Building Local Food Systems in the Finger Lakes Region



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Abstract

We investigate indicators that could identify the emergence of a local food system in the Finger Lakes region of New York State. A local food system is a system that is economically, socially, and environmentally sustainable. The Finger Lakes region of New York is a leader in local food systems. For this region to be used as a model elsewhere we find it necessary to first define and assess its components and their relationship to local agricultural production. Our indicators look beyond traditional consumer and producer food relationships, examining characteristics of agricultural production, environmental conservation, livelihood security and economic vitality, and institutional support systems to determine their role within a local food system.

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Introduction

Over the last several decades, the United States has seen the industrialization and globalization of its food system. Family farms have been replaced by large, corporate enterprises, which have come to be known as agribusiness or industrial agriculture. Agriculture is now dominated by large, multinational corporations, the ten largest of which account for over 60% of food purchases nationwide (Lyson, 2004). This system has led to a number of changes in how food is produced. Agriculture has become largely mechanized, with new technologies helping to increase yields and it has become highly regionalized. This regionalization of agriculture, whereby regions — most notably the grain belt — exploit their comparative advantage at the expense of crop diversification, has in turn led to the production of a narrow range of bulk or commodity crops (Lyson, 2004).

The globalization and industrialization of agriculture has not only led to a reduction in the diversity of crops grown, and thus available to consumers, but also to a greater distance between consumer and producer. Inexpensive transportation and technological innovations have allowed food production, much like manufacturing, to move to the areas of the country and the world where labor and land are the least expensive. With food now traveling an average of 1300 miles before reaching consumers' plates, there is little connection between producer and consumer and little consciousness on the part of the consumer as to where their food is coming from (Andreatta 2005). As Thomas Lyson so succinctly puts it in his book, *Civic Agriculture: Reconnecting Farm, Food, and Community*, "food has simply become a commodity that generates a profit for large corporations" (Lyson, 2004, p. 60).

In recent years, a movement to counteract the agribusiness has emerged. The local food movement seeks to reconnect consumers with food they eat, to restore economic vitality to small farms, and to encourage more environmentally sound and socially responsible methods of agricultural production. The concept "local food system" refers to the emergence and growth of community-based agriculture and food production activities that meet consumer demands for fresh, safe, locally produced foods, create jobs, encourage entrepreneurship, and strengthen community identity (Lyson, 2004). Books like Eric Schlosser's *Fast Food Nation* and Michael Pollan's *The Omnivore's Dilemma*, have alerted consumers to the problems with agribusiness and the benefits of eating locally. *The New York Times* has a recurring series on what it means to eat locally (Times Topics: Local Food). The American Farmland Trust has become heavily involved in advocating for local food systems, and a number of local food movements have arisen across the country. Component movements like the 100-Mile Diet and Slow Food USA, encourage consumers to think about what they are eating, where it comes from, and what the social, economic, and environmental costs of their decisions are. The local food movement has become especially pronounced in states like New York, which have been hard hit by manufacturing job losses and largely bypassed by industrial agricultural enterprises (Lyson, 2004).

Table 1. Differences between Local and Global Food System

Characteristics	**Global**	**Local**
Socio-economic assumptions	Well-being of society is a by-product of an efficient and unrestricted economy	The economy is embedded in social relations, and economic relationships
Structure of farming and food sectors	Rely on small numbers of large-scale industrialized farms	Rely on relatively larger number of farms of different types and sizes, structured based on unique production, marketing, financial and labor situations of farm
Characteristic of diets	Global uniform diet with similar array of food choices all over the world	Stronger seasonal products with a reduced diversity of crops available locally at any given time
Relationship to landscapes	Fewer, larger and less diverse farms	Conventional farms with more environmentally sound farming practices
Development of social capital	Relationship between farmers, food marketing businesses, and consumers are distant	Recurring social interactions among farmers, food marketing businesses, and consumers. They become members of the same community
Ownership and control	Assets owned and controlled by marketing	Assets owned and controlled by local individuals, families, corporations and/or cooperatives

Source: (Lyson & Green, 1999)

Defining Local Food Systems

In this section, we will briefly examine several scholarly and popular definitions of local food systems before offering our own definitions, drawn from components of each of these. It is a difficult task to define a local food system. Many long-time experts and researchers in the field of agriculture differ on what to call a local food system. These include "food citizenship," "ecological citizenship," "community-supported agriculture," "civic agriculture," "sustainable agriculture," and "ecoagriculture," each of which has its own definition (Baker, 2005; Seyfang 2006; Lyson, 2004; USDA; McNeely and Scherr, 2003). The various local food movements offer differing views on what exactly it means to eat locally, but they all agree on one thing: a local diet is more socially, economically, and environmentally sound.

Popular definitions of local food systems tend to focus on defining the distance from food to plate. The 100-Mile Diet, started by Alisa Smith and J.B. MacKinnon in 2005, has become one of the most well-known of these definitions. This diet, tried by several authors, including Barbara Kingsolver (*Animal, Vegetable, Miracle*) who have since written about it, advocates eating only food that comes from within a 100-mile radius of where a given consumer lives.

Finding food from within 100 miles will force consumers to think more about what they are eating and its origins, thus helping create stronger connections between the consumer and their food.

