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FOOD: A Multicomponent Local Food System Assessment Tool

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Abstract

Our goal with this article is to present a visual aid and tool for assessing local food systems. We propose that local food systems comprise four essential components represented by the acronym FOOD: in(F)rastructure, pr(O_1)duction, (O_2)rganizations, and (D)emand. The FOOD assessment tool provides a visual overview of the statuses of these four essential components relative to a particular food system. It is also useful for comparing one food system to another or for tracking changes over time. Availability of the tool has important implications for U.S. Extension professionals across a variety of disciplines with regard to connecting individual components within local food systems.

Keywords: infrastructure, production, organizations, demand, local food

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Introduction

Interest in local food systems increased threefold from 1992 to 2008 (U.S. Department of Agriculture [USDA] National Agricultural Statistics Service [NASS], 2014), and this trend is likely to continue. Definitions of local foods vary regionally in the United States, but key points resonate across all of them. Those points center on farmers and producers selling directly to end consumers within close geographical proximity, such as within a

town, county, state, or set radius in miles. Local food system end consumers include farmers' markets, community-supported agriculture groups, retail outlets, restaurants, and institutional buyers. Parameters of geographical proximity also vary for local food systems. For example, areas of high population density on either coast may have smaller radiuses (e.g., 100 mi.) for local food procurement, whereas locations in the Mountain West or Midwest may have larger radiuses (e.g., 300 mi.) to account for sparser populations and larger production distances (Gumirakiza, 2016; Ingerson, Jayaratne, Wymore, & Creamer, 2014; Thomson, Radhakrishna, Maretzki, & Inciong, 2006; USDA Economic Research Service [ERS], 2016).

As interest in local food systems has increased, so has Extension's involvement with them. While interacting with stakeholders, Extension professionals across program areas (e.g., community development, agriculture, food and nutrition) address a wide range of topics related to local food systems, but they may not have the appropriate tools to effectively facilitate those discussions. In addition, much of the existing published information focuses on stakeholder perceptions or case studies (Munden-Dixon, Furman, Gaskin, & Samples, 2015; Perez & Howard, 2007; Wise et al., 2013) or individual components of local food systems, such as production (Uchanski, 2014), making it difficult to comprehensively evaluate local food systems and their individual components together.

The concept of a food systems approach that addresses many factors from production to consumption is not new (Morgan & Fitzgerald, 2014; Story, Hamm, & Wallinga, 2009); however, few widely accepted tools are available for visualizing and assessing critical components of a local food system that can then be used by advocates, policy makers, and researchers to make informed decisions. Numerous challenges exist for those within a local food system, including identifying a supply chain infrastructure, identifying supporting organizations, determining demand, and determining food production capacity (Foley et al., 2011; Gooch, Marenick, & Zimm, 2010; Low & Vogel, 2011). In addition, issues related to local food systems are dynamic, and components of food systems are inextricably linked to one another. Direct sales efforts often lack the capacity to meet rapidly expanding consumer demand for local food (Huang, 1993; Thomson, Radhakrishna, & Bagdonis, 2011; USDA ERS, 2015). For example, as the demand for local food increases, small- to mid-scale growers respond by changing production capacity (Kader, 2005). However, moving large volumes of food, even locally, requires infrastructure such as refrigeration, packing facilities, equipment, and storage. Once infrastructure needs are met for the food system in a given area, other aspects of the system, such as supporting organizations' roles and linking of existing production supply with buyers, must be reevaluated in an iterative way.

Extension professionals would benefit from an assessment tool that is comprehensive enough to generate useful information about various key components within a local food system but not so broad that it is burdensome to use. In other words, there is need for a tool that (a) provides a framework for and consistent approach to benchmarking multiple components of local food systems and (b) allows for assessing the statuses of those systems (Wise et al., 2013). To this end, we developed an assessment tool that can be used at city, county, state, and regional levels to generate a visual representation of a local food system's status based on key components. We propose that local food systems comprise four essential components that can be represented by the acronym FOOD: in(F)rastructure, pr(O_1)duction, (O_2)rganizations, and (D)emand. Without all of these components, a system is incomplete and may be unstable. Herein, we provide an explanation of the quantification of each FOOD component and descriptions of how Extension professionals and stakeholders can use the FOOD tool to visualize and assess their own local to regional food systems.

