrated in figure 5.1 entitled "A Simple Multiplier Illustration."

The farmer has many options about what to do with that additional dollar of new local food sales. Suppose that the farmer elects to use that dollar to buy some additional equipment from a local retailer. What happens to that additional dollar which is now in the hands of the equipment retailer? In reality, the retailer cannot hold onto the entire dollar because he/she must pay to replace his/her inventory (inputs, feed, and equipment) that the farmer just purchased, also called indirect impacts in the context of I-O modeling.

**Figure 5.1: Simple Multiplier Illustration**




How much the retailer retains is tied to the margin or mark-up the retailer places on the piece of equipment. Let's assume that a retailer marked up an item by 40 percent, which means that 60 percent of that dollar leaves the area and goes to the manufacturer of that input or piece of equipment if it is not sourced from a local business. That represents a leakage of 60 cents per dollar (as shown in the above figure). The question that remains is, "what will the retailer do with the 40 cents that is retained in the local economy?" Suppose, again for the sake of discussion, that the retailer uses those 40 cents to pay the electric bill. Those 40 cents now represent sales or revenue to the local electric company. The utility company must, in turn, pay for electricity coming from the grid. In this example, the utility company pays 24 cents to companies outside the community that produce the electricity. This payment represents a leakage of 24 cents.

Suppose further that the utility company uses the remaining 16 cents to pay some of their labor costs, referred to as induced impacts in I-O modeling. These 16 cents now represent income to utility company workers who, in turn, may elect to spend it in the local economy. Let's assume that the utility worker spends that 16 cents at a local movie theater, which constitutes 16 cents of revenue going to the movie house, and that 10 cents of that 16 cents goes to pay movie rental fees, and is sent to Hollywood. This transaction would then represent a leakage of 10 cents out of the economy. This process of re-

spending and leakages continues until that entire initial dollar of sales to the local farmer leaks out of the economy.[46]

The value of the multiplier in this example is 1.66, calculated as the direct + the indirect + the induced effects. In other words, the multiplier includes the value of the initial $1 going to the farmer plus the sum total of local expenditures that resulted from the initial transaction; i.e., the 40 cents retained by the retailer, the 16 cents retained by the utility company, the 6 cents by the movie theater, and so on. For every dollar of new local food sales revenue earned by the farmer, the total impact on the local economy is estimated to be $1.66, i.e., the initial $1 expenditure and an additional 66 cents based on the calculated economic multiplier effect within the local supply chain sectors.

Using the notion of the economic multiplier, we can better understand how building local supply chains or networks constitute a form of import substitution. Re-localizing agricultural transactions and reinforcing local food supply chains and networks leads to a reduction in the volume of money that leaks out of the local economy, and thereby enhances the impact of new or redirected local food sales on the local economy. Note that this analytic framework is not really directly related to economic growth or development. Rather, it is aimed at assessing economic impact; i.e., this is what the economy looks like before the event or policy change, and this is what the economy looks like after the event or policy change.

One of the challenges in using multiplier analysis to examine the impact of a change in local foods activity is determining what the value of the multiplier is, or, more directly, obtaining an appropriate multiplier. As will be discussed in greater detail in module 7, there is no "local foods" sector in I-O modeling software. On the contrary, the data feature large industrial categories that aggregate production by related commodity type such as grain crops, oilseed crops, vegetable and melon crops, fruit farming, and different major categories of animal production. Consequently, the default multipliers in the modeling software reflect the averages for the region of analysis, whether it is a county or a State, which means the resulting multipliers are reflective of the average farm within those categories. However, producers of locally marketed foods are likely to have very different supply chain relationships, than, say, a local, industrial-scale vegetable producer selling directly to food manufacturers. Accordingly, one has to modify modeling systems to more adequately convey the economic worth of local food enterprises.

## Producing Reliable Local Foods Impact Estimates

Most analysts use some type of I-O model to generate sets of economic multipliers to be applied to local foods production, processing, distribution, and sales. There are several types of multiplier-generating services or systems, but the lion's share of analysts rely upon an economic impact modeling software called IMPLAN because of its ease of operation as well as the fact that its industrial accounts and assumptions are easily modified.[47] It is also possible for analysts to use multipliers or services generated by the U.S. Bureau of Economic Analysis (BEA) through its Regional Input-Output Modeling System (RIMS) II services, or from other I-O program or service vendors such as Economic Modeling Specialists, Inc. (EMSI).

## The Structure of Input-Output Models

I-O models depict the flow of transactions between local industries, sales by industries to households, and sales to other "final users" of goods or services, including regional exports (domestic and international). I-O models also track industries' uses of labor and capital inputs and of regional imports (once again, both

46 Normally I-O analysis considers the full array of transactions between the farmer, suppliers and employees, not just the single examples illustrated here for the purpose of clarity.
47 A more complete description of IMPLAN is contained in the next subsection.

## Case Study: I-O Models

Broadly, I-O models are built around a complete table of industrial and other transactions in an economy of scrutiny. This table, called a social accounting matrix (SAM), documents the buying and selling amounts among industries, households, and the rest of the world. I-O models allow analysts to understand the critical components of production in specific industrial types, and, once processed econometrically, they produce tables of multipliers for all industries that are contained in the model.

As one example of a three-sector model for Wisconsin local foods[48] shown in table 5.1, the I-O model was first generally represented as a way to show connections between supply chain sales, purchases, and total outlays:

**Table 5.1: Numerical SAM for a Three-Sector Economy**

| | | Industry Purchases | | | Consumption (C) | Exports (I+G+E) | Output |
|---|---|---|---|---|---|---|---|
| | | A | B | C | | | |
| Industry Sales | A | 1 | 2 | 1 | 5 | 10 | 19 |
| | B | 2 | 1 | 2 | 3 | 14 | 22 |
| | C | 1 | 1 | 1 | 6 | 7 | 16 |
| Income | | 7 | 9 | 5 | | 2 | 23 |
| Imports | | 8 | 9 | 7 | 9 | | 33 |
| Outlays | | 19 | 22 | 16 | 23 | 33 | 57 |

***Source: Watson et al. (2015).***

As this example shows, I-O models are not just "impact" tools. They provide a useful framework for understanding regional industrial structures, mutual linkages and inter-dependencies, and the overall nature of regional productivity. I-O models, however, have limits to their use and interpretation. For example, these are fixed price models that assume perfectly elastic labor and commodity supplies; this is not, in the longer run, how many economies perform since agents are constantly revisiting management choices.

domestic and international). The current version of the IMPLAN modeling system contains 536 industrial sectors, including 14 agricultural sectors. Every industry in the modeling system can have a transactional relationship with every other industry.

The multipliers for each industry are generated with the assumption that there is a constant, or fixed, relationship among industries such that if production in one industry doubles, so too will its demands for inputs. Accordingly, if local foods production doubles in a region, so too will its demand for regionally supplied inputs into food production. This is a reasonable assumption for small changes in output, but might be harder to defend as changes become larger. One of the challenges is that in general, as businesses become

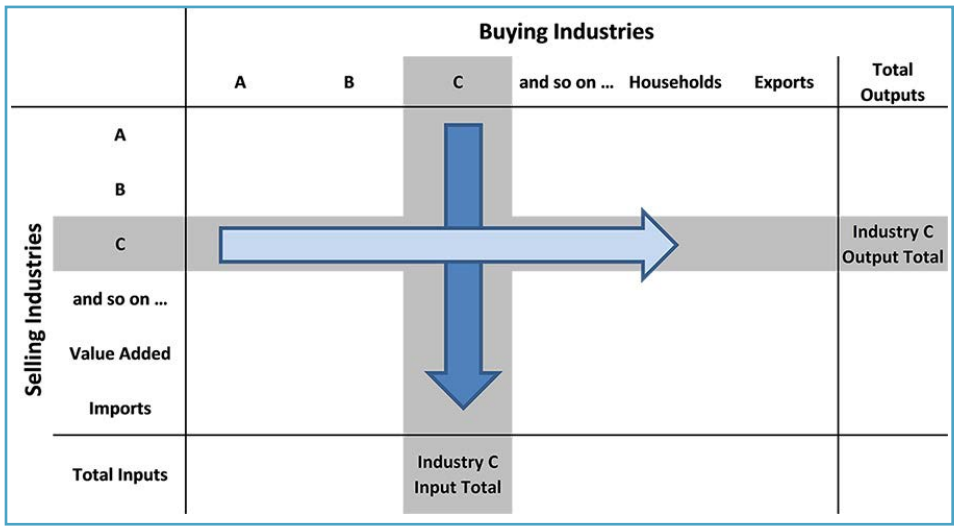
48 Philip Watson, David Kay, Gregory Alward, Stephen Cooke and Alfonso Morales. 2015. "Evaluating the Extent and Economic Contributions of a Local Food System through an Import Substitution Framework." *Working draft of report for Wisconsin Department of Agriculture.*

larger, they require a different mix of inputs to produce outputs. In many cases, this is due to the fact that they are trading a reliance on labor for technology (e.g., automated irrigation systems). I-O models would not capture these technological changes without modifications. Additionally, price changes are not captured within I-O models. I-O models of this type are called fixed-price models. These are two of the major shortcoming of I-O models, but as long as the change being modeled is small relative to the economy as a whole, this assumption can be justified.

Fixed price models of the economy can be thought of as a snapshot of the economy at any given time. They capture the flow of dollars among buyers (demand) and sellers (supply) within the economy. Expanding on the I-O example shared above, we expand on the matrix where buyers are located along the columns of the spreadsheet and sellers are located along the rows and each individual cell of the spreadsheet represents the dollar flow between any particular buyer and seller (table 5.2). Since supply equals demand, the column totals must equal the row totals.

Now think of the spreadsheet as a proxy for business transactions in the agricultural industry that includes purchases of products from the economy (expenditures across columns) and sales of products to the economy (sources of revenue across rows). Again, since supply equals demand in our scenario, total revenues of agriculture (row total) must equal total expenditures (column total).

**Table 5.2: Expanded SAM**




*Source: Shaffer, Deller & Marcouiler (2004).*

**Table 5.3: Multiplier Matrix for a Three-Sector Economy**

| | | Industry Purchases | | | |
|---|---|---|---|---|---|
| | | A | B | C | |
| Industry Sales | A | 1.25 | 0.29 | 0.25 | 0.37 |
| | B | 0.26 | 1.21 | 0.27 | 0.29 |
| | C | 0.26 | 0.27 | 1.26 | 0.42 |
| Income | | 0.65 | 0.68 | 0.60 | 1.39 |
| Type II Output Multiplier | | 1.77 | 1.76 | 1.78 | 1.08 |

*Source: Watson et al. (2015).*

The condition of supply/demand equality is important because it allows us to track how changes in one part of the economy ripple throughout the whole of the economy. These ripples constitute the multiplier effect. Revisiting the example from Wisconsin, the multipliers can be derived from the original I-O model to look like table 5.3.

## Basic I-O Modeling Structure

If we reference the multiplier in table 5.3 above, we can see the impact of the multiplier effect within the I-O "spreadsheet of the economy." In this scenario, there was a change in the demand (sales) for local foods. In order to produce additional output to meet that change in demand, the

farmer had to increase production, which in turn required the farmer to purchase additional inputs. In our example, the farmer purchased additional equipment from a local retailer. This represented an increase in demand or sales for the retailer, who must order new inventory to meet the new level of sales. The visual depiction of the simple multiplier illustrated in figure 5.1 shows us how the change in sales (demand) for farmers generates ripple effects throughout the entire economy.

I-O models help us to generate useful insights and conclusions about industrial change in a study area. They help us anticipate the magnitude and extent of regional linkages due to production or other changes across a range of indicators that are useful for decision-makers and planners. The most important "impact" outcomes are the total jobs and the total labor income that are generated from a production change scenario. In addition, transparent models like IMPLAN allow us to itemize and tailor the amount and types of inter-industrial activity that accumulates to other industries in the study region.

## Properly Specifying the Study Area

The first step in conducting economic impact assessments is to define the appropriate study area – i.e., the boundaries of the "local" or regional economy you intend to study. Determining what constitutes local can have a decisive impact on the results: it is nearly always true that the larger the definition of local, the more inter-industry linkages exist, and the larger the economic multiplier effect of a given change in the demand for local goods and services. To isolate the effects of an impact, it is desirable to create as small a study area as possible, while still including the areas necessary to capture all of the important effects.

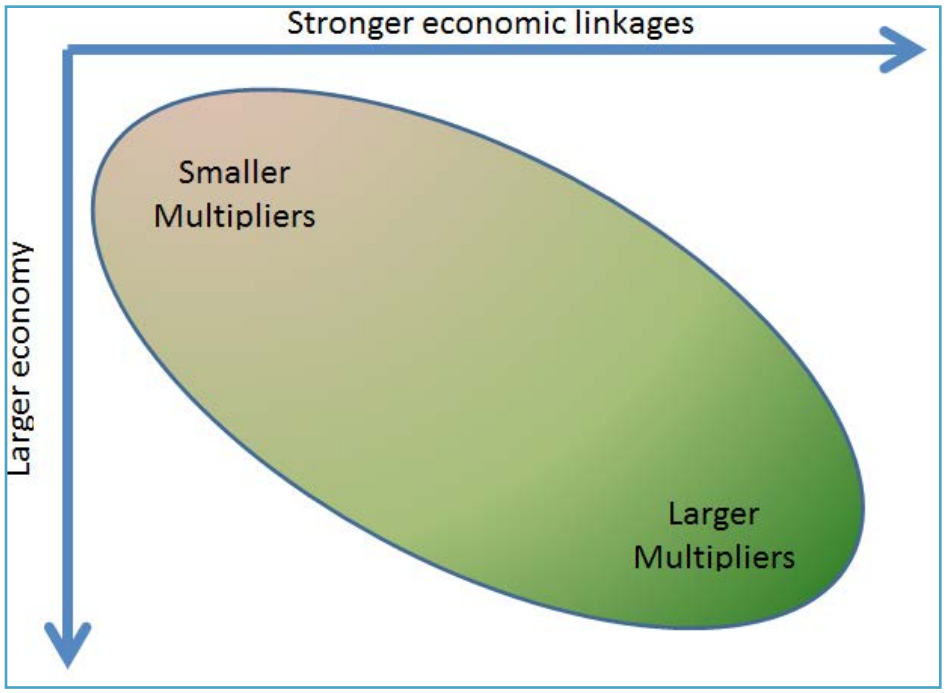
When defining a study area, you will want to consider the availability of secondary data for your region, as described in module 1 of this Toolkit. The methodology described in this section of the report uses secondary data available from the IMPLAN Group, LLC. (IMPLAN), available by zip code, congressional district, county, and State. IMPLAN's functionality allows researchers to easily develop multiple county- or state-based models. Though data are available at a sub-county level, regional scientists and the IMPLAN organization recommend using the concept of a functional economic area to guide decisions about study area boundaries. A functional economic area is basically a semi self-sufficient economic unit (and is therefore ideal for this type of analysis). It includes the places where people live, work, and shop, and can sometimes be identified by physical or other characteristics. The more closely the study area resembles a functional economic area, the more robust and credible the analysis is likely to be. It is rare that a sub-county

***Identifying exactly what can be classified as "local" can have an impact on results.***

area has the characteristics of a functional economic area. Accordingly, it is usually recommended that a county should be the smallest unit of analysis.