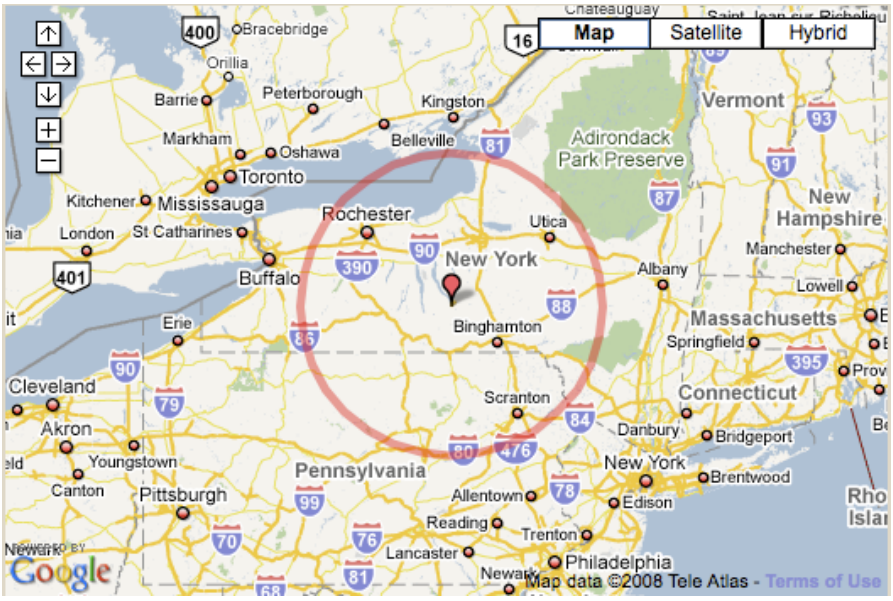


Figure 1. This map shows what the 100-mile diet would look like for a resident of Ithaca. Image courtesy of: http://100miledietorg/

Scholarly definitions of local food system focus less on the physical distance between the consumer and their food and more on the connection between the consumer and the producer. In her article, "Urban Connections to Locally Grown Produce," Susan Andreatta, an anthropologist and the University of North Carolina, who studies human ecology as it is related to small-scale agricultural production, focuses her definition of a local food system on these community connections:

> A local agrofood system comprises all the individuals and processes involved in getting food from local farms to local tables…a local agrofood system not only supports local communities and often, small-scale producers. Negative environmental impacts are also reduced, and consumers come to see their food purchases as part of a more sustainable food system (Andreatta, 2005, p. 120).

Andreatta goes on to say that these connections can be facilitated through farmer's markets and other such types of markets, where producers are selling directly to consumers, thus facilitating "the interconnectedness of community and agriculture networks and put[ing] more of each dollar in the farmer's pocket" (p. 123-124).

Thomas Lyson, a former professor of development sociology at Cornell University, who focused his research on local and global aspects of agriculture, coined the term "civic agriculture," which, like Andreatta's definition of the local agrofood system, focuses on the connection between producer and consumer:

> Civic agriculture, by contrast, is a locally organized system of agriculture and food production characterized by networks of producers who are bound together by place. Civic agriculture embodies a commitment to developing and strengthening an economically, environmentally, and socially sustainable system of agriculture and food production that relies on local resources and serves local markets and consumers. The imperative to earn a profit is filtered through a set of cooperative and mutually supporting social relations. Community problem solving rather than individual competition is the foundation of civic agriculture. (Lyson, 2004, p. 63-64).

Lyson's definition also overlaps with Andreatta's in that it focuses on what happens to the money transacted in the purchase of local food. Andreatta emphasizes that local food systems allow more money to go to local farmers, while Lyson emphasizes the social relationships built on profits from local food systems.

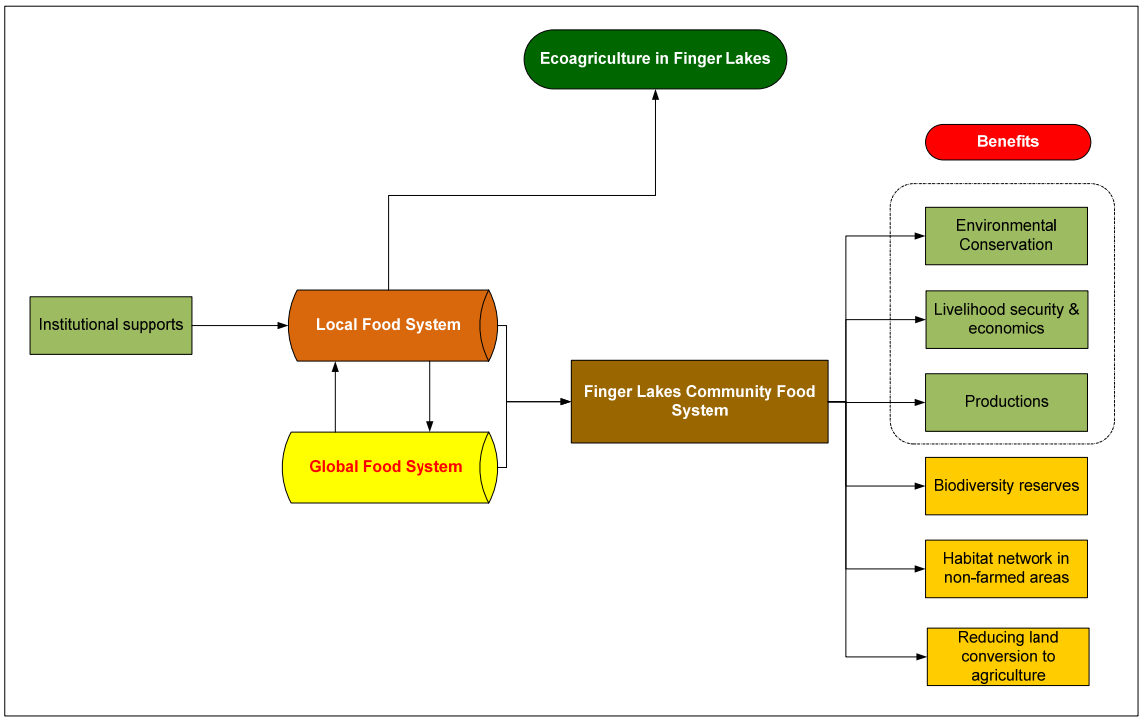
Both Andreatta and Lyson mention the sustainability of local food systems in all its forms (environmental, economic, and social); they focus on the economic and social side. Jeffrey McNeely and Sara Scherr's definition of ecoagriculture, as discussed in their book, *Ecoagriculture: Strategies to Feed the World and Save Wild Biodiversity,* focuses on the environmental component*:*