The FOOD visual aid and assessment tool cuts across diverse Extension and community program areas (e.g., horticulture, family and consumer sciences, nutrition education, community and economic development, etc.) and

creates an overview that connects program areas that normally would not interact. For example, Extension professionals often are called on to convene groups of diverse community stakeholders, but they may have limited experience in assessing their local food system. This visual tool allows them to communicate a food system's status to a wider audience (e.g., producers, food advocates, policy makers, entrepreneurs). Finally, the tool also can be used to visualize and assess the impacts of local food system investments and initiatives. For these reasons, the FOOD tool should be of broad interest and usefulness to U.S. Extension professionals.

Methods and Data in Use of the FOOD Assessment Tool

When assessing a local food system using the FOOD tool, the evaluator(s) must characterize each of the four components as robust—signified by a capital letter (e.g., "F"); present, yet weak—signified by a lowercase letter (e.g., "f"); or lacking altogether—signified by a missing letter (i.e., a blank, _). For example, a local system could be defined as fo_D, indicating that the system has adequate infrastructure (f) and production (o_1), no organization or advocacy support (_), and relatively robust demand for local food (D). These characterizations are based on numerical values associated with each of the FOOD components, such as number of applicable infrastructure facilities or number of acres used for producing food within the food system. Evaluators may be able to obtain such data from publicly available sources (e.g., USDA NASS) or may have to collect the data directly. Additionally, the criteria for evaluating each component vary and are dependent on the food system being assessed—for example, infrastructure needs for one food system will differ from those of another. Later in this article, we provide sample scenarios that exemplify this quantification of the FOOD components.

The FOOD assessment tool can be used in two ways. It can be used to conduct a "FOOD self-assessment" for a given area or region, such as a county, first to establish a baseline status and then again at given time intervals to track changes. A second way the tool can be used is to make relative comparisons across areas or regions, an approach we refer to as conducting a "FOOD comparative assessment." For example, a user of the tool can compare each of the four FOOD components as applicable to two counties in the same state or geographic region. This approach is useful for identifying similarities and differences among areas of interest and providing associated perspective. Both uses of the tool can help users determine where to focus resources to effect positive change. With either use, the assessment should be repeated every 3 to 5 years for the purpose of tracking changes over time, tracking progress of an existing food system, or tracking progress toward specific goals (e.g., generate x% increase in the amount of local food in the system; improve food access, job creation, and economic development). These two ways in which the tool can be implemented allow users to examine both spatial and temporal variability and changes within food systems, providing real-world usefulness.

Examples Representing Use of the FOOD Assessment Tool

The above section detailed the basic mechanics of the FOOD tool; in this section, we provide specific examples of the FOOD tool's self-assessment and comparative assessment uses, with emphases on sources of data being used and how these data are processed to produce outputs of the tool. The first example represents a self-assessment of one county in New Mexico, and the second example represents a relative comparison of three diverse New Mexico counties; however, the processes described can be modified for use in any area or with any food system. The data used and the assessment outcomes are shown in Tables 1 and 2 at the end of this section. To generate such tables, an evaluator must obtain data from available sources or collect data directly (as has been noted). For the examples presented here, we collected infrastructure (F) and organizational capacity (O_2) data directly as this information was not available from other sources at the time. We did not directly measure

production (O_1) or local demand (D); instead, we used readily available agricultural statistics from USDA NASS.

First steps in using the FOOD tool involve formulating an area-specific definition of each component and determining how each component will be quantified. For the purposes of the examples provided here, the definition of and quantification method for each component are described below. These can be used as a starting point for those with limited experience in food system assessments:

- Infrastructure (F) included cold storage facilities, shared-use and community kitchens, and other agricultural facilities used for processing, grading, storing, transporting, and packaging food items (Kader, 2005). We quantified the infrastructure component by identifying the actual number of aforementioned physical facilities in each county and recording that value in table form. To aid the direct measurement of infrastructure, we conducted interviews with industry professionals, university specialists, Extension agents, and other key informants. As a result, we generated a large contact reference list. To verify that the local food infrastructure had been completely documented for a given county, we used the following protocol: (a) During each interview, the local specialist recommended a series of additional contacts; (b) once there were no new recommended contacts, sources of information on the local food infrastructure were deemed exhausted. This approach is referred to as "snowball sampling" (Lynch, Uchanski, Patrick, & Wharton, 2018). This same information, though, could be accessed through publicly available sources in certain regions (e.g., business chambers, public registries).