It is sometimes tempting to assume that local foods have a statewide impact and, therefore, one should choose to use a statewide model for estimating impacts. However, using a larger geographic region as the basis of your analysis will ultimately inflate and exaggerate your impact results owing to the greater likelihood of input purchases. Furthermore, the impact results will be less reflective of the actual economic activity occurring in the primary location of the study. A good rule of thumb is that a study territory should encompass the geography where the majority of the assessment team members live. Additionally, we recommend considering your target audience when determining appropriate geographic boundaries for your I-O model. If your project is funded by a State agency, defining local food by State boundaries may make sense. Or, if the initiative you are assessing is funded by a county, or facilitated through a Cooperative Extension agent who is funded through a county, then county borders may be the more appropriate definition. Alternatively, perhaps you are trying to assess what the impact of an initiative or policy is to participating producers. If this is the case, then defining your study area based on the locations and distribution patterns of the participating farms might be most appropriate. You will also need to keep in mind the residential location of the labor force, as their spending patterns are important to your study results.

**Figure 5.2: Illustration of Factors that Drive the Size of an Economic Multiplier**




Another approach you may wish to consider is to conduct the analysis for multiple study areas, each relying on differing assumptions. This strategy provides those reading the study a better understanding of the range of potential impacts across a broader geographic territory without compromising the integrity of the results.

## Other Considerations: Reasonable Size of Multipliers

One of the biggest challenges in assessing the reasonableness of an economic impact assessment is the relative size of the multipliers. It is not uncommon for advocates of a particular policy or action, such as the promotion of local foods, to use the largest multiplier possible to build support for their position. There are generally two things that drive the size of the multiplier: (1) the level of inter-industry linkages (i.e., imports or leakages); and (2) the size of the economy being examined. As illustrated in figure 5.2, smaller economies (e.g., small rural communities) that have limited local linkages will have small multipliers, whereas larger economies (e.g., large metropolitan areas or a State) that have stronger industry linkages will have larger multipliers.

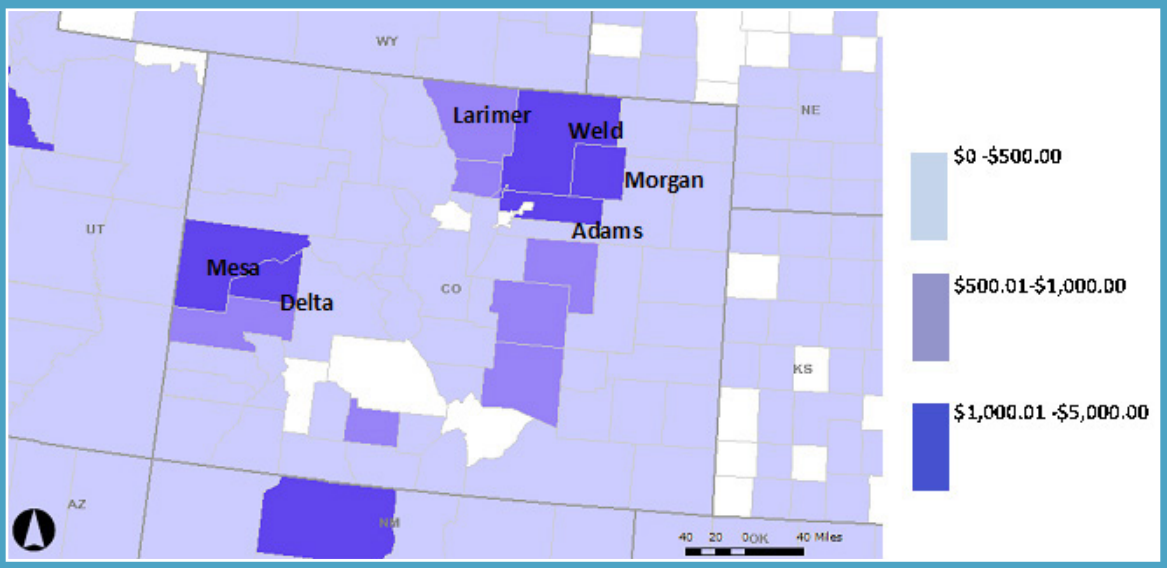
While these two characteristics often move together, they are uniquely defined in that you could have weak economic linkages in a small economy, you just will never have a large multiplier in a small area, even if linkages are very strong, because the number of businesses in any one area to

## Case Study: Colorado Farm to School[49]

In situations where one is unsure of "the best" assumption to make, conducting your analysis using a scenario approach can make sense, particularly in that it processes a range of results. Gunter and Thilmany used a scenario approach to analyze how the definitional choice for "local" affected the outcome of their economic impact assessment of a farm-to-school program in Colorado.

In Colorado, the majority of the population lives along the Front Range (see figure 5.3) and some direct-market oriented vegetable producers can operate in this region. Yet, based on the State's climate, almost all of the tree fruit production (which is a high demand good) occurs on the West Slope (about 250 miles from the Front Range). Given uncertainty about how to define the geographic scope of the program's impact, this team decided to define two different regions. To get a sense of the hyper-local impact, the first region includes only Larimer and Weld counties surrounding the school district. Then, to look at a more regional impact, the second region added the five counties with the highest dollar value of direct sales (Mesa, Delta, Adams, Morgan, and Weld). By including these counties, fruit sales of the West Slope producers were captured while at the same time relying only on the counties that already have the infrastructure and distribution capabilities for intermediated sales from producers.

**Figure 5.3: Map of Direct Farm Sales in Colorado, 2007[50]**

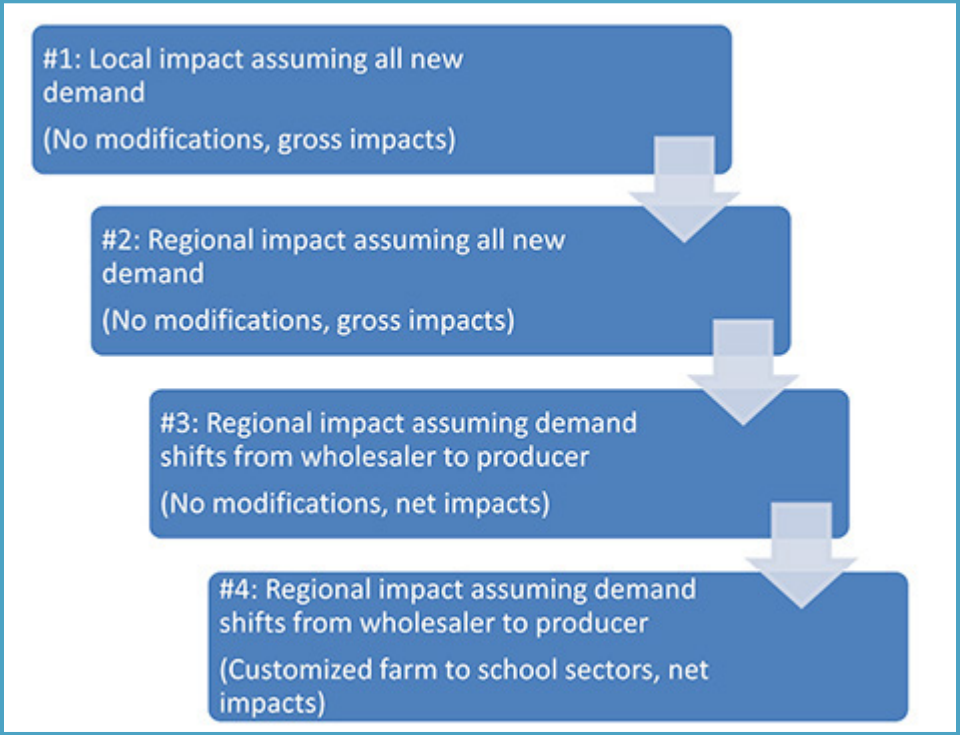



*Source: Food Environment Atlas, Economic Research Service, U.S. Department of Agriculture*

Utilizing these two regions, scenarios (outlined in figure 5.4) were developed to determine outcomes based on differing assumptions. The first scenario includes Larimer and Weld counties and assumes that all purchases made by Weld are all new demand (no money was taken away from any other sector in the region). Scenario two is exactly the same, but also includes the larger six county region. However, given the larger region and possibility of competing wholesale activities occurring in the region, sales to producers is most likely shifting sales away from wholesalers in the region. We explore this issue further in module 7.

49 For more information, visit http://coloradofarmtoschool.org/colorado-farm-to-school-task-force/.
50 For more information, visit http://www.ers.usda.gov/data-products/food-environment-atlas.aspx.

**Figure 5.4: Scenario Map for Economic Impact Assessment of Farm-to-School Programming in Colorado[51]**



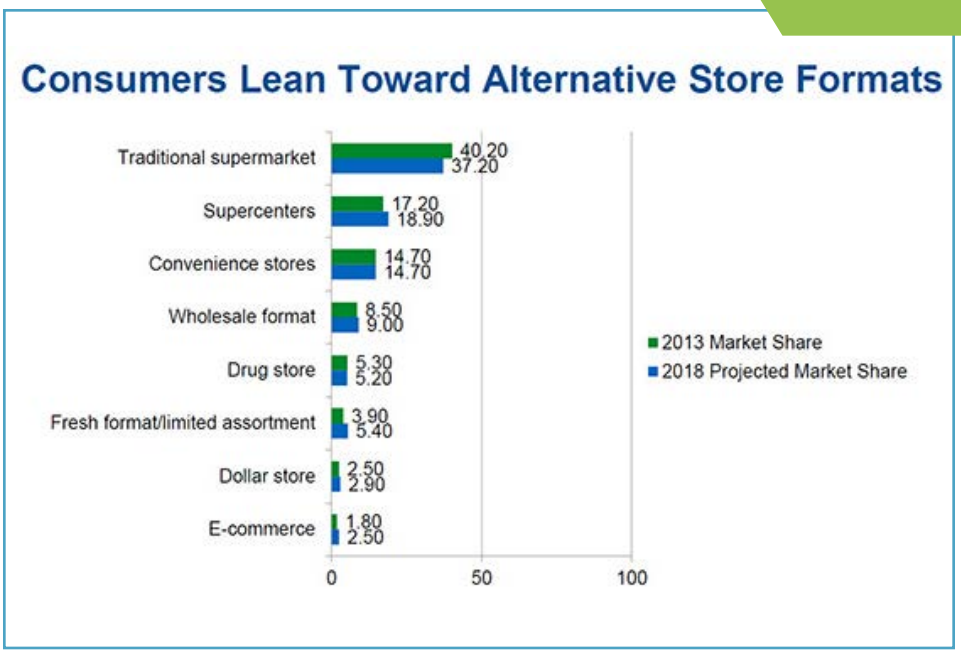

*Source: Gunter & Thilmany McFadden (2012).*

As expected, this study found that the more expansive parameters used to define the boundaries of the targeted local food region, the greater the estimated economic impact of local food activities. This is due to the fact that in a larger economy (as defined by space and/or potential buying dollars), there will be more inter-industry linkages.

have commercial relationships with will be limited. Subsequently, for smaller regions, the ability to retain dollars locally tends to be weaker, thus driving the size of the multiplier down. For a larger region, dollars will tend to remain in the region longer, thus pushing the size of the multiplier upward, but such linkages can still be made stronger with intentional community planning and networking. If a community analyzes the potential impact of a local foods initiative using multipliers specific to a local county, the impacts will be smaller than if the same initiative is examined using multipliers for the state.

Which approach is "correct"? Both are "correct," but the point of reference (county vs. state) is different. While there are no hard and fast rules about multipliers because each industry and community is unique, it is useful to note that researchers typically use multipliers that are less than 2.0, with multipliers for smaller rural areas hovering closer to 1.3 and those for larger, more urban areas hovering closer to 1.9. This rule of thumb is based on estimates from rigorous academic assessments done over several decades. However, there are always unique situations involving regional economies and industries that are capable of yielding larger multipliers.

51 For more information, see: Gunter, A., and D. Thilmany McFadden. May 2012. "Economic Implications of Farm to School for a Rural, Colorado Community." *Rural Connections*: 13-16.




***Source: 2014 Retail Shop Topic, Jones Lang LaSalle, September 2014, available from*** http://www.us.jll.com/united-states/en-us/Research/JLL-ShopTopic-Grocery-share.pdf?aa79b615-6518-4080-af03-e6104ea59d91

## Other Considerations: Reasonable Scenario Development

Next to identifying the appropriate multiplier, the most important step in conducting an impact assessment is accurately describing the scenario under consideration. For local food, this can be complicated because the promotion of local foods typically involves a shift in the allocation of consumer food dollars. Expanded demand for local foods is too often treated as "new spending," which is factually incorrect and can lead to faulty analysis. For example, if a household elects to purchase additional quantities of locally-sourced food, that generally means there has been a shift away from traditional sources of food. Similarly, if a household elects to buy produce from a farmers market and not at a chain retail grocery store, this means there has been a gain in farmers market sales, but a loss of sales to the grocery store. The net impact of this change in spending patterns hinges on the linkages of locally sourced food purchased at a farmers market compared to the linkages of non-local food purchased at a grocery store. (Additional considerations for scenario development are covered in the following section, module 6.)

## Understanding Input-Output Analysis Limits

While there are a number of useful applications in which I-O models can be used to analyze the impacts of local food, it is also important to understand the built-in limits of I-O. As with any economic modeling technique, some simplifying assumptions about the structure of the economy must be made to allow the modeling process to move forward. However, for the purposes of guiding policy development and economic decision-making, and considering consequences for local governments and service provision, the most important limitations to the use of I-O models – or the data generated from those models – can be classified as follows:

- Feasibility and return on investment issues.
- Understanding employment impacts.
- Impacts on existing activity and current residents.

## Feasibility and Return on Investment

I-O models are not structured to address the overall feasibility (profitability) of a scenario or to predict expected returns on investment. Feasibility studies are separate from an economic impact evaluation, though the data from such studies are useful in developing impact analysis scenarios. At its most basic level,

a feasibility analysis measures whether a business concern can generate sales to be profitable in a conventional sense. I-O studies would then use this information to project potential regional economic outcomes from a new (and supposedly) successful venture. Proponents and policymakers need to understand that an I-O analysis cannot inform investors or taxpayers as to the potential financial success of a venture. This may be confusing to some people because the results of I-O based impact assessments are periodically used to assert that a region is realizing gains across several categories (like total industrial sales, revenue, or personal income) that exceeds the amount of public subsidy. Hence, there is a declared public return on investment. These assertions are made by either naïve or unscrupulous practitioners of economic impact analysis and are used inappropriately to influence policymakers and citizens into believing regional economic and fiscal accounts are flourishing as a result of a particular initiative. I-O models cannot yield the information that is necessary to assess the rate of return on an investment or support a cost-benefit type of analysis related to the use of public funds.

## Employment Impacts

I-O models can compute how many new jobs are required in the regional economy given a scenario of change, such as a shift in consumer spending away from grocery stores to a local farmers market. A change in jobs is assumed to lead to changes in area households, which in turn boosts regional consumer spending on local products. There are, however, intervening conditions that interfere with these tidy assumptions. New jobs could go to existing unemployed, under-employed, or local residents who currently commute to jobs in nearby regions. Further, a new job could actually go to an individual who starts commuting from a nearby community. In essence, while I-O can provide an estimate of the number of jobs resulting from the scenario under consideration, it cannot inform us as to who is taking – or losing – those jobs. There are other important considerations in terms of job change. Local foods production tends to be seasonal and cyclical. Therefore, the numbers of jobs created that are full-time or part-time must be enumerated. Additionally, per-job earnings, a surrogate for job quality, will also need to be highlighted. All jobs are not equal, and overall job worth is an important consideration when drawing conclusions about an economic change. Last, there are issues associated with labor supply and labor skill diversity. An I-O model tells us the number of jobs required for a particular scenario. It does not tell us, however, if the skill sets required to satisfy those jobs are available in the community. Skilled I-O modelers can affix an industry by occupation matrix to their modeling system to produce findings about the kinds of skills required for a scenario to be realized and whether the regional labor force in fact contains those skills. To assume, however, that building a specific type of industrial capacity in rural areas will be able to take advantage of an adequate supply of skilled labor is imprudent.