> Ecoagriculture builds on the concept of ecosystem management that is being adopted by many conservation organizations around the world. It recognizes that good farm and landscape design, while crucial, is just a start; long-term success will also require improvements in the productivity and functioning of agricultural components and management systems (McNeely and Scherr, 2003, p. 87).

Our definition of a local food system draws from all of these, emphasizing the connections between consumer and producer, as well as the means of production. We also emphasize that the definition of a local food system needs to be context sensitive, and will differ from region to region and country to country. It should, thus, be understood, that the definition we present is an ideal definition, and for practical application should be refined for each individual location.

We define local food systems as a system of food production and consumption defined by more than just the distance from production site to plate. The distance should be defined by region (in Ithaca, for example, it is possible to maintain a fairly well-balanced, complete 30-mile diet; in Phoenix, this would be nearly impossible), with the understanding that the directness of the connection between producer and consumer and the level of community support for local food be as important indicators as the number of food-miles. Furthermore, a local food system is one that is economically (supporting economic vitality and livelihood security), socially (creating connections between producers and consumers, and helping to create a better understanding of food systems, and providing equity in access to local food), and environmentally (using ecologically and environmentally sound growing practices) sustainable. Our paper develops this definition of a local food system, relative to the Finger Lakes region, through four sets of indicators: indicators of agricultural production, indicators of environmental conservation, indicators of livelihood security and economic vitality, and indicators of institutional support.

Figure 2. A working conceptual framework for local food systems and their benefits.



Why Local? – Benefits of Local Food Systems

Local food systems offer a number of benefits to both producer and consumer, from more money going directly into the pockets of the local farmers, to fresher, more nutritious food for consumers. The Farm and Food Policy Project identifies higher and more stable farm incomes as one of the most important benefits of a local food system, arguing that this not only allows existing small farmers to stay in business, but also encourages new farmers to go into business (Anderson, 2008). Lyson seconds this point in his discussion of civic agriculture and presents the following data to support it: in 1910, farmers made $24 million, a 41 percent share of all farm-related economic activity. In 1990, farmers made only $23 million, a nine percent share, while marketers made $216 million, a 67 percent share (Lyson, 2004). Local food systems could allow this balance to shift back to the farmer. Furthermore, local food systems can also have the economic benefit of creating more jobs in rural areas, helping these communities to retain wealth and restore economic vitality.

The American Farmland Trust, which has become increasingly active in working to build local food systems and preserve farmland on the urban fringe, identifies access to fresher, more nutritious food as an important benefit to consumers (American Farmland Trust, 2008). In the industrial agriculture system, fruits and vegetables lose much of their nutritional value as a result of the amount of time they spend in transport and in storage. By creating more direct

connections between producers and consumers, local food systems help ensure that the time between when produce is harvested and when it is consumed is minimized (Anderson, 2007).

Local food systems also lead to greater transparency and accountability on the production side. Building stronger relationships between producer and consumer, combined with greater knowledge about the food system on the part of the consumer, leads to more communication between producer and consumer, and more direct feedback from the consumer; thus a local food system create trust through accountability (Anderson, 2007). This differs greatly from the agribusiness model where consumers have little idea about the origins of their meals and few opportunities to offer feedback. As a result, agribusiness does not lead to accountability on the part of the producer. This is suggested in a study discussed by Lyson which shows that while industrial agriculture leads to lower production costs it often does not lead to lower costs for the consumer, as the multinational corporations who control much of the agricultural sector function as an oligopoly, allowing them to set prices higher than the free-market price (Lyson, 2004).

Finally, local food systems also lead to more environmentally sustainable practices. These systems, because they are not parts of an industrial machine whose sole goal is to maximize profit, lead to more sustainable management practices, such as crop diversification, and to the conservation of important natural resources and biodiversity. Local food systems also lead to a reduction in food-miles, which reduces the carbon footprint of these small farms and, due to their diversity, lead to more resilient farm systems that can resist crises like the recent nation-wide tomato and spinach *E.coli* scares (American Farmland Trust, 2008; Anderson, 2007).

In short, local food systems lead to more money going directly to farmers, more contact between farmers and consumers, more nutritious (and possibly affordable) food for consumers, more environmentally sustainable practices (in growing the food, transporting, and storing it), and more resilient food systems.

Spatial Dimensions of Local Food Systems – Location and Food Access

Our definition of a local food system emphasizes the connection between producer and consumer and a comprehension on the side of the consumer of how the food system operates. Creating these connections is not just dependent on creating a system that supports small-farms and environmentally friendly means of production, but also on providing access for consumers to local food systems. This section focuses on local food systems and food access, an issue of equity in the discussion about local food.