- In our example, the production (O_1) component was defined as edible horticultural crops, such as fruits, vegetables, and nuts. We quantified this component for each county of interest by retrieving from USDA NASS data the number of acres of horticultural crops harvested. This is just one approach; evaluators can define production more broadly to include, for example, meat animal production, eggs, dairy, honey, tree products, fisheries, and so on.

- The organization (O_2) component included food policy councils, local food advocacy groups, and other supporting organizations, such as regional or state commodity commissions and associations (e.g., New Mexico Chile Association). We calculated the numeric value for this component by dividing a county's population by the number of organizations in the county. This calculation can be viewed as a ratio for making comparisons. As we did for infrastructure, we conducted feedback loop interviews to identify relevant organizations. Such information also could be sourced through publicly accessed channels and web searches.

- In our example, the demand (D) component involved demand for local foods within a county. We calculated a numeric value for this component by dividing a county's population by the dollar value of direct-sale edible horticultural goods in the county (total dollars spent on edible horticultural goods in the county). This calculation can be adapted and expanded to include the population of the defined system and the economic dollar value of specified local food sales.

After formulating a definition for each component and determining how each component will be quantified, evaluators using the FOOD assessment tool can generate data and compile those data in table form. Next, a letter value (i.e., capital letter, lowercase letter, blank) is assigned for each component and assembled in order to form a visual aid based on the FOOD acronym. The process of assigning the letter values varies, depending on whether evaluators are conducting a FOOD self-assessment or a FOOD comparative assessment.

In conducting a FOOD self-assessment, one needs to know how to assign a letter value to each of the four components relative to the applicable area. To do this, the evaluator must identify applicable goals for the area and assign letter values accordingly. For example, the evaluator for an area may set a goal of having five advocacy organizations in the area within a 5-year period. If only one advocacy organization exists in the area at the time of the assessment, the evaluator may assign a lowercase "o" to the third position in the FOOD acronym. This same approach can be used for each of the four components. In the example shown in Table 1, the county added seven infrastructure facilities over a 10-year period (2005–2015). Therefore, the letter designation for the infrastructure component changed over time, from lowercase "f" to capital "F." The number of acres in horticultural production decreased over the same period, but not enough to change the production component status from lowercase "o" to blank. In 2005, the county did not have any food advocacy organizations, so a blank was assigned to the organizations component at that time. By 2015, there were five organizations, but the county may have had a goal of reaching 10 such organizations or some similar benchmark. Therefore, lowercase "o" was assigned to represent growth, but not goal attainment. Lastly, the proxy for demand (dollars spent per resident) was considered high by local metrics in 2005; therefore, a capital letter "D" was assigned to the fourth position in the acronym. This metric did not change substantially over time and so remained "D" in 2015.

To conduct a FOOD comparative assessment, it is somewhat easier to assign a letter to each of the four components. For example, if two areas are under analysis in the assessment and both have production to report but one has more acres in production than the other, evaluators would assign uppercase "O" to the second position in the FOOD acronym for the former area and lowercase "o" for the latter area. In the example of a comparative assessment represented in Table 2, letters were assigned according to relative differences among three counties.

Table 1.

Example FOOD Self-Assessment for One Sample County Over a 10-Year Period

	FOOD system component							
	Infrastructure (F)	Production (O)	Organizations (O)		Demand (D)			
Year of assessment	# of facilities[a]	# of acres	#	Population/ # of organizations[b]	Value ($)	$ spent/ resident[c]	Population	FO ass
2005	4	516	0	N.A.	$1,500,000	$75.00	20,000	
2010	7	498	4	5,250	$1,600,000	$76.19	21,000	
2015	11	452	5	4,800	$1,700,000	$70.83	24,000	

Note. N.A. = not applicable, as no organizations existed in 2005 (i.e., the calculation could not be made). [a]Actual count of facilities in county. [b]County's population divided by number of organizations in county. [c]Value of dir marketed horticultural goods in county divided by county's population (i.e., number of residents). [d]Each FOOD self-assessment is made relative to past years' assessments and/or internal benchmarks and goals. The four individual components can be identified as robust, signified by a capital letter (e.g., "F"); present, yet weak, signified by a low letter (e.g., "f"); or lacking altogether, signified by a missing letter (i.e., a blank, _). In this example, the assessmer

for the better with time.