## Impacts on Existing Commercial Activity

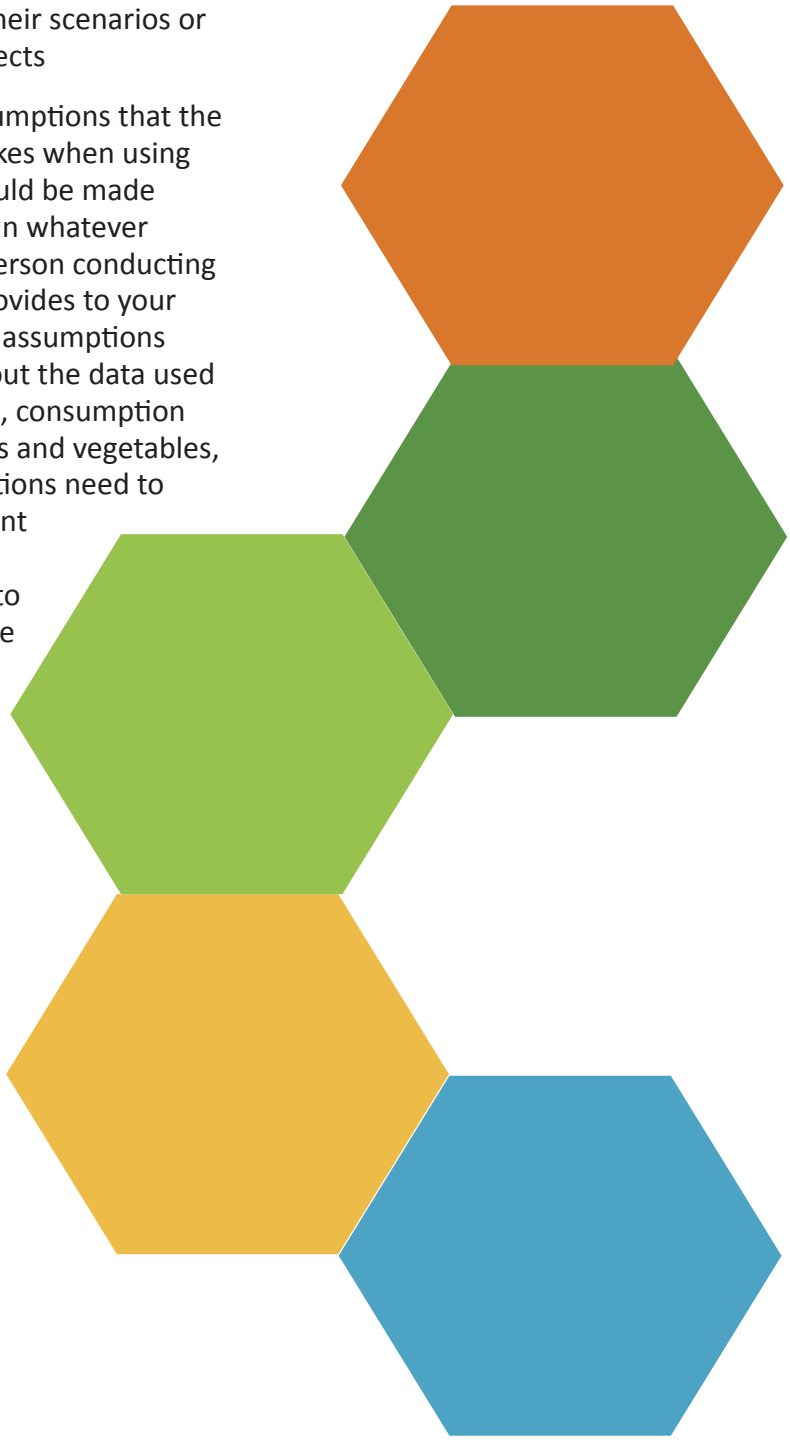
There is one underlying assumption to most economic impact methods that can cause difficulties in truly understanding the impact of any given scenario: supply responses are unconstrained. This means that potential supply is unlimited and that price does not play a role in the outcome of the model. We know, however, that in the real world, there are constraints to supply and prices can rise or fall depending on the scenario under consideration. In much of the U.S., nearly all arable land is already in production, or the supply of land is limited. Any expansion of local foods production, therefore, will tend to result in land use shifting away from one type of cropping to another. These countervailing offsets are discussed at length in module 6. In addition, we could see the price of farm land change as its uses are altered. This is a scenario that most I-O models cannot address. Alternatively, increased success at marketing local food directly to consumers will often displace sales made by area grocers. These are just two examples, but I-O scenarios that assume local food expansion must be tempered with I-O analyses of the consequences of

potential differences in land use and marketing channel choice. You must be careful to consider all aspects of the suggested economic scenario, and the ways in which these factors might influence the interpretation of impact results.[52]

## Takeaways

Community development analysis is a complicated process that involves the incorporation of development theory with appropriate measurement tools. We use I-O models as our primary mechanism for measuring regional economic impacts associated with local food systems. When you use these tools, however, you need to be mindful of several things:

- The structure and logic of I-O modeling systems
- The limits of I-O models
- That the region of scrutiny should match the economic activity being evaluated
- That the scenarios of analysis should be well-developed and realistic
- Off-setting consequences that are part of their scenarios or policy prospects
- That the assumptions that the modeler makes when using IMPLAN should be made transparent in whatever report the person conducting the study provides to your team. These assumptions could be about the data used in the region, consumption rates of fruits and vegetables, etc. Assumptions need to be transparent for other researchers to critique those assumptions as sound or unsound.



52 Note that a properly developed I-O model focused on the economic impact of local food system change should generally include a fiscal (tax revenue) component associated with labor force, household, and income changes. Most local foods analysis scenarios do not yield large localized gains in employment or area incomes. Nonetheless, there may be positive consequences associated with job creation due to specialized production, aggregation and distribution requirements. If so, it may be prudent to attach fiscal impact evaluations of local foods projects to any I-O study of local food systems so that their influence on job creation and tax receipts may be evaluated in proper context. In recent years, advocates for local foods and/or other non-conventional agricultural crops, like organic production, have lobbied local governments for tax-based incentives to help stimulate interest and investment. In these cases, local governments are forgoing immediate tax receipts in favor of regional economic enhancement. These governments hope that in the long term, resulting growth will generate other tax revenues that more than offset the cost of meeting the growth in all local government service demands associated with the initiative (or net positive fiscal impacts result). I-O models do not produce estimates of net fiscal gains or losses, but information derived from the analysis, like job and income gains, can be entered into properly specified impact models to further complement the regional economic impact evaluation.

# Module 6 — Addressing Opportunity Costs in the Analysis of Economic Impacts Across Local Food Systems

Module 6 focuses on understanding two key assumptions of I-O models (I-O), the "no resource constraints" assumption and the "no opportunity cost of spending" assumption. These assumptions are fundamental in properly estimating and interpreting the economic impact of local and regional food systems. In this module you will learn:

- What the no resource constraint assumption means and how you can think about it in terms of your local economy.
- What the "no opportunity cost of spending" assumption means and how it is typically considered when modeling economic impacts of local foods.
- How your team can correctly incorporate these two key concepts into your I-O model.

The content of this module is appropriate at the stage of your project when your team has:

- Defined its scope, specific goals and objectives, timeframe, available resources, and regional boundaries (module 1);
- Collected requisite primary and/or secondary data (module 2 for secondary data and module 3 for primary data); and
- Involved a technical expert who has a thorough understanding of the terminology and limitations of I-O models, advanced training on conducting an economic impact assessment, and knowledge of its limitations (module 5).

As discussed in module 5, economic impact assessments of local and regional food systems are typically done with I-O models. Economists often focus on several aspects of such models that are fundamental in properly estimating and interpreting the economic impact of increases in local food sales on local (or regional) economies. Two key, usually implicit, assumptions with regard to the use of such models include the "no resource constraints" assumption on the supply side and the "no opportunity cost of spending" assumption on the demand side.

The "no resource constraints" assumption assumes that gross gains in local food production must be balanced against the fact that these shifts (referred to as countervailing effects) will usually come in the form of a direct, acre-by-acre reallocation of existing uses of agricultural land. A growth scenario, such as the growth of the local food system, is often constructed by policymakers under the implicit assumption of "no resource constraints;" that is, land, water, and any other resources that are requisite to the growth of locally produced foods are plentiful. Hence, it is assumed that the expansion of locally produced foods does not take land, water or resources away from other productive activity. Incorporating countervailing effects means that as more specialty crops, for example, are put into production to meet growing demand for local fruits and vegetables, more arable land is unlikely to become available. Accordingly, increases in specialty crop production likely mean land diverted away from other uses such as corn or soy production.

The "no opportunity cost of spending" assumption means that while farmers directly marketing their crops constitute a positive local economic impact, there may also be negative impacts of that same spending due to the opportunity cost of lost direct sales activity in other food-handling sectors of the economy (typically the wholesale and retail sectors). Opportunity cost, a key concept in economics, has often been described as expressing the basic relationship between scarcity and choice. Opportunity cost should be considered from the demand side; it reflects the assumption that a region does not fundamentally change the amount of money spent in the food sector based on the availability of locally grown food. Rather, it is more likely

that customers shift purchases from one source of foodstuffs to another. This concept is also a key discussion point for any economic assessment of a food system, innovation, change, or new action plan. For instance, if a region's food buying dollars are shifted as a result of a "Buy Local" promotional campaign, or investments in a new local food initiative can be expected to displace some food distribution activity previously conducted by a less locally oriented firm, then the opportunity costs of making this purchasing change need to be considered in any credible analysis of economic impact.

In this module, we discuss the limitations of analyses that proceed under these "no resource constraints" and "no opportunity cost of spending" assumption, and how analyses can be formulated to more accurately represent market responses – measuring net rather than gross impact. Measuring opportunity cost and countervailing effects are not straightforward, and require information about the extent to which increased consumer purchases of locally grown food affect other types of food purchases, change market prices and/or supply chain characteristics, or impact land use. This information is generally unavailable from secondary sources, and involves additional primary market information and/or assumptions.

When opportunity costs related to demand changes or countervailing effects related to resource constraints are not incorporated into an economic impact analysis, the analysis is likely to overestimate regional economic gains from a shift to more local purchases and/or consumption. Since economic impact numbers will be smaller when opportunity costs and countervailing effects are included, this approach can be challenging from a political standpoint, where larger numbers help to 'sell' projects, even though the results are less defensible.[53] Therefore, when embarking on an economic impact analysis, we believe it is a valuable practice to adopt more standardized approaches, offer good examples of how these adjustments can be incorporated, and learn from previous rigorous examples to support your modeling refinements (we have included several throughout this module). Instructions on how to follow these recommendations are provided in the remainder of this module.

## Case Study: Supply and Demand Size Constraints – Incorporating Opportunity Cost and Countervailing Effects[54]

Two studies that provide useful examples about ways to incorporate opportunity cost and countervailing effects into your local and regional food system assessment are *Evaluating the Economic Impact of Farmers Markets Using an Opportunity Cost Framework*, a study that evaluated the economic impact of West Virginia's farmers markets, and *The Regional Economic Development Potential and Constraints to Local Foods Developed in the Midwest,* which focused on the potential economic impact of expanded local fruit and vegetable production in several Midwestern States.

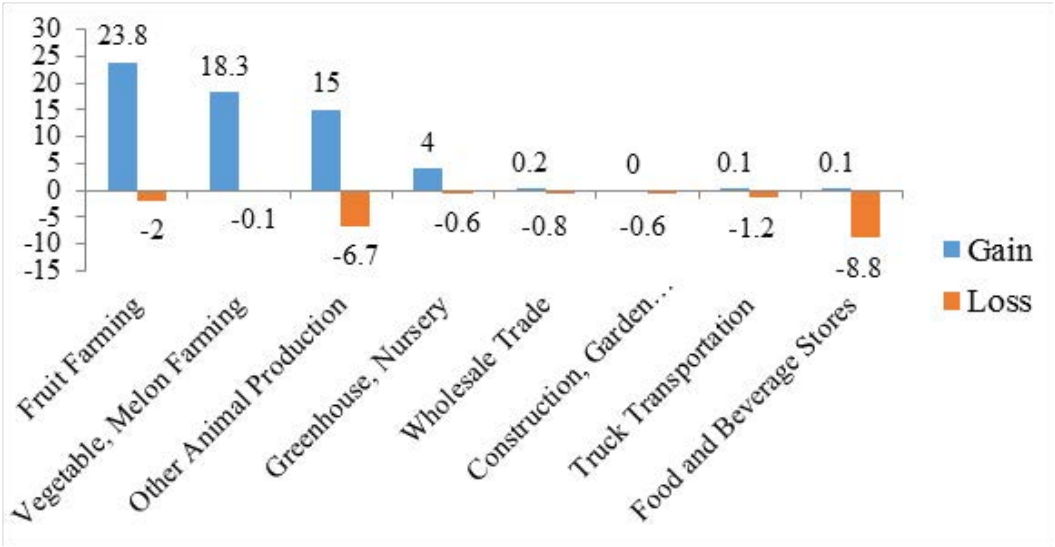
In *Evaluating the Economic Impact of Farmers Markets Using an Opportunity Cost Framework* the authors use primary data collected from producers who participate in West Virginia farmers markets to inform an IMPLAN-based I-O study. They account for the opportunity cost by assuming the positive impacts associated with money spent at farmers markets results in decreased spending at local grocery stores, as well as building material and garden supply stores (due to ornamental sales at farmers markets). The study found that while farmers markets would result in a net positive impact on the State economy, accounting for

53 For more information, see: Hughes, D.W., C. Brown, S. Miller, and T. McConnell. 2008. "Evaluating the Economic Impact of Farmers Markets Using an Opportunity Cost Framework." *Journal of Agricultural and Applied Economics*. 40(1):253-265.

54 Hughes, D.W., C. Brown, S. Miller, and T. McConnell. 2008. "Evaluating the Economic Impact of Farmers Markets Using an Opportunity Cost Framework." *Journal of Agricultural and Applied Economics*. 40(1):253-265.

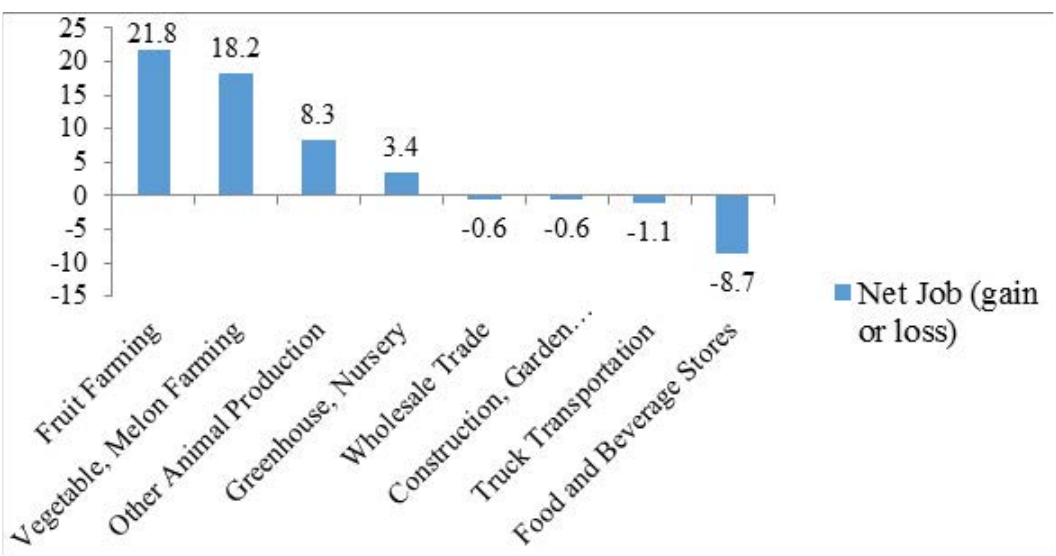
the opportunity cost of spending reduced the economic impact of the markets from 119 jobs (69 full-time equivalent jobs) and $2.389 million in output including $1.48 million in gross state product to 82 jobs (43 full-time equivalent jobs), $1.075 million in output, and $0.653 million in gross state product. Figures 6.1 and 6.2 illustrate the expected net job impacts to selected industry sectors affected by estimated changes in consumer purchasing patterns (e.g., increased spending at farmers markets results in decreased spending at local grocery stores and building material and garden supply stores).