According to the Center for Disease Control and prevention, 11 percent of US households are food insecure, meaning that these households are not sure where, how, or if they will get their next meal (Anderson, 2007). In general, low-income households have less access to food, let alone fresh, healthy food, than middle-class and wealthy households. Grocery stores in low-income neighborhoods often have less fresh produce, higher prices, and fewer options than those in wealthier neighborhoods. This leads to unhealthy diets and related health problems (Anderson, 2007).

Often, the populations most in need of fresh, healthy food are the most isolated from it spatially. These include both rural and urban populations; the latter are removed by both a lack of information and a lack of transportation options. The American Planning Association, in evaluating the role of planners in agricultural planning, evaluated the spatial dimensions of food systems, focusing on issues of access. They suggest developing community based solutions to improve food access, including better transportation (both of residents to food and of food to

residents), encouraging the development of neighborhood grocery stores, and viewing retail access to fresh food as essential in community development planning (APA Divisions Council 2008).

The Farm and Food Policy Project similarly recommends increasing transportation options, expanding federal programs that help connect low-income populations with healthy food, and making it easier to buy locally grown produce with food stamps (Anderson, 2007). Improving food access for low-income communities will be an essential challenge of any local food system, but one that can help ensure the social sustainability of such a system.

Regional Context

Finger Lakes Region

The region is called the Finger Lakes because of the long, narrow lakes that run across the region (Figure 1). The Finger Lakes, from east to west are: Otisco, Skaneateles, Owasco, Cayuga, Seneca, Keuka, Canandaigua, Honeoye, Canadice, Hemlock, and Conesus. Cities and large villages in the Finger Lakes region, including Skaneateles, Auburn, Ithaca, Geneva, Watkins Glen, Penn Yan, Hammondsport and Canandaigua, are located at the head and foot of most major lakes.

Figure 3. A map of the Finger Lakes Region

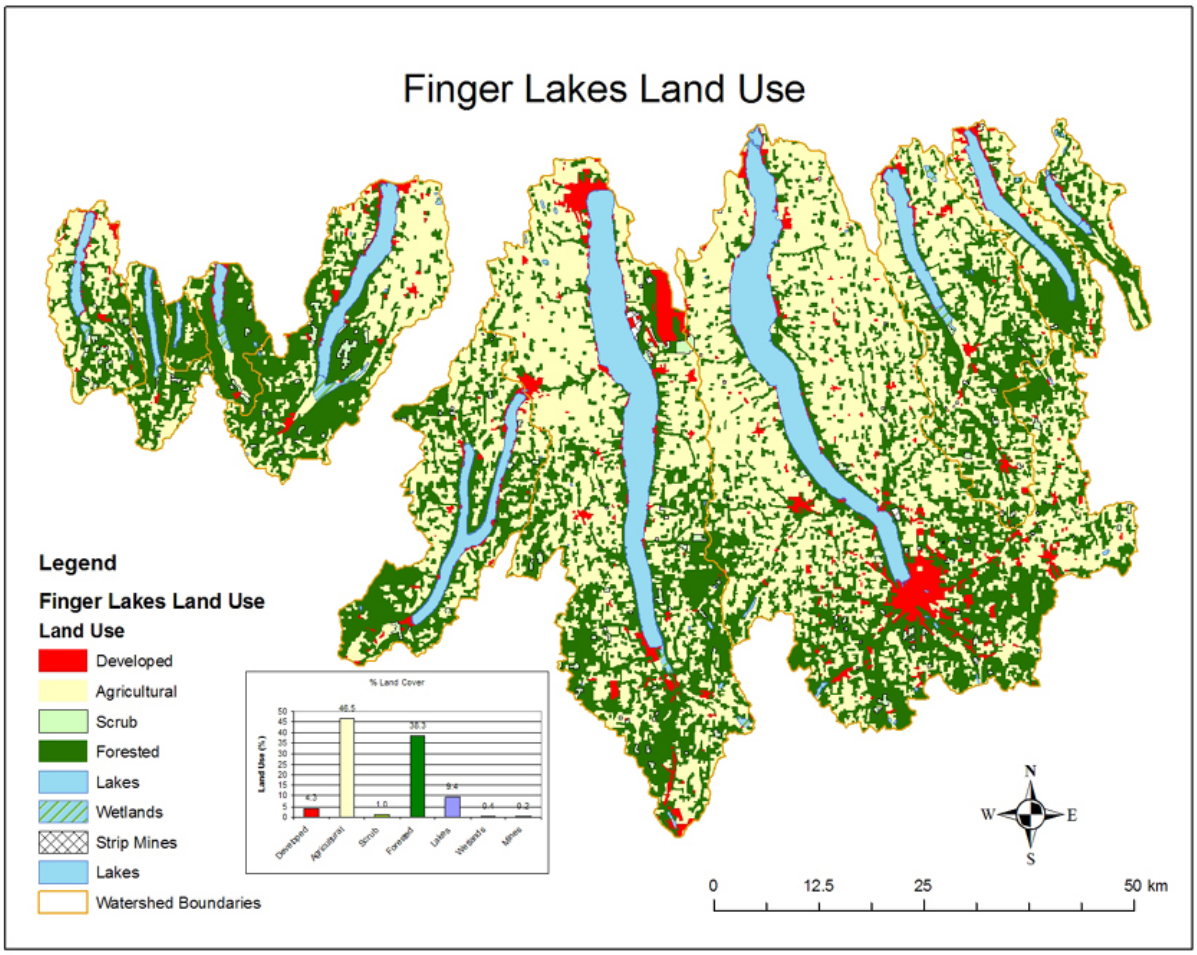


Land Use in the Finger Lakes Region

In 2008, almost 40 per cent of the total Finger Lakes region was covered with forest, whereas about 45 per cent of the total region was vegetation land (FLI, 2008). The Finger Lakes region is regarded as a vital agricultural sector of New York State. Vineyards are located between the lakes and they co-exist with dairy farms. Other crops grown by regional farmers

include corn, hay, wheat, oats, barley, and soybeans. Major vegetable crops are cabbages, sweet corn, and potatoes. Maple syrup and honey are famous local products of the region. Two institutions supporting the agriculture industry in the region are Cornell University, which maintains the New York State Agricultural Experiment Station, and the horticultural gene bank at Geneva, which is on the north end of Seneca Lake.