Table 2.

Example of a FOOD Comparative Assessment for Three Selected Counties in New Mexico at the Same Time (201

	FOOD system component							
	Infrastructure (F)	Production (O)	Organizations (O)		Demand (D)			
County	# of facilities[a]	# of acres[b]	#	Population/ # of organizations[c]	Value ($)	$ spent/ resident[d]	Population	FOC compar assessr
County A	74	96,185	9	23,718	$1,795,000	$8.41	213,460	FOc
County B	15	2,180	8	5,009	$1,087,000	$27.13	40,072	foO
County C	4	230	6	4,888	$192,000	$6.55	29,328	foO

aActual count of facilities in counties. bSource: U.S. Department of Agriculture National Agricultural Statistics Servic (2014). New Mexico state agricultural statistics. Retrieved from https://www.nass.usda.gov/Statistics_by_State/New_Mexico/. cCounty's population divided by number of organizat county. dDollar value of direct-marketed horticultural goods in county divided by county's population (i.e., number c residents). eThe FOOD comparative assessment is a relative comparison of each of the criteria, including # of in(F)rastructure facilities, number of acres of horticultural production (O), number of residents per organization (O), dollar value spent per resident (D). In this example, capital letters vs. lowercase letters are assigned on the basis of one county compares (i.e., higher or lower, respectively) to another.

Discussion and Implications

Around 2012, the New Mexico legislature considered a bill proposing that the public procurement of fresh produce be through local sourcing (i.e., within the state). This circumstance created a need within Extension to develop a tool to assess food systems in the state that also could be used to facilitate discussions on the topic. Our project and resulting tool represent steps in determining the feasibility of that proposed legislation. To start, we selected three diverse New Mexico counties to test the tool at a local level using real data. We based the examples presented in this article on those initial data, with an emphasis on horticultural crops. With this tool, Extension professionals, individuals involved in the transportation and processing of crops, and producers are able to assess where additional resources and energy are likely to provide the best return on investment and increase the production and consumption of locally sourced food. This assessment, in turn, informs how to improve the linkages between producers, individuals involved in the transportation and processing of crops, and end consumers. Identifying and strengthening these key linkages can lead to increased production and consumption

of locally sourced food and, accordingly, can add value to all elements of the supply chain. The tool also can inform how a particular locale, region, or state can advance a goal of increasing production of locally sourced food, potentially leading to increased economic development and an enhanced quality of life for residents.

Although horticultural crops were our focus, the FOOD tool is flexible and can be used to assess any local food system. It also allows for adaptability in determining local threshold values and definitions for each of the four critical components. For this reason, we did not set threshold values (e.g., >10 organizations designates a capital "O"); instead these values should be determined at a local level. Although the tool is flexible and dynamic, it does have limitations. The tool was designed to be used for macro level assessments and, as such, it may not address the *quality* of each of the four components (e.g., the functionality of infrastructure or organizations). The mix and balance of each of the FOOD components also should be considered in a more detailed assessment. The tool also may be limited by the quality of the data available. For example, given finite resources, it may be difficult to identify small producers and/or processors using publicly available information. As a result, an assessment may not be as refined as desired.

Our development of the tool was focused on Extension professionals who are engaged in broad food systems discussions. With the tool, we identify the four critical components of local food systems and provide sample definitions and protocols for data collection. Consequently, the tool provides a common language that can be used in connecting Extension program areas with diverse stakeholders around the topic of local food system assessments.

Conclusions

The FOOD tool presented here provides a technique for visually identifying the statuses of the four critical components of a local food system, which, when identified together, facilitate a broader understanding of the food system through self-assessments and comparative assessments. Enhancing this understanding is the first step toward fostering a deeper community discussion about where to focus activities, efforts, and resources. To our knowledge, this new tool can be useful across a wide range of food systems. Furthermore, the FOOD tool cuts across a wide range of Extension program areas, while remaining manageable, thus facilitating connections that would be difficult to realize otherwise. It is useful to Extension professionals working with diverse audiences to talk about their food systems and to describe the impacts of local food system initiatives. An important next step will involve applying the tool across the diverse and unique food systems throughout the United States to further evaluate its effectiveness.

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