**Figure 6.1: Selected West VA Sectors Experience Job Gains and Losses Due to Expanded Farmers Market Sales[55]**




*Source: Hughes, Brown, Miller & McConnell (2008).*

**Figure 6.2: New Job Impacts due to Expanded Farmers Market Sales in West Virginia[56]**




*Source: Hughes, Brown, Miller & McConnell (2008).*

55 Source: Hughes, D.W., C. Brown, S. Miller, and T. McConnell. 2008. "Evaluating the Economic Impact of Farmers Markets Using an Opportunity Cost Framework." *Journal of Agricultural and Applied Economics*. 40(1):253-265.
56 Ibid.

In *The Regional Economic Development Potential and Constraints to Local Foods Developed in the Midwest,* the author addresses the countervailing effects of increased fruit and vegetable production (figures 6.3 and 6.4). Using secondary data, the author demonstrates that the land, water, and other resources required for the growth of local foods production must come from existing commodity crop production. The study estimated county-level fresh fruit and vegetable production potential (supply side) for Minnesota, Wisconsin, Illinois, Michigan, Indiana, and Iowa, as well as expected sales of fresh fruit and vegetables based on current population (the demand side).

**Figure 6.3: Expected Acres Needed to Satisfy Demand for Local Fruits and Vegetables Within the 6 State Region[57]**

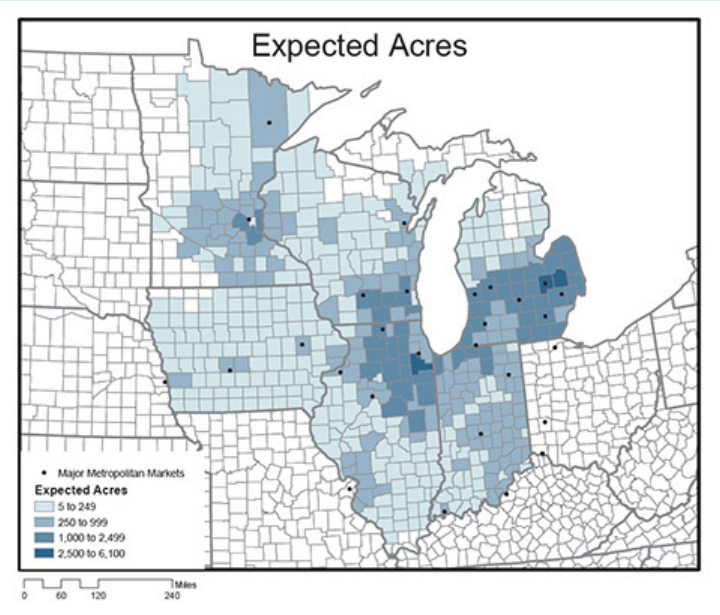
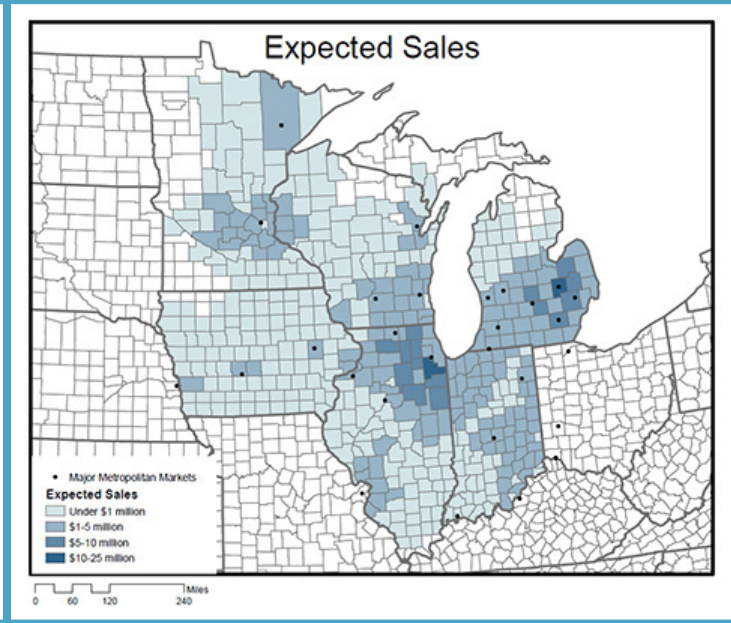



**Figure 6.4: Expected Sales from Demand for Local Fruits and Vegetables Within the 6 State Region[58]**




***Source for both maps: Swenson, D. (2011).***

In total, the study estimates the 195,669 acres of fruits and vegetables would be needed to satisfy local demand for fruits and vegetables in the 6 State region, with a farm value of $635,441,980. Though these numbers may seem large, the study found that there would be fewer than 250 acres of production in 53 percent of the counties, and only 10.5 percent had the potential of 1,000 acres or more. Over 57 percent of the counties would have gross farm-level sales under $1 million, and only 3.2 percent would exceed $5 million. In total, the study finds the gross total output impact from the increased demand for fruit and vegetables would be $1,027,657,939, generating 6,694 jobs.

However, Swenson shows that the land in this region suitable for fruit and vegetable production is likely already planted in corn and soybeans. He therefore calculates the net impacts that would occur from shifts away from corn and soy to fruit and vegetable production. Results indicate that the overall net impacts would be a gain of 4,802 jobs and a regional total output impact of $709,803,348. This, the study demonstrates the importance of incorporating countervailing effects in a local foods economic impact assessment.[59]

57 Source: Swenson, D. 2011. *The Regional Economic Development Potential and Constraints to Local Foods Development in the Midwest.* Leopold Center for Sustainable Agriculture. Iowa State University. Available at: https://www.econ.iastate.edu/sites/default/files/publications/papers/p12697-2011-03-30.pdf [Accessed 27 May 2015].
58 Ibid.
59 Ibid.

## Resource Constraints and Local Food Systems: Supply Side Countervailing Effects

Using properly specified I-O models, local food market analysis can help communities, regions, and States project growth in jobs, income, and value-added production based on assumptions about levels of fruit, vegetable, or animal production, and assumptions about satisfying unmet regional demand for locally-grown crops or locally raised or processed animals. While it may be tempting to think that incremental gains in local food production represent pure gains in regional economic output, as evidenced by increases in the number of factors involved in local food production, these gross gains in local food production must be balanced against the fact that these shifts will usually come at the direct, acre-by-acre expense of existing uses of agricultural land since very high percentages of arable land in the U.S. are already devoted to crop production or are officially idled in set-aside programs like the Conservation Reserve Program (CRP). It is therefore prudent for local foods impact analysts to assume there is a direct relationship between local food production gains and declines in other regional crop production. There are of course exceptions, such as reclaimed land in and around urban areas that may be farmed temporarily or land that is idle for reasons other than its crop-producing potential. However, in impact analysis, these are atypical cases. The norm is that farmland for local foods must come from the existing supply of utilized farmland.

Such a one-to-one land opportunity cost assumption is even more salient in an era of comparatively robust returns to conventional cropland uses like corn, soybean, and wheat production. Higher commodity prices have resulted in expansions in crop acres over the past 5 years, reductions in Conservation Reserve Program acres, and reductions in hay land and pasture land.[60] For example, estimated U.S. planted field crop acres in 2014 were nearly 5 percent greater than in 2011, according to the USDA's National Agricultural Statistics Service (NASS). Robust crop prices have also driven agricultural land prices upward. In Iowa, for example, 2013 State average agricultural land prices were $8,716 per acre, a 72-percent increase from 2010. Crop-producing land has high value and tends to be maximally utilized.

While there may be other supply-side resource constraints, such as access to water, properly offsetting land demands is usually the most important factor to consider when developing an I-O analysis based on expanding local and regional food production. The process is admittedly less straightforward when under-utilized land is brought into production or reclaimed, making it more difficult to properly assign opportunity costs. For example, if prevailing area use values reflect systematic disinvestment or widespread blight, land utilization costs might simply reflect the costs of acquisition and readying the land for production. The same can be said for abandoned or fallowed rural land that has production potential or is otherwise being used sub-optimally. It is generally the case that the current use of the land represents the opportunity cost, but it certainly should be remembered that the current use of the land also provides a strong signal as to the land's production potential.

60 The Conservation Reserve Program (CRP) is administered by the Farm Service Agency (FSA) of the USDA. Farmers enroll in the program and receive rent payments by agreeing to remove environmentally sensitive land from agricultural production. The CRP enrollments are 10-15 years in length. CRP's main objective is to re-establish valuable land cover to help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat.

## Case Study: Local Food Land Requirements

Two studies conducted in the Midwest demonstrate the economic impacts of the small amount of land required for expanded local foods production. The first study helps us understand how much land is required to supply a comparatively large population of consumers. It was based on production and consumption estimates for 28 types of fruit, melon, and vegetables across 7 States in the upper Midwest. After adjusting for existing consumption patterns, duration of growing season, the storage life of the crops, and land productivity, the study determined it would take 195,669 acres to grow 100 percent of the seasonal produce demanded by 35.6 million persons residing in the Midwestern metropolitan market targets. To put that increase in local foods acreage into perspective, 195,669 acres represented less than 1 percent of all cropland in Iowa, just one of the seven Midwestern States evaluated in the study.[61]

The second study examined the economic impact value of land resource constraints for Kane County, IL.[62] This example makes clear the process of netting out countervailing effects in compiling economic impacts; it is a more localized example of an exurban area producing for existing regional and nearby dense urban demand. Kane County sits in the western portion of the greater Chicago-Naperville-Joliet consolidated metropolitan region. With current and projected growth in urban development raising concerns about the loss of farmland within the region, regional planners requested an evaluation of the economic and farmland preservation potential of local foods development. Like the broader Upper Midwest study discussed above, this research considered regional demand for fresh fruits and vegetables as well as regional production potential. It considered existing fresh fruit and vegetable production in the county along with feasible growth in the demand for locally produced food by residents. The research also evaluated demand from potential consumers in surrounding metropolitan areas in terms of their distance from Kane County.

Area planners and Extension professionals agreed on a bundle of 24 fresh fruits and vegetables that they felt could be competitively marketed regionally. Yields per acre were initially estimated with the Iowa Fruit and Vegetable Market Planner decision tool.[63] These values were then adjusted to land productivity differences between an Iowa baseline county and Kane County. Subsequently, shifts in cropland acreage required to meet local (seasonally adjusted) demand were derived from regional population and yield forecasts.

Table 6.1 lists the initial output and land requirements. The study determined that to serve a regional population of 445,328 people, 2,157 acres of fruit and vegetable production would be required (with a wholesale value of $9.45 million). As the county already had 1,252 acres in vegetable and orchard production, only 905 additional acres of production would be needed to satisfy total regional demand during the produce harvest season (assuming the production from the 2,157 acres would only be sold regionally).

61 Swenson, David. *Selected Measures of the Economic Values of Increased Fruit and Vegetable Production and Consumption in the Upper Midwest*. Leopold Center for Sustainable Agriculture, Iowa State University, 2010. Found at: http://www.leopold.iastate.edu/sites/default/files/pubs-and-papers/2010-03-selected-measures-economic-values-increased-fruit-and-vegetable-production-and-consumption-upper-mid.pdf.

62 Swenson, David. *The Economic Contribution Potential of Local Foods Production in Kane County, Illinois*. Department of Economics Report, Iowa State University, 2013, see: http://www.econ.iastate.edu/sites/default/files/publications/papers/p18114-2013-05-19.pdf.

63 This tool allows for "what-if" planning for crop production by commodity based on place-specific, empirically determined yield estimates and area consumption expectations, see: http://www.intrans.iastate.edu/marketplanner/.

**Table 6.1: Kane County Fruit and Vegetable Market Potential and Production Factors**

| | |
|---|---|
| Competitively served regional population | 445,328 |
| Acres required to meet seasonal fresh fruit and vegetable demand | 2,157 |
| Farm value in $2011 | $ 9,452,705 |

*Source: Swenson (2013).*

For convenience in modeling, the 905 acres needed for this expanded production transition were rounded up to 1,000 acres of new vegetable and orchard production, representing just a 0.7 percent greater share of the nearly 149,000 acres of total cropland in the county. Using a county-specific I-O model adjusted for expected fruit and vegetable production costs for Kane County farmers, total fruit and vegetable production economic impacts were compiled, as were the offsetting opportunity costs of shifting production away from conventional cropping. Existing county production statistics indicated that 62 percent of the removed land would be in corn production and the remaining 38 percent in soybean production. Subtracting the economic impact of gain in vegetable acres by the economic impact of the loss in corn and soybean acres (i.e., evaluating the shift of the use of 1,000 acres) yielded estimates of net economic gains to the regional economy.

Table 6.2 shows the results. New fruit and vegetable production on 1,000 new fruit and vegetable acres would have generated $6.88 million in total output once all direct, indirect, and induced activities were included. Of this amount, $3.14 million consisted of value added, and $2.1 million consisted of increased labor income for a total of 48 workers. However, the simultaneous contraction in conventional commodity farming output would lead to a direct, indirect, and induced reduction in economic activity of $1.58 million. Value added would decline by $708,257, and 13 total jobs ($338,500 in income) would be eliminated. Taking these countervailing effects into consideration, the 1,000 acre shift into produce acreage could still be expected to yield a $5.3 million net increase in total industrial output, a $2.43 million net increase in value-added, and a $1.8 million net increase in labor income based on 35 new (net) jobs in the county.