Figure 4. A map of land uses in the Finger Lakes Region shows that much of the land remains forested or in agricultural production.



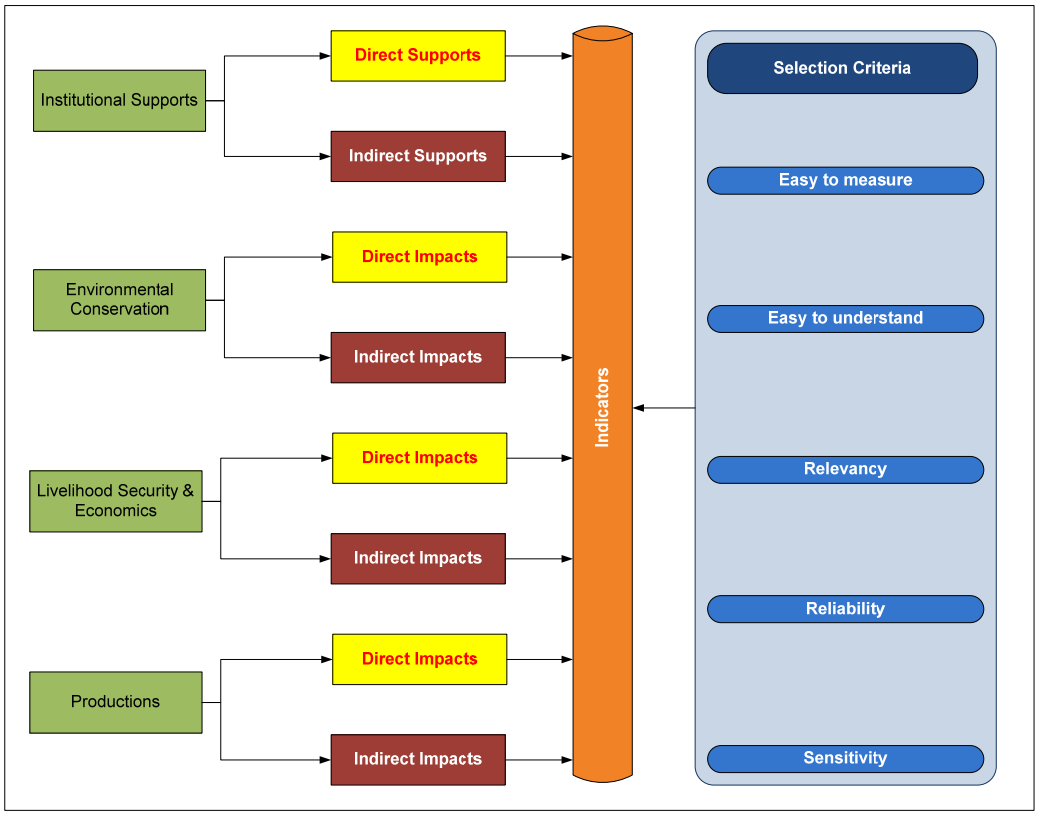
Indicators of Local Food Systems

The Landscape Measures Resource Center defines an indicator as

> An object or phenomenon that can be counted or measured, which enables claims to be made that change is occurring regarding progress toward a goal. In the LM framework, indicators are measured to reveal how well criteria (sub-goals) for landscape performance are being met. It is equally viable to create indicators of the broader goal, directly (LMRC, 2008).

When selecting indicators, the use of clear selection criteria can serve as a guideline for finding effective indicators. Effective indicators are easy to measure, easy to understand, relevant, reliable, and sensitive to changes. An indicator is easy to measure and requires simple calculation based on accessible data that are available or can be collected and interpreted with reasonable efforts. An indicator is intuitive to laypersons and decision-makers. Indicators must reveal something the user wants to know about the system. Users can reliably trust the information that the indicator provides. And finally, when the system changes occur, the indicator changes in a predictable way (Buck et al., 2006).

Figure 5. Types of indicators and selection criteria



This paper will explore several indicators of local food systems and how they can be used to determine if a local food system is developing in the Finger Lakes Region. These indicators have been divided into four categories, based on our definition of a local food system. First is a set of indicators of agricultural production, which includes means of production, farm size, and the overall carbon and water footprints of the farm. Second, we examine indicators of environmental conservation, which include food miles, emissions, and the level of biodiversity conservation. Next, we look at indicators of economic vitality and livelihood security, including the terms of employment, the profit generated by the food system and whether or not that profit remains local, and the resiliency of the system. Finally, we discuss indicators of institutional support, including norms, values and the institutional environment or infrastructure.

Indicators for Agricultural Production

In our examination of a local food system within an eco-agriculture framework we emphasize the sustainability of local farms as a key component of a local food system. We identify the presence of a local market for food produced on these farms as a direct indicator of a local food system. Crop diversity, farm size, means of animal waste disposal, carbon footprint, and crop rotation practices all serve as indirect indicators in agricultural production that support the presence of a local food system.