**Table 6.2: Opportunity Costs Per 1,000 Acres of Conventional Kane County Crop Land Converted to Fruit and Vegetable Production**

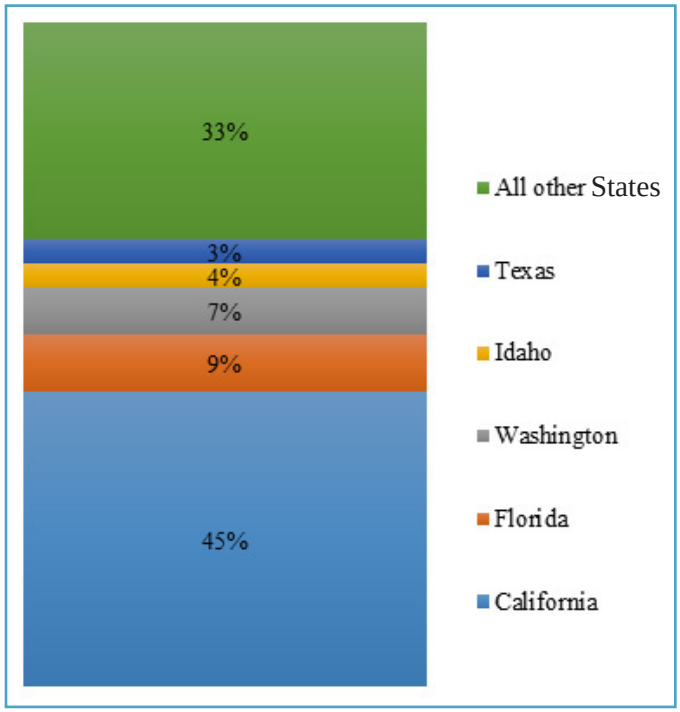
| | Corn and Soybean Production | Fruit & Vegetable Production | Net Difference |
|---|---|---|---|
| Output $ | -1,576,895 | 6,883,822 | 5,306,927 |
| Value added $ | -708,257 | 3,141,300 | 2,433,043 |
| Labor income $ | -338,500 | 2,101,708 | 1,763,208 |
| Jobs | -13 | 48 | 35 |

*Source: Swenson (2013).*

Local foods production can offset demand for fruits and vegetables produced in areas with production advantages that have evolved as dominant national suppliers established their supply chains. Even though two-thirds of the Nation's fruits and vegetables are currently grown in California, Florida, Washington, Idaho, and Texas, as illustrated in figure 6.5, a meaningful shift to locally grown fruits and vegetables in other areas could affect those and other regional export-oriented agricultural economies.[64]

This raises the "beggar-thy-neighbor" dilemma where localized gains come at the expense of other regions. In classical economic terms, everyone becomes worse off if this behavior is carried to its extreme because the benefits of comparative advantage in trade are thwarted when everyone acts only to maximize local production. That is an issue to be acknowledged in the grand scheme, but local foods production in the U.S. is governed by highly variable levels of local demand. As price is a key component to local demand, there are limits to how effectively local producers can compete with regions with clear production advantages even if premiums for locally sourced food exist. Additionally, in an era of unpredictable water availability, maximizing local production in certain parts of the country may not be realistic or optimal.

**Figure 6.5: Fruit and Vegetable Production Acres by State, 2012**




***Source: Boys & Hughes (2013).***

Nonetheless, the degree to which local production replaces imported goods from other regions of the country has been used as a major economic development selling point to justify policy and program creation at the local, State, and Federal levels. Producing locally – that is, substituting local production for historical imports from other States or countries – generates multiplier-based net gains in regional economic output. While local foods production in the short run will often yield net new jobs and incomes, the actual or potential regional gains must be measured reliably and realistically. First, existing local foods production and consumption must be measured so that a regional baseline is declared. Economic impacts must reflect net regional gains in local foods productivity, rather than the gross numbers commonly shared in studies. Next, realistic growth scenarios must be established. These scenarios must consider realistic capacities to both produce and to consume. As such, reasonable growth scenarios must not discount climatic limitations, economics, available infrastructure, and consumer preferences in determining production potential. National annual yield averages, for example, do not apply to the Midwest given their overall growing season and other natural constraints, notwithstanding their abundance of superior soils. Additionally, land productivity is much lower in many temperate areas of the U.S. than in areas that currently specialize in fruit and vegetable production because the temperate areas have poorer soil qualities and are subject to pest infestations. There are also large areas of the U.S.

64 See, for example, Boys, K. A. and D. W. Hughes. "A Regional Economics Based Research Agenda for Local Food Systems." *Journal of Agriculture, Food Systems, and Community Development* 3(4):1-6. Also, when one region's actions are detrimental to another's, as is the case with local foods production, there is the potential for retaliatory actions from exporting regions, though none have been evidenced as yet.

where low population densities simply cannot support the demand needed for profitable local or regional food markets. Finally, it is necessary to initially establish local food demand potential from existing evidence of what residents actually eat, not what researchers or advocates think they should eat. All of these considerations need to be factored into credible studies. Once a region's growth potential has been determined, then economic impacts can be calculated with properly specified I-O models that reflect the production costs of the local foods sectors and the expected gross changes to the regional economy.

## Local Opportunity Cost of Direct Farm Marketing Channels

In the scenarios previously discussed in this module, the I-O modeling process focused on changes in the size of local food acreage. However, these studies stopped at the farm gate, with no attention to other stakeholders in the food supply chain who might lose or gain. Net gains were simply measured on the assumption that farmers in the scenario sold their merchandise directly to wholesalers. In the next segment of the module, we attempt to more closely mirror real-world conditions by considering other important regional offsets, such as when producers directly market their crops to household consumers and alter demand for retail, wholesale, and other distribution services. When farmers directly market a portion or all of their crops, additional offsets to regional growth must be factored into conclusions about regional economic gains for accuracy's sake.

Let us consider a simple example regarding how to evaluate the opportunity cost of a local food system using purchases from a farmers market and making specific assumptions regarding the local opportunity cost of such purchases. We will use $1 dollar of spending on locally grown produce as our example. To model the impact of that spending, we will conceptually multiply the $1 dollar through the I-O based multiplier table, showing the resulting change in economic activity throughout the local economy.

To fully understand this scenario, we must first understand the concept of margining in I-O models (see Case Study on page 92). To examine the concept of margining as it applies to local food systems, we will look at $1 dollar's worth of spending on produce purchased at a local grocery store by a local household. When we examine that one dollar of spending, we see that it includes portions that go to transportation, wholesale, and retail services and to the actual produce growers. We can assign various parts of this retail dollar to each of these activities. In our example, we can assume $0.40 goes to the grower, $0.20 to transportation, $0.10 to wholesale, and $0.30 to retail (grocery stores are obviously an important component of food retail).[65]

65 In the current version of IMPLAN, the margin sectors are 319 wholesale trade businesses, various retail trade sectors 320-331 including retail trade food and beverage 324 (grocery stores mostly), and various transportation sectors 332-335. Of course, the actual impact scenarios are also somewhat more complicated than what is presented here. For more detail see: Hughes, D. W., Brown, C., Miller, S., & McConnell, T. (2008). "Evaluating the economic impact of farmers markets using an opportunity cost framework." *Journal of Agricultural and Applied Economics*, 40(1), 253-265. http://purl.umn.edu/45523.

## Case Study: What Is Margining?

Within an I-O framework, the Bureau of Economic Analysis defines the margin or margin costs as the value of the wholesale and retail trade services provided in delivering commodities from the producer to the purchaser. The margin is calculated as sales receipts less the cost of goods sold, and consists of the trade margin plus sales taxes and excise taxes collected by the trade establishment.

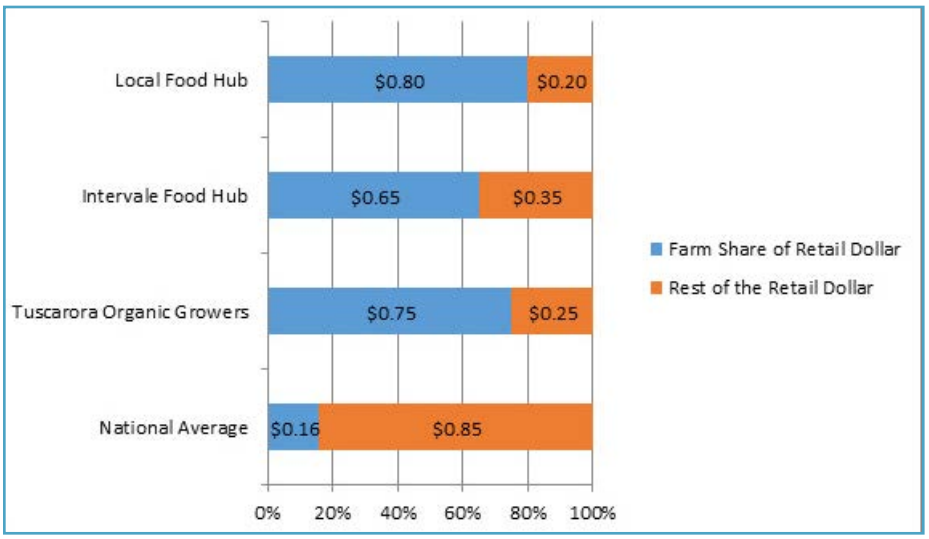
Margining in I-O models is required because commodities (goods) physically and functionally move or are sold through a set of marketing channels, specifically transportation, wholesale, and retail marketing channels. In fact, for most goods, the interface with the final consumer (buyer) is completely at the retail level. For example, we purchase gas for our car, and that gas is based on a whole series of transformations and movement of petroleum from the mining, processing, transportation, wholesale, and retail sectors. As consumers, we never interact directly with oil producers in a physical sense, but purchase the gas from a retail business. In fact, many, if not most, goods are bought and sold in this manner (i.e., with the final transaction occurring via the retail sector, as opposed to market transactions between buyer and the actual product maker.) Margining expenditures at the retail – or the final consumer – level allows the I-O model to represent the true functional relationship between producers and consumers. In this manner, consumers are characterized as purchasing goods directly (in a functional sense) from sectors such as manufacturing and agriculture. But in applying the concept, we also allocate certain portions of the retail dollar to appropriate "margin" sectors.

Now think of the same $1 of spending on produce as occurring at the local farmers market. In this case the marketing functions (transportation, wholesale, and retail) are all part of the farmer's distribution costs. That is, the farmer provides all or most of these marketing functions (figure 6.6 portrays a hypothetical situation in which the farmer provides all marketing functions). A small portion of the total spending could be allocated to the farmers market manager/operator. Given these changes in farmer responsibility (i.e., assuming additional supply chain functions), changes in the farm sector model coefficients may also be required to represent changed shares of expenditures. In fact, one of the primary motivations for promoting local food systems is that farmers receive a much greater share of the food retail dollar in such systems than in conventional food marketing channels where local produce is sold directly to a wholesaler (see figure 6.7).[66]

**Figure 6.6: Breakdown of $1 Spending on Produce, Farmers Market vs. Grocery Store**

66 Source: Diamond, Adam, Debra Tropp, James Barham, Michelle Frain Muldoon, Stacia Kiraly, and Patty Cantrell. *Food Value Chains: Creating Shared Value to Enhance Marketing Success*. U.S. Dept. of Agriculture, Agricultural Marketing Service, May 2014. Web. <http://dx.doi.org/10.9752/MS141.05-2014>

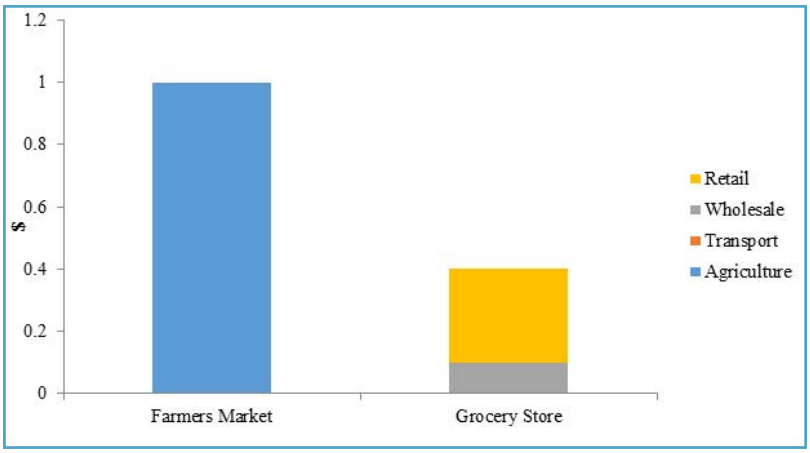
### Figure 6.7: Farm Share of the Retail Dollar in Conventional Food Marketing Channels Compared to Select Local Food Channels




***Source: Diamond et al. (2014).***

### Figure 6.8: Division of $1 Spending on Produce, Farmers Markets vs. Grocery Store

### Figure 6.9: Difference in the Direct Impacts From $1 of Spending at a Farmers Market Compared to at a Grocery Store




How does this hypothetical spending pattern relate to the opportunity cost of local food systems? To see this relationship, we now reexamine our graph in terms of where such activities occur (see figure 6.8). We assume, for now, that the produce grower is not local and that a non-local set of businesses provides the transportation. But we also assume that the wholesale sector is entirely local and, obviously, the retail portion is local (since the purchase is from a local grocery store).[67] Based on our scenario, the $1 dollar in spending has an opportunity cost in the local economy of $0.10 in reduced sales for wholesale activity and $0.30 in reduced sales in retail activity. The local direct impacts are shown in figure 6.8 for both the farmers market and the grocery store.

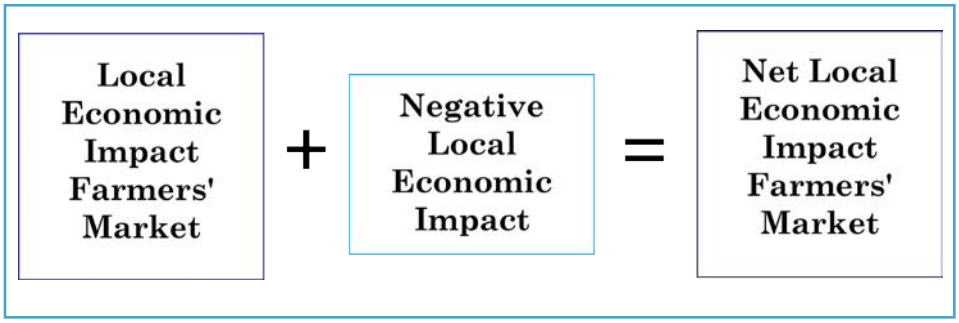
How do we appropriately evaluate the economic impact in our local economy? Figure 6.9 shows the spending by the farmers market as a direct impact on the local farm sector. It illustrates the hypothetical difference in the direct impacts from $1 of spending at a farmers market compared to at a grocery store. Recall that this is important as the final (total output) impact is calculated as the direct + indirect + induced impact, and is based on the strength of local linkages throughout the local economy.

67 The store does not have to be locally owned; rather, the goods in question just have to be locally provided (meaning the store would use locally-provided inputs, including local workers.)

Finally, the net impact of the farmers market purchases on the local economy is illustrated in figure 6.10 and constitutes the positive local economic impact of increased farmers market purchases plus the negative impact of that same spending due to the opportunity cost of lost direct activity in the wholesale and retail sectors (we add these figures together rather than subtracting the opportunity cost portion because the opportunity cost is already reported as a negative value). Note that the net economic impact of increased farmers market activity is still positive, but is reduced from the level that existed before opportunity costs were taken into account.

One of the many advantages of using I-O models to calculate the net economic impact of local food activities is the level of detail concerning the local economy that such models are able to contain. For example, an IMPLAN-based model of a local economy can contain up to 536 economic sectors on the supply side. We can examine the "winners" and "losers" associated with various local and regional food system initiatives or policies when we account for opportunity costs. Through awareness of the policy "winners" and "losers", economic developers and policymakers can work to craft incentives that minimize losers and maximize winners, depending policy goal.

**Figure 6.10: Net Economic Impact on Local Economies of Sale at Local Farmers' Market**




## Case Study: Evaluating the Economic Impact of Food Hubs including Opportunity Cost

*Regional Access Picking up Beef from Maple Avenue Farm, Earlville, NY.*

Schmit et al. (2013)[68] conducted a very interesting extension of this concept in examining the opportunity cost of a food hub's sales through traditional wholesale firms. They estimated the degree to which a food hub could take demand away from other components of the food system in general through reduced purchases by grocery stores and other business buyers. Their analysis indicates that half of the food hub's customers diverted purchases from other sources due to the availability of food hub products. Accordingly, they calculated the opportunity cost to be 11 percent of the original food hub economic impact.

68 Schmit, T.M., B.B.R. Jablonski, and D. Kay. 2013. *Assessing the Economic Impacts of Regional Food Hubs: the Case of Regional Access*. Cornell University. <http://dx.doi.org/10.9752/MS145.09-2013>

## Takeaways

Local, State, and Federal policymakers are increasingly being asked to support the development of infrastructure or consider changes in policies with regard to local food systems. Advocates are, of course, pushing for such changes. We can glean a number of lessons for local food system advocates and local policymakers to use in evaluating the potential economic impact of a given local food system project.

- Opportunity costs are important. Too often, economic impact studies of local food systems fail to take into account countervailing effects or opportunity costs. However, researchers and members of local food system assessment teams should always keep those concepts in mind when evaluating the results of such studies. The bottom line is that actual benefits may be smaller than projected benefits.

- Remember the assumptions upon which I-O models are based; in particular, the fixed price and lockstep production assumptions discussed here and in module 5. Lockstep production assumptions imply that changes in input use correspond perfectly with changes in output; i.e., if output increases by 50 percent, for example, the use of inputs will also increase by that amount. Such assumptions mean that model results should be evaluated with care because they may not always represent economic reality.

- Local food system impact studies that account for opportunity cost from the demand side or countervailing effects from the supply side can point out possible winners and losers as such systems develop. This provides information concerning why certain sectors could oppose the growth of local food initiatives, or, if the impact is small, such information might be used to alleviate fears with respect to opportunity costs. This may also present an opportunity to bring together representatives from different sectors to craft policies that minimize "losers."

# Module 7 — Advanced IMPLAN Analysis to Understand the Economic Impact of Local Food System Initiatives

Module 7 is the most technical module and is recommended for users with expertise in the field of economic I-O modeling (I-O), or who have recruited a partner with such expertise to their team. This module provides technical and detailed information on how to adjust the default settings and create a modeling environment that is more directly reflective of conditions in your community or region using the software program IMPLAN. In this module you will learn:

- Why your team might want to modify IMPLAN for your economic impact study
- How to modify IMPLAN
- The data you will need in order to modify the model
- Modeling approaches for your impact assessment.

The content of this module is appropriate at the stage of your project when your team has:

- Defined its scope, specific goals and objectives, timeframe, available resources, and regional boundaries (module 1)
- Collected requisite primary and/or secondary data (module 2 for secondary data and module 3 for primary data)
- Involved a technical expert who has a thorough understanding of the terminology and limitations of I-O models, advanced training on conducting an economic impact assessment, and knowledge of its limitations (module 5)
- Considered how to carefully reflect opportunity costs and countervailing effects into your modeling efforts (module 6).

The proper use of I-O models is key to performing rigorous analysis of local food system activities because they provide such a data rich starting point. Nevertheless, as discussed in module 6, conducting a careful and comprehensive local food system assessment usually involves making several additional adjustments to the default modeling systems, such as:

- Scrutinizing the default baseline data that are contained in the model;
- Modifying existing data where appropriate;
- Amending assumptions about relationships among sectors in the model;
- Manually introducing missing or new sectors into the economy, if needed; and
- Distinguishing between gross economic effects and net effects in your evaluation.

Although these steps can be challenging and time-consuming, they are necessary to create a depiction of your community or region informed by your initial community-based conversation and planning efforts (as discussed in module 1).

The purpose of this module is to provide guidance on how to conduct more advanced analyses with IMPLAN software, so that you can adjust the default settings and create a modeling environment that is more directly reflective of conditions in your community or region. The more advanced the analysis, the more careful you should be in selecting a team member or recruiting an expert that has experience in customization, understands the drawbacks and caveats of this work, and knows the importance of transparency in sharing assumptions and methodologies. Though there are other types of software available for this type of analysis,[69] IMPLAN is widely accepted among economists and other economic development professionals and is the most commonly used, in large part because of the ease with which modifications can be made to the model. The content of this module assumes that you are familiar with

69 For example, RIMS II, available from the U.S. Department of Commerce, Bureau of Economic Analysis, as well as more advanced modeling tools (i.e., General Algebraic Modeling Systems, GAMS, which facilitates computable general equilibrium modeling – more advanced than I-O in that it allows for the endogenizing of prices)

### Case Study: Positive Net Economic Impacts Occur When the Local Economy:

- Can rely on local production to offset or substitute for commodities that must be fully or partially imported – economists refer to this as import substitution (see Module 5 for additional explanation)
- Can produce sufficiently more than local demand requires and can **export** the remainder
- Increases its share of locally-controlled and governed food production enterprises compared to non-local ownership, while the share of economic activity already associated with the local food sector also grows (e.g., ownership income remains in the local community instead of flowing to distant shareholders).

In the absence of these factors, changes from one kind of intra-local activity to another intra-local activity (i.e., purchases from a local distributor to purchases from a local farmers market) do not produce net economic impacts in the near-term.

IMPLAN software and databases (for a basic overview of I-O models and IMPLAN's economic analysis structure and capacities, please see module 5 or refer to IMPLAN's website, http://implan.com).

The techniques presented in this module incorporate additional data and information from primary and secondary sources. While modules 2 and 3 introduced and explained the wide variety of data that are available or can be collected, this module will illustrate how much richer your economic analysis can be when those data are brought to bear on important community economic priorities. While time-consuming to compile, the information can be used effectively to assess the impacts of food system activities; in particular, such additional data are useful when computing the value of inter-industry linkages within the local economy as a result of expanded final demand for local goods and services.

Note that IMPLAN can be used to conduct both economic impact assessments of food system initiatives or activities, as well as to estimate the economic contributions of local food systems to the local economy. There are important differences between the two. Contribution analysis measures the gross changes in a region's existing economy that can be attributed to a given industry, event, or policy. In contrast, impact analysis examines the net (marginal) change in new (or foregone) economic activity associated with an industry, event, or policy change in an existing regional economy.[70]

## Why Might We Need to Modify IMPLAN for Local Food System Impact Assessments?

To conduct a robust economic impact analysis, you need to have information about industry linkages both within and among industrial sectors of an economy. Fortunately, IMPLAN provides a considerable amount of this information in its basic format. Using predominantly public data from national sources to create a national table of accounts, IMPLAN offers a comprehensive set of balanced Social Accounting Matrices (SAMs) for every county and State in the United States.[71] These SAMs illustrate a relatively complete picture of the economy, accounting for all expected inter-industry transactions as well as transfers to and from institutional sectors like households, capital, governments, imports, and exports.

IMPLAN's SAM will account for within-region transactions among industries and households. When processed using standard I-O protocols, the SAM yields multipliers that describe how

70 For more information of the distinctions between economic impact assessment and contribution analysis, please see: Watson, P., J. Wilson D. Thilmany, and S. Winter. 2007. "Determining Economic Contributions and Impacts: What is the difference and why do we care?" *The Journal of Regional Analysis and Policy*. 37:2.

71 IMPLAN data come largely from Federal sources, including: the U.S. Bureau of Economic Analysis' Regional Economic Accounts, the U.S. Census Bureau's County Business Patterns, National Household Personal Consumption Expenditures, the Annual Survey of Manufacturers, and the USDA's National Agricultural Statistics Service (IMPLAN Group, LLC 2013).

the supplying sectors respond to industrial changes (the indirect effects or the type I multipliers) and how the total economy, including households, respond to industrial changes (the indirect plus the household or induced effects yield type II multipliers). The SAM contained within IMPLAN, then, approximates both within-region industrial transactions and the relationship of the region to the rest of the world.

As explained in more detail in module 5, IMPLAN displays the entire U.S. economy in 536 sectors. The primary economic sectors that pertain to aspects of food and agriculture in the default settings include:

- Oilseed farming and grain farming
- Vegetable and melon farming
- Fruit farming and tree nut farming
- Greenhouse, nursery, and floriculture production
- Tobacco farming, cotton farming, and sugarcane and sugar beet farming
- All other crop farming
- Cattle ranching and farming (meat)
- Dairy cattle and milk production
- Poultry and egg production
- Animal production (excluding cattle/poultry/eggs)

Each IMPLAN industrial sector is represented by a single, initially fixed expenditure pattern, which economists refer to as a production function, a mathematical expression that relates the quantity of inputs required to produce that industry's resulting output.[72] An example from IMPLAN is provided in figure 7.1, which lists the top 10 intermediate outlay categories for vegetable and melon production in Iowa out of a possible 536 categories of commodity requirements. The sum of all input coefficients plus those for payments to value added equals 1.0. Consequently, they can be interpreted to mean that for each $1 of output change in vegetable and melon farming, that sector required an additional $.051 in agricultural support activities, nearly $.018 in agricultural chemicals, and so on.

To reiterate, the complete expenditure pattern reflects how, on average, each industry sector spends money on:

- Other sectors in the local economy (intermediate purchases)
- Employee compensation, proprietor income such as returns to business owners,

**Figure 7.1: Sample Vegetable and Melon Farming Sector Production Function**

| Commodity Code | Commodity Description | Coefficient |
|---|---|---|
| 3019 | Support activities for agriculture and forestry | 0.050965 |
| 3172 | Pesticides and other agricultural chemicals | 0.017660 |
| 3395 | Wholesale trade distribution services | 0.013922 |
| 3156 | Refined petroleum products | 0.010476 |
| 3003 | Vegetables and melons | 0.009820 |
| 3170 | Phosphatic fertilizer | 0.009519 |
| 3169 | Nitrogenous fertilizer | 0.008667 |
| 3440 | Real estate buying and selling, leasing, managing, a... | 0.008388 |
| 3062 | Maintained and repaired nonresidential structures | 0.006948 |
| 3262 | Farm machinery and equipment | 0.005949 |

***Source: IMPLAN***

72 For an in-depth discussion of how production functions are constructed within IMPLAN, see Lazarus, W., D. Platas, and G. Morse. 2002. "IMPLAN's Weakest Link: Production Functions or Regional Purchase Coefficients." *The Journal of Regional Analysis & Policy*. 32(1):33-49, and Liu, Z., and M. Warner. 2009. "Understanding Geographic Differences in Child Care Multiplers: Unpacking IMPLAN's Modeling Methodology." *The Journal of Regional Analysis & Policy*. 39(1):71-85.

other property type income such as payments to investors, and indirect business taxes like sales taxes (i.e., value added payments)[73]

- Other sectors outside of the local economy (i.e., intermediate imports)
- Other sources such as institutional outlays (i.e., payments to households, capital, or governments).

As you might imagine, this assembly of industry data constitutes a very rich starting point for analysis, even if you need to modify the model to more accurately reflect the region of interest. The challenge with using IMPLAN data derived from national averages is that industry sector information is available only on an aggregate basis for an entire commodity- or industry sector, which often limits the extent to which local food system activities can be accurately analyzed. Unfortunately, much of the current research literature attempts to quantify the impact of local food systems using expenditure patterns for aggregated sectors, such as all vegetable and melon farming in the targeted region, thereby making the implicit assumption that the purchasing and sales patterns of local food system participants (both farmers and other value-adding businesses in the region) are the same as those in the aggregated commodity sectors.[74] Yet, there is ample evidence that farmers and value-added businesses participating in local food systems interact differently with the local economy than is reflected by the relevant aggregated sector data available from IMPLAN. For example, data from U.S. Department of Agriculture's Agricultural Resource Management Survey demonstrate that the majority of farms participating in local and regional food system markets are small and mid-scale,[75] and that these producers have different input requirements per output of production.[76] Likewise, by definition, many of the value-adding businesses that have emerged to meet the demand for local food – i.e., food hubs, local food aggregation and distribution businesses – are likely to purchase a greater share of their inputs locally, direct from farm-suppliers, than is reflected in the applicable sectors.[77]

73 Value added components together can be thought of conceptually and literally as representing the dollar value the business adds to the inputs of goods and services that it must purchase from other businesses in the process of producing its own output. As noted, value added is primarily distributed via the payments out of revenues that go to owners, workers, investors, and government. Value added by a business is measured in practice as the difference between the total value in the market (revenues received for product sales) and the payments to other businesses for the inputs it must purchase from them.

74 Note that there are a few studies that do disaggregate local food producer sectors. For example, Gunter and Thilmany (2012) utilized a combination of survey data and National Agricultural Statistics Service data to create a customized farm-to-school farm sector within IMPLAN, reflecting differential production function of farm-to-school producer participants. Schmit et al. (2013) collected detailed expenditure and sales data from farms in New York selling product to food hubs, and show that these farms have different spending patterns than depicted in the default agricultural sector data in IMPLAN, including more local purchases per unit of output. Swenson's (2011) study is the only of its kind focused on local food system infrastructure. His research on the small-scale meat processing sector in Iowa demonstrates differences in expenditure patterns based on the scale of operation.

75 See: Low, S.A., and S. Vogel. 2011. *Direct and Intermediated Marketing of Local Foods in the United States*. ERR-128. Washington, D.C.: U.S. Department of Agriculture, Economic Research Service. Available at: http://www.ers.usda.gov/Publications/ERR128/

76 Examples include: Boys, K.A. and D.W. Hughes. 2013. "A Regional Economics-Based Research Agenda for Local Food Systems." *Journal of Agriculture, Food Systems, and Community Development* 3(4):145–150; Jablonski, B.B.R. and T.M. Schmit. 2014 'Local' producers' production functions and their importance in estimating economic impacts. Working Paper 14-15. Dyson School of Applied Economics and Management, Cornell University; King, R., M.S. Hand, G. DiGiacomo, K. Clancy, M.I. Gomez, S.D. Hardesty, L. Lev, and E.W. McLaughlin. 2010. *Comparing the Structure, Size, and Performance of Local and Mainstream Food Supply Chains*. ERR-99. U.S. Department of Agriculture, Economic Research Service.

77 According to how these intermediaries are modeled within the IMPLAN framework, their inputs are actually only marginally different from other systems. This is due to the fact that when modeling wholesalers and retailers, we actually ignore the cost of goods sold and model the margins.

## Case Study: Assessing the Economic Impacts of Local Food System Producers by Scale

In a study of local food system producers in New York, researchers used primary data to modify IMPLAN in order to estimate the local economic impact of small- and medium-scale agricultural producers with direct farm sales compared to other agricultural producers. A team of researchers from Cornell University worked with extension agents from an 11-county region to collect expenditure and sales information from small and mid-scale producers that used direct to consumer marketing channels (labeled the SDA sector in table 7.1).

The primary data demonstrated that small- and medium-scale direct agricultural producers have different expenditure patterns than other agricultural producers, both in terms of what they purchase and the percentage of purchases in the local economy. Using this data, the study created two agricultural sectors from the default agricultural sector in IMPLAN, one for small- and mid-scale farms that participate in direct marketing channels and one for all other producers. The different expenditure patterns of these two groups resulted in different economic impacts. The team found that whereas the SDA sector had higher associated employment and labor income multipliers compared to the non-small direct agriculture (NSDA) sector, the NSDA sector had larger total output and value added multipliers. The results underscore the importance of collecting appropriate data and modifying IMPLAN to outline the economic impacts of small- and medium-scale local food system participants on the local economy.[78]

**Table 7.1: Multipliers for the Default Agriculture, Small Direct Agriculture (SDA), and Non-Small Direct Agriculture (NSDA) Sectors[79]**

| | Model 1 | Model 2 | |
|---|---|---|---|
| Multiplier | Default | NSDA | SDA |
| Employment | 1.53 | 1.50 | 1.73 |
| Labor Income | 1.76 | 1.81 | 1.84 |
| Total Value Added | 2.32 | 2.47 | 2.12 |
| Output | 1.90 | 1.94 | 1.87 |

*Source: Schmit, Jablonski & Mansury (2013).*

78 For more information, see: Schmit, T.M., B.B.R. Jablonski, and Y. Mansury. 2013. "Impacts of Local Food System Activities by Small Direct-to-Consumer Producers in a Regional Economy: A Case Study from Upstate NY." *Working Paper 13-16*. Dyson School of Applied Economics and Management, Cornell University.