This section discusses these indicators and includes references to interviews with local area farmers that helped us determine the practicality of our indicators for the Finger Lakes region. Understanding the interests and motivations of local farmers is crucial if the indicators suggested are indeed used to monitor the presence of a local food system. Despite the centuries old roots of the concept, recent knowledge regarding local food systems largely comes from institutions such as Cornell. Integrating this knowledge into the daily lives of local farmers poses a unique set of issues considering that the practices of many local farmers are based on generations old knowledge frameworks (Francis, et al., 2008). A local food system will only be present if it is able to integrate the tried and true knowledge of the farmers with that presented by institutions.

Interviews with local farmers revealed a commitment to the land that extended beyond that posed by the economic incentives of farming (Farmer 1, 2008). Contrary to the assumption that farmers would do what is most economically efficient, our limited interviews revealed a strong conservation ethic and commitment to the local community. Comments such as, “No one knows where their food comes from anymore,” suggest that local farmers are willing to amend their practices to allow for a local food system. Use of the following indicators to determine if local food system is already in place in the Finger Lakes region will reveal great differences in farming practices between farmers in the area. First generation farmers will likely demonstrate greater commitment to sustainable farming because local farmers just starting out are generally doing it for environmental reasons rather than for the economic advantages (Farmer 4, 2008). However, that is not to say older generation farmers will not also be farming in ways that indicate a local food system. The way in which older generation farmers lament turn conventional farming has take away from the community may help promote local food systems as a “return to how it used to be” (Farmer 1, 2008). Whether or not a majority rules style decision is appropriate for identification of a local food system is appropriate is debatable. This issue is further complicated by the fact that variation between indicators exists within individual farms in the Finger Lakes region.

Local market for food produced

In a local food system food grown on the farm is sold directly to the local community. The presence of a local market for food grown on the farm can be used as an indicator of a local food system. Local farms that export most of their produce outside of the region because the local community does not demand enough of their particular crop do not demonstrate adherence

to this indicator. For example, an apple farm in the Finger Lakes region that sells twenty percent of their apples locally but exports eighty percent out of the region would not be part of a local food system.

This indicator demonstrating a local market for food produced has advantageous implications for food security. The concept of food security suggests that when there is direct access by consumers to food production, the food security of the consumer will increase. One of the main arguments for localizing food systems is to increase the availability and access to food in a region (Cowell and Parkinson, 2003). Farms that grow produce to be sold locally provide this access.

Quantities of food production in terms of imports and exports can help reveal whether or not there is a local market for food grown in the Finger Lakes. Unfortunately, policy affecting production and consumption of food generally occurs at the national level, and the Finger Lakes does not have a regional body for examining these numbers (Cowell and Parkinson, 2003). Therefore county-by-county analysis of economic activity may be more appropriate for determining the presence of this indicator in the Finger Lakes region because local import and export figures are collected by county. Exact values rather than estimated figures should be examined in order to avoid criticism of the legitimacy of the numbers used (Cowell and Parkinson, 2003). A study by Cowell and Parkinson examined food imports and exports in Britain to determine whether a local food system existed in the UK. They divided the food consumed in Britain into fourteen foodstuffs categories, ranging from vegetables and products to beverages to tobacco (Cowell and Parkinson, 2003). The inclusiveness of the investigation predicates the systems-thinking necessary to determine the sustainability of a system. For each category consumption (*C*) was determined using the equation:

$$C = P_n + I - E - S$$

For this equation P_n equals the net production of food in the UK excluding waste at the point of production, *I* equals the imported food to the UK per year, *E* equals the exported food from the UK per year, and S equals the increase in farm and other stocks per year (Cowell and Parkinson, 2003). From this information a self-sufficiency index can be determined, which is the ratio of production to consumption (Cowell and Parkinson, 2003).

If evidence shows that there is a local market for food produced, the conclusion may be drawn that the region's food system uses less food miles than it otherwise would. Food sold directly in the region does not require huge shipping costs, lowering the carbon footprint of the area's food system. The Cowell and Parkinson study found that production was lower than consumption in all categories except cereals and potatoes, evidence that a local food system does not exist. Determining which foodstuff categories have the lowest production to consumption ratio can help suggest categories in which efforts to diversify crops should be focused. If a particular category has a high self-sufficiency index due to the fact that the foodstuff cannot be produced in the region, such identification can help us understand what kinds of local diet modifications may be beneficial to achieving a local food system. For example, many spices cannot grow in the Finger Lakes, so this category would have a high self-sufficiency ratio. Determining ways the diets of local people could avoid these spices would help foster a local food system.

Crop diversity

The diversity of the crops grown by farmers in a region can also be an indicator of a local food system. Self-sufficiency indexes can be used to determine whether or not a region has a diversity of crops for consumption. Uniformly low indices across all foodstuffs categories would represent very high diversity in a region's crop production. Crop diversity shows a local food system because it supposes that local people are able to meet diverse dietary demands from food produced locally.

In addition to meeting local demands a diversity in food production fits within the eco-agriculture framework for sustainable farming. Monocrop farms, which are becoming prevalent in America, destroy the integrity of the soil. Some areas are more adept to crop diversity than others, and the Finger Lakes region is likely in the latter category due to seasonal weather restrictions on the growing options. Improvements in food production technologies may help overcome such barriers into the future. An example of such a technology can be found in the Cornell Hydroponic's Facility (CHF) that uses computer programming innovations to control lighting and temperature in the greenhouse and knowledge about lettuce growth to grow lettuce sans herbicides and pesticides 365 days per year at a rate twenty times that of California lettuce producers, most of which is supplied to the Wegmans supermarket in Ithaca (Goldweber, 2003). Genetic engineering of crops is another avenue technological innovation that may allow for increases in crop production and crop diversity in the Finger Lakes.