79 Capital District Region, New York State, 2010

From the examples cited previously, you can see how developing a better understanding of the purchasing and sales practices of local food system participants is a vital step in quantifying their local economic impacts, as well as allocating these impacts properly across sectors. By augmenting the IMPLAN database with the data needed to construct new sectors, and/or modify existing sectors, you can more accurately reflect the local economic impacts of local food system initiatives and participants. This will help local officials and community stakeholders design targeted programs and policies that accurately take local economic conditions and distribution effects into account.

The rest of this module outlines best practice approaches to customizing IMPLAN and how to adjust the default features within the IMPLAN model to more accurately reflect local food system activity. Rather than providing a step-by-step guide, we have elected to present a few examples of the ways in which researchers have successfully transformed default IMPLAN modules for local food research needs.

## Customizing a "Local Food Farm" Sector

Understanding how farmers who sell through local food markets interact with other sectors of the economy is important in improving the precision of a local food system impact assessment. Since local food system policies and interventions are often explicitly designed to support the viability of local, smaller-scale farming, many researchers, practitioners, and policymakers are acutely interested in understanding the precise impacts resulting to this industry sector.

Within IMPLAN, there are 14 sectors related to agricultural production. In many cases, however, farms participating in local food systems are smaller, more diversified, and assume additional supply chain functions – e.g., doing their own marketing, processing, and distribution – compared to the average farms represented in the default IMPLAN agricultural sectors. Since the data in the basic IMPLAN model represent the weighted average values of production characteristics of the most common agricultural producers in a study area, the production functions may not accurately reflect the structure of the local food supply chain. To account for expected variations when focusing on local foods producers and distributors, several studies modify the default IMPLAN model by creating a new local food farm sector.[80] Please note that such a modification is only a valuable exercise if it accurately reflects *new* economic flows not already accounted for within the local farm economy and the related IMPLAN database.

## Data Needs for Sector Modification

You can easily add new sectors to IMPLAN by finding one that is unpopulated in the local economy. In many parts of the U.S., for example, there is no tobacco grown and thus the tobacco farming sector can be used for this purpose. This sector can be renamed and populated with information to more accurately

80 See: Gunter, A. and D. Thilmany. 2012. "Economic implications of farm to school for a rural Colorado community." *Rural Connections: A Publication of the Western Rural Development Center*, 6(2): 13-16 Haynes, M. 2010. *Farm-to-School in Central Minnesota - Applied Economic Analysis*. Minneapolis, MN: Center for Urban and Regional Affairs, University of Minnesota. Available at: http://www.cura.umn.edu/publications/catalog/cap-144; Schmit, T.M., B.B.R. Jablonski, and D. Kay. 2013. *Quantifying the Economic Impacts of Food Hubs*. Cornell University. http://dx.doi.org/10.9752/MS145.09-2013; Schmit, T.M., B.B.R. Jablonski, and Y. Mansury. 2013. "Impacts of Local Food System Activities by Small Direct-to-Consumer Producers in a Regional Economy: a Case Study from Upstate NY." *Working Paper 13-16*. Dyson School of Applied Economics and Management, Cornell University.; and Swenson, D. 2006. *The Economic Impacts of Increased Fruit and Vegetable Production and Consumption in Iowa*: *Phase II*. Ames, IA: Iowa State University, Leopold Center for Sustainable Agriculture. Available at: http://www.leopold.iastate.edu/pubs-and-papers/2006-05-fruit-and-vegetable-production-phase-two

reflect the local food farm sector. Given that this new sector starts out empty, it must be populated with data. Those new data can come from primary research (your interviews of local producers, for example), secondary research, or through creative modification of existing production functions in the IMPLAN model altered to represent production scenarios or scales different than the default average values. The reality is that sometimes key expenditures must be imputed.

Although some data exist from secondary sources that you can use to modify IMPLAN, in many cases, you will need to augment available data sources by collecting additional information from the food system businesses you are modeling (i.e., farmers, food hubs, buyers). The goal of the primary data collection is to come up with an average local food farm expenditure profile that can then be increased by the total number of farms in the study area to create the local food farm sector within the IMPLAN model. We warn you at the outset that this is not an easy task to accomplish. Modifying the IMPLAN model based on data from non-generalizable surveys or incomplete population enumerations may not yield results based on sound regional industrial accounting. Therefore, it is important to ensure that such surveys are as representative of the targeted local producer or processor population as possible. Relying exclusively on convenient sources of data, such as a small sample of program participants or advocates, will likely be inadequate in documenting operational costs fully and can lead to economic distortions when those data are run through I-O models. For more information on primary data collection and rigorous survey techniques, see module 3.

## Customizing IMPLAN

This next section outlines the basic information you need to know in order to make appropriate customized changes within IMPLAN software.[83]

### Case Study: Imputing Key Expenditure Items into IMPLAN to Create Alternative Production Functions

In the absence of primary data on employee compensation expenditures for farms that participate in farm-to-school programming in Colorado, Gunter and Thilmany (2010)[81] used an average of the percentage of employment from the food and beverage retail sector and the vegetable, melon, and fruit farming sector when they created a new "farm-to-school producer" sector in IMPLAN. They made this decision based on the assumption that the average farm-to-school agricultural producer likely grows and sells his or her own products, and thus they wanted to capture the assumed marketing activities as a proxy for retained transaction costs. Likewise, Hughes et al. (2008)[82] modified the default value added components in the relevant agricultural sectors within IMPLAN to reflect that most farmers selling at West Virginia's farmers markets were small and had a non-corporate structure. In their economic impact assessment they increased payments to proprietor's income and reduced payments to other property type income.

81 http://coloradofarmtoschool.org/colorado-farm-to-school-task-force/.
82 Hughes, D.W., Brown, C., Miller, S., and McConnell, T., 2008. "Evaluating the economic impact of farmers markets using an opportunity cost framework." *Journal of Agricultural and Applied Economics*, 40(1):253–265.
83 This section is only intended to provide a conceptual overview of how these advanced modifications are done within the IMPLAN database. For a step-by-step guide, including screen shots, of how to make these changes, we recommend you refer to Schmit, T.M., B.B.R. Jablonski, and D. Kay. 2015. *A Practitioner's Guide to Assessing the Impacts of Regional Food Hubs*. U.S. Department of Agriculture, Agricultural Marketing Service. Though this guide refers to food hubs specifically, the principles can be applied to a wide variety of local food systems and enterprises.

## Study Area Data[84,85]

The proper specification of the appropriate study region is discussed in module 5. The study area should contain the intended population of producers and their primary labor resources and the supply territory of their industrial inputs. It should not be so large as to over-describe primarily localized effects, and it should not be so small as to fail to capture key linkages.[86] Properly specified study area data should provide information about the total size of the sector broken down into the following categories:

- Number of employees[87]
- Total output (value of production, usually measured in gross sales)
- Value-added (employee compensation, proprietor income, other property type income, and indirect production taxes).

## Industry Production

Next, you need to modify the expenditure pattern of the farm-based activity portion of the local food (FBLF) sector. In other words, it is not just important to know the total size (employment, output, total intermediate expenditures, and value-added) of the FBLF sector, but also its local inter-industry linkages. These linkages help to measure net impacts because they allow the model to assess whether some economic activity that previously "leaked" from the region is now captured due to the different business strategies and expenditure patterns associated with the farm enterprises participating in local food supply chains.

There are three parts involved in modifying the industry production values within IMPLAN:

1. Customizing the industry's average expenditure patterns (i.e., the gross absorption coefficient for each industry sector from which the farm sector purchases product);
2. Customizing the commodity production to ensure that it reflects the products (commodities, in IMPLAN's language) produced by the FBLF sector; and
3. Customizing the trade flows to reflect the portion of products (i.e., commodities) purchased by the FBLF sector from local sources (e.g., modifying the regional purchase coefficients, or the percentage of expenditures by the sector procured locally).

After customizing a new FBLF sector within the IMPLAN model, the appropriate farm sectors (e.g., fruit farming, vegetable and melon farming, dairy farming) should be reduced by the corresponding determined amount. This is important because the FBLF sector expenditures and sales are already accounted for within the IMPLAN database, and this will ensure that you are not double counting. If, for example, you are adding $1 million in output, along with all jobs and payments to labor and proprietorships, to a newly itemized "FBLF" vegetables production sector that you created based on your primary and secondary data collection, you should then subtract those exact values from the aggregated vegetable and melons sector so that the area of the economy producing those commodities is the same as before the addition of the FBLF sector modifications.

## Customizing Other Sectors

Though the above description focuses on modification to a FBLF sector, you can follow the same type of approach to modify other industry sectors. Swenson, for example, was interested in looking at the specific economic impact of small-scale meat processing firms in Iowa, compared to the

84 All of the modifications can be done outside of the IMPLAN software by exporting the IMPLAN industry-by-industry database. However, this requires specialized training, and thus this protocol describes changes within the IMPLAN software itself.

85 Note that anything that gets added to your new sector should be subtracted from at least one existing sector. This is important, as the local food farm expenditures and sales are already accounted for with the IMPLAN database.

86 For more information about defining the local study area, and especially about the concept of a functional market area, see: Schmit, T.M., B.B.R. Jablonski, and D. Kay. 2015. *A Practitioner's Guide to Assessing the Impacts of Regional Food Hubs*. U.S. Department of Agriculture, Agricultural Marketing Service. Functional market area definition begins on page 8.

87 Within IMPLAN, the number of employees or jobs refers to the number of positions in a sector, not the number of employed persons. As many people have more than one job, there are almost more jobs than employed people in the economy. In addition, there are significant qualitative differences among the different sectors; for example, jobs in manufacturing are much more likely to be full-season, full-time jobs, whereas many jobs in retail may be part-time or seasonal positions.

***Puget Sound Meat Producers Cooperative was founded because small livestock producers' livelihoods were threatened by having to travel long distances to slaughterhouses. The Washington based slaughter unit operates at three venues on a weekly or semi-weekly schedule.***

larger, more dominant meat processors in the same State.[88] Based on Census of Employment and County Business Patterns data, he discovered that small processor operations were much more labor intensive than larger operations, and that returns to labor were much lower. This necessitated compiling a "small meat processing" sector that was fundamentally different than the default sector in IMPLAN, so that the incremental gains or losses in that new sector would be properly reflective of that subset of the industry. It is important to note that although the local meat processing sector produced more "jobs" per animal units harvested, these plants were not as efficient and did not make as significant a contribution to the local economy as one would imagine based on jobs created per animal units harvested alone.

## Impact Assessment

Whether or not you use a customized FBLF sector or a more disaggregated one in your analysis you have a couple of choices about how to use IMPLAN appropriately in order to analyze the local economic impact that results from local food system activity. If you use a customized FBLF sector, you can simply shock that sector of IMPLAN by the number of jobs (or total value of employee compensation) in that sector to estimate the multiplied-through economic contribution of that sector to the regional economy. Please note that there are multiple dimensions to local foods analysis that have potential for informing policy and program development. For example, you may wish to identify the specific activities that exist among producers, distributors/ sellers, and different types of local consumers. Alternatively, you may wish to analyze each component of local foods production, distribution, or marketing transactions separately in order to isolate the relative economic contributions of local foods development at different stages of the supply chain.

## Analysis-By-Parts

For certain value-added businesses that have emerged to meet the demand for local food, it is not that straightforward a task to define the appropriate industry sector(s) and linkages with other industries. For example, trying to create an entity similar to the food hubs industry sector within IMPLAN is

88 Swenson, D. 2011. *Exploring Small-Scale Meat Processing Expansion in Iowa*. Ames, IA: Iowa State University, Leopold Center for Sustainable Agriculture. Available at: http://www.iowameatprocessors.org/LeopoldExpan.pdf

complicated. While in some cases a food hub's expenditure pattern is similar to that of the "transit by truck" sector (335), in many cases a food hub takes on additional supply chain functions that require a different mix of inputs (i.e., food hubs may also function as processors). The implication for an impact assessment is that additional information must be collected to develop a food hub sector, or to describe the nature of all of its transactions.

As described in detail in their "*Assessing the Economic Impacts of Regional Food Hubs: the Case of Regional Access*" report, Schmit et al.[89], propose utilizing an analysis by parts (ABP)[90] approach in these situations. This is also commonly called a "bill of goods" approach. Under this approach, the analyst enters the expenditures (inputs) for local foods producers or distributors into the modeling system sequentially, in lieu of entering an output change for the overall sector. Conceptually, the component expenditures of ABPs represent the first round of indirect inter-industry purchases and payments to value added made by the food hub that trigger additional indirect and induced effects. The initial change in final demand modeled for food hub products represents the direct effect; combining this with the estimated indirect and induced effects determines the total effect.

Defining the scope of a value-added business to be modeled using an ABP approach within IMPLAN requires detailed data on the enterprise's annual outlays, including:

- Purchases by the business from each major industry sector, along with the proportions of those expenditures that are purchased within the defined local economy
- Payments to the value added components[91]
- Other institutional purchases (such as payments to households or government purchases).

Total outlays should equal total outputs such that all sales by the business are distributed to the three components above.

Figure 7.2 demonstrates an ABP set-up, allocating $100,000 in hypothetical outlays by a regional producer. The first data column contains the hypothetical market value of input purchases. The second data column allocates the relevant percentage of those input expenditures to suppliers within the regional economy (assuming that the remainder leaks outside of the region). If the ABP information contains data on within-region purchases, then the local purchase percentages can be set to 100 percent. It is important, though, in the absence of information confirming such, that purchases not be set to 100 percent unless the data support that conclusion because that would artificially inflate the impact summaries.

89 Schmit, T.; Jablonski, B.; and Kay, D. 2013. *Assessing the Economic Impacts of Regional Food Hubs: The Case of Regional Access*. Cornell University. Available from: https://www.ams.usda.gov/sites/default/files/media/Accessing%20the%20Economic%20Impact%20of%20Regional%20Food%20Hubs%20The%20Case%20of%20Regional%20Access%20Presentation.pdf

90 See IMPLAN's *Case Study: Analysis-By-Parts* for more information: http://implan.com/index.php?option=com_content&view=article&id=730:case-study-analysis-by-parts&catid=264:KB43

91 IMPLAN allows payments to labor income or to households as separate items of analysis. It does not, however, accommodate other payments to value added, such as payments to investors or indirect tax payments as activities that are amenable to an APB framework.

**Figure 7.2. Hypothetical Example of Analysis by Parts for $100,000 of Inputs**

| Sector | Industry Sales | Local Purchase Percentage |
|---|---|---|
| 19 Support activities for agriculture and forestry | $51,000.00 | 33.70 % |
| 395 Wholesale trade | $29,000.00 | 65.92 % |
| 411 Truck transportation | $9,000.00 | 92.05 % |
| 525 Local government electric utilities | $4,000.00 | 100.00 % |
| 402 Retail - Gasoline stores | $3,200.00 | 99.97 % |
| 526 Other local government enterprises | $2,800.00 | 100.00 % |
| 448 Accounting, tax preparation, bookkeeping, a... | $1,000.00 | 52.79 % |

***Source: IMPLAN***

To complete the ABP, you also need to produce a table of payments to workers (earnings) as well as payments to the farmer (proprietors' incomes). The sum of the intermediate inputs plus the payments to labor will constitute all indirect and induced activity associated with your study situation. You will then add the original direct data (farm sales, payments to workers and other value added components, and jobs) to the previously created summaries to round out the economic analysis.