Farm size

Knowledge of the numbers of small farms in the Finger Lakes can be used as an indicator of a local food system in part because high numbers of smaller farmers suggest greater diversity in crop production. Also, small farms typically sell locally because they do not produce enough to warrant significant export of their produce (Pirog, 2003). Small-scale farms are becoming a fixture in niche markets, such as organic produce, on the national level because they do not produce enough food through conventional methods to compete with larger farms (Steele, 1997). Small farms provide returns to the local economy by buying consumer and capital goods, utilizing service and financial industries, and paying taxes (Steele, 1997). In addition, small farms help preserve rural landscapes by buffering from development, and local food systems work in part to maintain the regional environment (Steele, 1997). Especially in the Northeast, small farms also can aid the local economy, providing sustainability for a local food system, by serving as a tourist destination for visitors interested in observing cultural heritage traditions (Steele, 1997).

Small farms are perhaps one of the easiest agricultural indicators to quantify. Data on farm size can be found in the United States Census of Agriculture that occurs every five years and was last conducted in 2007 by the United States Department of Agriculture. Agricultural economist Cheryl Steele defines small farms in the United States as farms with sales of less than $20,000 per year (Steele, 1997). This number can be varied based on type of farm.

Interviews with local farmers revealed a sad tone about the state of small farms in the Finger Lakes. The farmers' distress seemed to stem from the degradation of community that occurs when larger farms dominate the landscape. Sense of community is a major value of a local food system, and this value is especially apparent among farmers whose economic well-being as well

as psychological health benefits from small local competition. One farmer interviewed lamented the fact that there used to be 36 farms on his block that now only has three (Farmer 1, 2008). This particular farmer was also able to identify to whom all the neighboring farms now sold their produce and to whom these sales went a generation ago (Farmer 1, 2008). He expressed anxiety about the future state of the smaller farms in the region whose products were of the conventional variety, namely milk (Farmer 1, 2008).

Waste disposal

The attractiveness of small farms warrants environmental consideration. As one farmer interviewed alluded to, smaller farms have a smaller density of animals, so the waste from these animals is not as concentrated and can be more easily diluted (Farmer 1, 2008). Animal waste disposal poses serious pollution threats to water quality, soil integrity, air purity, and the rural-urban interface especially as intensification of animals occurs in conventional farming (Mackie *et al*, 1998). Nitrate leeching from animal wastes can contaminate ground or surface waters, and result in ammonia toxicity for fish and alter the effectiveness of chlorination (Mackie *et al*, 1998). Phosphorus can enter the water system through the use of manure as a fertilizer, and its presence stimulates algal growth that interferes with oxygen needs of fish and wildlife (Mackie *et al*, 1998). Methane and nitrogen oxides result from manure degradation and contribute to greenhouse gases. Farmers can minimize these detrimental impacts of animal wastes by decreasing waste concentration and decreasing the likelihood that animal waste runoff will enter waterways. Allowing herd to graze in fields as opposed to housing them year-round in the barn is a means to disseminate concentrations. Farmers in the Finger Lakes have poor winter weather as a barrier to year-round grazing as cold temperatures can be harmful to animals and snow covered pastures offer few feed options, but the expressed convenience of barns as the animals' exclusive environment suggests that a local food system is not present (Farmer 2, 2008). Fencing off waterways in grazing lands will help prevent animal feces from directly entering the water system. Farms that do this can indicate a local food system because they represent environmentally friendly practices that benefit the well-being of all individuals in the community.

Traditionally in the Finger Lakes region few restrictions have been in place regarding location of animals in relation to waterways such as streams and ponds on the farms, and the means farmers use to dispose of animal wastes is not monitored in a way that prevents the waste from entering the waterway (Farmer 2, 2008). Conservation groups including the Natural Resources Conservation Service (NRCS) have begun working with farmers to develop prescribed grazing plans. The plan requires a joint drafting of a grazing plan by the farmer and the NRCS and if the farmer adheres to the plan, opportunities for grant funding from the New York State Environmental Protection Fund become available on the grounds that the farmer is employing Best Management Practices associated with grazing (RC&D, 2008). To date, thirty farms in the Finger Lakes region have completed grazing plans, and most of the grant funding they have received as a result of these plans has been used to construct fencing around waterways on the farms (RC&D, 2008). As a result, 86,430 feet of fencing has been installed in the Finger Lakes to minimize the propensity of animal wastes in the waterways (RC&D, 2008).

Despite these numbers suggesting local adoption of animal waste initiatives, one of the farmers interviewed expressed resistance to the project because he did not want to be told by the government how to operate grazing on his land (Farmer 1, 2008). Even though he understood

the benefits of fencing off waterways from animals, he did not want restrictions on the places he could move his animals (Farmer 1, 2008). Fertilizer and pesticide use is monitored in the Finger Lakes regions where these chemicals have a higher likelihood of entering waterways, but limits on animal wastes in the watershed have not be placed to the same extent, and their adoption may prove politically difficult because they must compete with the success of generations old farming practices.

Carbon footprint

The environmental benefits of a local food system are also apparent through calculations of the carbon footprint of the system. A local food system does not require the transportation system a global food system mandates, nor does it need the carbon dioxide used to run such a system. The transportation used to distribute food produced can help determine the carbon footprint of the system. Cowell and Parkinson (2003) examined the carbon footprint of the UK food system by looking at energy used for transportation. They quantified this number with the equation,

$$T_p = t_e D_p I_p$$

In this equation T_e equals the total energy needed for transportation, t_e equals the specific energy consumption for food transportation, D_p equals the distance between the food soruce and the trading partner or consumer, and I_p equals the food imported by the producer from the trading partner.