## Conclusion

Ultimately, the decision to go to the extra trouble to customize a sector within IMPLAN is up to you, and depends on the goals of your study, expertise, and available resources. Perhaps the most important thing to keep in mind is that IMPLAN is both a powerful and blunt tool. IMPLAN data and software (and IO/SAM models more generally) are used to produce reasonable and defensible approximations of the economic impacts of local food systems. To do so requires the substitution of local knowledge, additional research, or outright supposition. The value of the tool reflects the quality of our insights and conscientiousness in producing our estimates. Accordingly, it is imperative that our methods, assumptions, and modifications be transparent and grounded in reality, just like any other social science research method.

## Takeaways

This module emphasizes the importance of:

- Competently manipulating an IMPLAN model to adequately evaluate a local economic activity to include evaluating the adequacy of the baseline data for your region of assessment;
- Distinguishing between measuring regional economic effects or contributions versus measuring incremental gains to regional productivity;
- Customizing a local foods sector in lieu of broad aggregations contained within the modeling system to include creating new sectors that describe local foods-producing actors;
- Procuring reliable and defensible data to populate your model;
- Developing a coherent scenario of change, to include considering all gross gains, offsets, and net outcomes; and
- Using alternative approaches, like ABP, to compile participants' regional economic linkages.

Finally, this module suggests analysts should be very transparent and open with their procedures and assumptions so that methods can be replicated and appropriately modified to suit local conditions, the scope of local food economic impact assessment work can be expanded, and the quality and rigor of local foods economic impact assessment can be improved.

# Glossary of Terms

| | |
|---|---|
| Agglomeration | Agglomeration is the idea that proximity to competitors and suppliers has become an increasingly important consideration for companies, especially newer firms, when deciding where to locate. Agglomeration can be described as industry clusters within a single geographic area. Examples of agglomeration include the computer technology industry in Silicon Valley, CA, or the wine industry in Napa Valley, CA. |
| Analysis by parts (ABP) | Analysis by parts (ABP) is also called "bill of goods" analysis. It is a type of input-output analysis that specifies each individual intermediate input associated with a project rather than the total output change in the project. |
| Attributes | Attributes are qualities or features regarded as a characteristic or inherent part of someone or something. |
| Backhaul | Backhaul is the return trip of a vehicle transporting cargo or freight. To backhaul is to have cargo in both directions of the trip. |
| Beggar-thy-neighbor | Beggar-thy-neighbor is a dilemma where localized gains come at the expense of other regions. In classical economic terms, everyone becomes worse off if this behavior is carried to its extreme because the benefits of comparative advantage in trade are thwarted when everyone acts only to maximize local production. |
| Bill of goods | Bill of goods analysis is a type of input-output analysis that specifies each individual intermediate input associated with a project rather than the total change in the project. |
| Bivariate analyses | Bivariate analysis is one of the simplest forms of analysis involving the analysis of two for the purpose of determining the empirical relationship between them. Bivariate analyses are most often used to answer questions about differences in responses among various segments of a survey population. |
| Buy local | Buying locally is a form of import substitution. Higher incidences of within-region purchases prevent sales leakages for imports and therefore add income to a region. |
| Causality | Causality is the relation between an event and a second event, where the first event is understood to be responsible for the second. |
| Census | A census is an official count or survey of a population, typically recording various details of individuals. |
| Cluster | A cluster is a concentration of related industries in a particular area, and includes the companies in the industry as well as those who support the industry, such as suppliers, service providers, and relevant government agencies. |

| | |
|---|---|
| Contribution analysis | Contribution analysis is the gross changes in a region's existing economy that can be attributed to a given industry, event, or policy. |
| Convenience sampling | Convenience sampling is a technique that does not involve random sampling or other probability sampling methods. A convenience sample is made up of subjects that are the easiest to locate. |
| Countervailing effects | Countervailing effects (offsets) refer to the idea that gross gains in production of one good must be balanced against the fact that these shifts will usually cause shifts away from production of other goods. |
| Development | Development is investments, strategies, and policies that aim to improve prosperity, typically by creating and/or retaining jobs, supporting higher incomes, or growing tax base. |
| Dillman Method | The Dillman Method is an approach to obtaining responses to surveys. This approach consists of using an introductory letter, a printed survey with an addressed stamped return envelope, and a series of reminder postcards. It is a commonly used method in mailed surveys. |
| Dimensions | Dimensions are aspects or features of a situation, problem, or thing. |
| Direct impacts | Direct impacts are those economic impacts associated initially with the economic change that is being measured, i.e., the output of a new enterprise, the labor incomes paid in that enterprise, the expected total value added, and the number of jobs (also see backward linkages). (See input-output analysis). |
| Economic contribution | An economic contribution is a gross change in a region's existing economy that can be attributed to a given industry, event, or policy |
| Economic impact | An economic impact occurs when a measured scenario demonstrates net gains to a regional economy. An economic impact occurs when there are substitutions for previously imported goods (import substitution) or the region is able to export goods or services to external buyers. |
| Exports | Exports are sales to buyers outside of a region. Exports can be to a neighboring region, the rest of the State, the rest of the country, or to other countries. Export sales reflect production that is in excess of local demand and is therefore available to the rest of the world. Export sales are the key manner in which regional economies expand. |
| Final demand | Final demand is the bundle of goods or services that are not sold as intermediate inputs and ultimately go to final users. The final users in input-output analysis include sales to households, governments, capital, and exports. For input-output accounting purposes, final demand does not add more value added to a commodity within the region of analysis. |

| | |
|---|---|
| Firmographic | A firmographic is a compiled set of characteristics of organizations or business firms that describes the qualities of these entities. This is a correlate of demographic data that helps to portray the characteristics of a population of people. |
| Fiscal impact | A fiscal impact, positive or negative, occurs when industrial activity levels change in an area. When there is new production, and by extension new labor demands, capital investment, and higher levels of inter-industrial transactions, there will be tax and service use consequences for local and for State government. If a project produces a net economic impact for a region such that there are gains in regional production, that project will also generate positive fiscal consequences provided it and the labor created by the project generate tax payments in excess of their collective demands for local or State government services. |
| Fixed-price models | Fixed-price models assume that all interrelationships between industries and other economic institutions (households, governments, capital) are fixed, and that all coefficients into production, such as inputs, capital, and labor, are static. For every industry represented in the model, the input and labor requirements per dollar of output do not change even if there are price changes in the economy, such as would be the case with, for example, an energy price shock or a shortage of a particular agricultural commodity caused by drought. |
| Functional economic area | A functional economic area is a semi self-sufficient economic unit. It includes the places where people live, work, and shop. It can sometimes be identified by physical or other characteristics. |
| Gross absorption coefficient | The gross absorption coefficient is the total amount of any commodity or service required for the production of the selected industry's products before netting out the share procured locally versus those purchased elsewhere. |
| Growth | Growth is an increase in the market value of goods and services sold, or of the capacity to produce them, over a period of time. |
| Impact assessment/analysis | An impact assessment is the process of identifying the anticipated or actual impacts of a given change on those social, economic, and/or environmental factors which the change affects. |
| Import substitution | Import substitution is a key justification for local foods initiatives as it is a strategy that has the potential to both retain dollars within a region, and create a multiplier effect from new production. In classical economics, all import purchases result in a reduction in regional incomes. When local goods are substituted for imported goods, regional incomes grow. |
| Indirect impacts | Indirect impacts reflect the multiplied-through estimate of intermediate inputs required to satisfy the original project scenario. (See input-output analysis) |

| | |
|---|---|
| Induced impacts | Induced impacts accumulate when all workers in the scenario (the direct workers and the indirect workers, initially) convert their labor incomes into household spending on local goods and services, thereby inducing another round of regional economic activity. (See input-output analysis) |
| Input coefficients | Input coefficients are the dollar value of a commodity an industry requires directly to produce a dollar of output. It is also referred to as the direct requirement coefficient. |
| Input-output model | Input-output models process regional, State, or national tables of inter-industrial transactions (linkages) to generate industry- specific multipliers. They are used to project region-specific economic consequences of industrial expansion, contraction, or changes in household incomes. |
| Intercept surveys/sampling | Intercept survey/sampling is a form of surveying that occurs when a selection of people is interrupted during their normal activities to collect their responses to questions. |
| Intermediate inputs | Intermediate input are all goods or services that are used as inputs in the production of a commodity. All businesses have supply requirements that are met in part by regional suppliers and in part by external suppliers. The magnitude of within-region purchases of intermediate goods partly determines the size of multipliers that industries will have in a regional economy. That is, all else equal, the more that local businesses buy locally, the larger the multiplier will be. |
| Intermediate purchases | Intermediate purchases are purchases of goods and that are used for the production of other goods and services rather than for final consumption. These inputs are sometimes referred to as current-account expenditures. They do not include any capital-account purchases nor do they include inputs from the primary factors of production (labor and capital) that are components of value added. |
| Key informants | Key informants are those who have substantial knowledge about your subject of interest. |
| Labor income | Labor income in input-output models is composed of wages, salaries, and employer-supplied benefits (social insurance contributions, health care, and retirement). Labor income also includes the salaries proprietors pay themselves for managing their businesses. |
| Leakage | Leakage is the outflow of income, resources, or capital from a given economy. |
| Likert scale | The Likert scale is a method of ascribing quantitative value to qualitative data, in order to make it amenable to statistical analysis. A numerical value is assigned to each potential choice. |

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| Linkage | Linkage refers to the degree to which one industry depends on commodity, capital, and service inputs from other regional industries. |
| Location quotient | A location quotient is a technique used to compare the industrial activity levels among different areas of the country. Location quotients are ratios that allow you to compare the concentrations of a resource or specified activity to that of a larger area such as a State or the Nation as a whole. A comparison of location quotients can help to identify sectors of opportunity that may serve to deepen the contributions of the food system to the broader economy. |
| Margining | Margining is the process of applying margins. Margins are the value of the wholesale and retail trade services provided in delivering commodities from producers' establishments to purchasers. Margin is calculated as sales receipts less the cost of goods sold. It consists of the trade margin plus sales taxes and excise taxes that are collected by the trade establishment |
| Mind map | A mind map is a visual representation of hierarchical information that includes a central idea surrounded by connected branches of associated topics. |
| Multiplier | A key component of input-output analysis is the production of multipliers that indicate the extent of linked economic activity within a study region resulting from a change in production in a sector of the economy. These multipliers are produced using the Leontief Inverse procedure for processing an original social accounts matrix (SAM). The Leontief Inverse is, in turn, based on the strength of internal industry linkages (see intermediate demand and household demand). In the input-output modeling process, multipliers are created for industrial output, and all of the elements of value added (labor income, returns to proprietors, investment income, and indirect tax payments). Job multipliers are econometrically estimated separately and added to the model. Output models are usually reported per one dollar of industry sales or output; i.e., a $1 increase in sales by industry A will lead to a $1.50 increase in sales or output throughout the local economy. |
| Non-random sample | A non-random sample is any sampling method where some elements of the population have no chance of selection, or where the probability of selection cannot be accurately determined. |
| Opportunity cost | In general economic terms, opportunity cost represents the next best alternative or the opportunity foregone when making a specific choice. For example, if a farmer decides to convert conventional commodity crop acres for soybeans into vegetable production, the opportunity cost of that choice would be the value of using that land for soybean production. |
| Output | Output is the value of production for an industry over the course of a year. Output is usually measured in producer prices, and the value of all inputs into production equals the value of all outputs in an input-output model. For most simple scenarios, output is more or less gross expenditures over the course of a year, including all value added payments (profits are part of value added payments). |

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| Primary data | Primary data are those data that are collected firsthand by a researcher making direct contact with a given population. |
| Production function | Production function is an equation that expresses the relationship between the quantities of productive factors (such as labor and capital) used and the amount of product obtained. It states the amount of product that can be obtained from every combination of factors, assuming that the most efficient available methods of production are used. |
| Qualitative | Qualitative data are differences in essential qualities between two objects or samples that cannot be expressed as a number. |
| Quantitative | Quantitative data are data that can be expressed as a number or a quantity. |
| Quota sampling | Quota sampling is a non-probability sampling technique wherethe assembled sample has the same proportions of individuals as the entire population with respect to known characteristics, traits or focused phenomenon. |
| Random sampling | Random sampling is any method of sampling that selects its subjects based on the probability that they were chosen randomly rather than as a result of bias. In order to have a random selection method, a process or procedure must be developed that assures that the different units in the population have equal probabilities of being chosen, so that neither a limited data set, nor the viewpoint of the researcher, dictates what or who is selected for sampling. |
| Rapid market assessments | Rapid market assessments (also known as dot poster surveys) were developed at Oregon State University to gather information from farmers market patrons. To use this relatively simple method, closed-ended questions are written on large flip charts. Respondents are given a strip of colored dots to place on the corresponding answer. |
| Regional purchase coefficients | A regional purchase coefficient (RPC) is the proportion of the total demand for a commodity by all users in the study area that is supplied by producers located within the study area. For example, if the RPC for the commodity is 0.8, then 80 percent of the demand by local fish processors, fish wholesalers, and other fish consumers are met by local fish producers. Conversely, 20 percent (1.0-RPC) of the demand for fish is satisfied by imports. |
| Resource constraints | Resource constraints are a limit or restriction on the amount of resource available. |
| Return on investment | Return on investment (ROI) refers to the generation of earnings on an investment such that all costs of production are covered, including a normal return to investors. ROI is expressed as an annualized value. Input-output models do not produce information that informs ROI calculations. |

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| Scenario | The scenario reflects the conditions under which an economic change is purported to occur in input-output analysis. It could involve the introduction of a new industry, an expansion or contraction in production of a commodity, or a set of inter-related activities associated with a policy or project proposal. Proper specification of the scenario is a key step in analysis. |
| Secondary data | Secondary data are primary data that are summarized for reporting purposes. |
| Shock | A shock is an event that affects an economy, either positively or negatively. |
| Significant difference | A significant difference (statistical significance) is a difference between two groups that cannot be explained away by chance alone. |
| Snowball sampling | Snowball sampling is a non-probability sampling technique where existing study subjects recruit future subjects from their acquaintances. |
| Social Accounting Matrix | In IMPLAN language, a social accounting matrix (SAM) is the primary table used in an input-output model. It is a comprehensive accounting of the sales and purchases made by industries, households, and other critical institutions in an economy. |
| Social network analysis | Social (commercial) network analysis is a mapping and measuring of relationships and flows between people, groups, organizations, and business entities. The nodes in the network represent some form of “active” relationship (commercial, project, programming). This visual and mathematical analysis of human and business relationships can help researchers conceptualize the breadth and depth of networks. |
| Spillover | Spillover effects are economic events that occur in one context because of another external event. |
| Study area | Study areas reflect the area in which the primary economic activity is taking place. The study area should be no larger than the territory within which the majority of direct value added payments accumulate. |
| Type I multiplier | A type I multiplier measures the direct and indirect effects of a change in economic activity. It captures the inter-industry effects only, i.e., industries buying from local industries. |
| Type II multiplier | A type II multiplier captures the direct and indirect effects. In addition to the inter-industry effects, the Type II also takes into account the income and expenditures of households. The household income and the household expenditures are treated as industries. This internalizes (endogenizes) the household sector, including the induced or household spending effects. |

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| Value Added | Value added in input-output analysis is made up of labor incomes paid to workers, income paid to capital investment or profits (e.g., payments to proprietors for their management, payments to investors), and indirect tax payments (that is, taxes that are included in the purchase price, such as sale or excise taxes and property taxes) that are part of the production process. |
| Variable | A variable is a quantity capable of assuming any of a set of values. |

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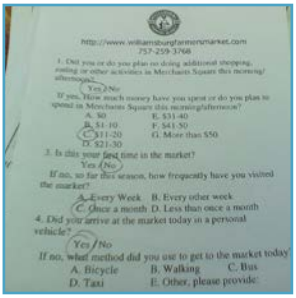


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