The carbon footprint of a food system also must include activities on the farm. Identification of all sources of energy input and output on the farm is necessary to determine a farm's carbon footprint. Direct energy input from farm activities includes that of petrol, diesel, lubricants, electricity, and fuel use by contractors (Barber, 1998). Tractor usage represents direct energy input contributing to carbon emissions, and farms that demonstrate reduced reliance on tillage, such as the decision by a farmer not to fall plow, may demonstrate support for a local food system. Tractor driving techniques can be utilized to reduce carbon output by the tractor. For example, tractor fuel use can be reduced by stopping the engine if idling for more than twenty seconds, operating the tractor in higher gears at lower engine speeds, and replacing tractors with pickup trucks or motor bikes for light load and nontransport tasks (Barber, 2004).

Indirect energy inputs on the farm that contribute to a farm's carbon footprint include in fertilizers, especially nitrogen fertilizers that require high energy cost to manufacture and are used frequently (Barber, 2004). When determining energy consumed through fertilizers the nutrient components of each fertilizer must be examined as well as the components of chemicals such as herbicides and pesticides used to encourage growth (Barber, 2004). The herbicides Preglone and Glyphosate require the largest energy input, and fungicides contribute the least (Barber, 2004). Herbicide and pesticide use on the farm can also be considered independent of the carbon footprint as an indicator for a local food system because their heavy use can degrade the soil and waterways of a region. Irrigation techniques vary in their energy use, and because the Finger Lakes receives high amounts of precipitation, irrigation is an area in which the local energy input has the potential to be quite low. The water footprint, or the water needs by the system can be determined on local farms and used to assess the system's sustainability. Energy

on the farm is also required by buildings, something to especially consider in the colder climate of the Finger Lakes.

Energy output is found in the food and crops produced by the farmer. Barley and wheat crops have the largest energy output in terms of vegetable production. The use of corn as a fuel source must also be factored into this calculation. A Northeast Biofuels and GS Agrifuels Corporation, biodisel plants in Fulton, New York, just outside the Finger Lakes region, have begun to purchase corn from local farmers that was formerly used to feed livestock (Nilles, 2007).

Evidence in the Finger Lakes indicating efforts to reduce the carbon footprints of farms can be found in the Solar Powered Livestock Watering Project spearheaded by the Finger Lakes Resource Conservation and Development Council. Animals grazing on pasture should have access to water sources within 500 feet of the grazing location (RC&D, 2008). Watering troughs and reservoirs serve to accomplish this goal, but they require pumps to be filled. Not only do electric and gasoline powered pumps increase the carbon footprint of the farm by using nonrenewable coal-burning technology, but they are often impractical for use in pastures in the Finger Lakes because these pastures may not be located near electric power lines and gasoline pumps require much maintenance (RC&D, 2008). Through this project eleven livestock farms in the area have begun looking to renewable energy sources including wind and solar energy to run their pumps and works to disseminate information about this innovation to more local farmers (RC&D, 2008).

Crop rotation

Crop rotation is an important agricultural indicator for a local food system because it allows for replenishment of nutrients leeched out of the field during monocrop cultivation. Crop rotation also provides benefits for water resource protection. One farmer interviewed criticized his neighbor's decision to plant corn on a field for the third year straight because it was "drying out the field and destroying the nutrients" (Farmer 1, 2008). Corn in the Finger Lakes region is the crop with some of the most harmful impacts to the soil in part because of its water use. Crop rotation can occur by planting soybeans in a field every three years instead of corn, or by altering in which fields corn and wheat is planted. Soybeans can be tilled back into the soil at the end of the season to provide additional nutrient recovery.

The use of rotational grazing by farmers serves as an indicator of a local food system because it reduces the farmer's reliance on fertilizers, reduces the concentration of animals in one area, and diminishes negative erosion impacts from monocrop fields. Rotational grazing is a practice by which farmers set aside distinct pastures on which their animals graze. For the majority of the year an individual pasture will have no animals on it because it is given more time between grazings than with time for grazing to allow for the pasture to re-grow. A visual of rotational grazing would show a high concentration of animals in one pasture surrounded by several empty fields. The idea is that when the pasture re-grows it will provide more food than it would if the animals were allowed to spread out and graze on all pastures at the same time. The practice is more common in regions of the world, such as New Zealand, where the climate is suitable for year round grazing. Nonetheless rotational grazing can still occur in the Finger Lakes for at least part of the year.

One of the farmers interviewed, who was also a Cornell graduate, practiced rotational grazing, providing support for this indicator in the Finger Lakes. He described his commitment

to this practice as stemming from the conservation benefits it provides, and noted that the practice was very different from the conventional farming methods employed by his father who owned the farm in the previous generation (Farmer 3, 2008). In his rotational grazing scheme the cows "do their own harvesting," and he doesn't have to plant crops that erode his land (Farmer 3, 2008). He states that pasture grazing does not erode the soil (Farmer 3, 2008). He has 160 milking cows, and every milking occurs in a different pasture, so between milkings a pasture can re-grow, its grass fertilized by the manure let by the cows, and ultimately each pasture will have more or less the same grass height (Farmer 3, 2008). The milking output from his cows competes for the highest herd production in Onondaga County (Farmer 3, 2008). His success suggests that rotational grazing provides economic and well as environmental advantages to farmers.

Indicators for Environmental Conservation

Two problems, (1) biodiversity extinction and (2) growing population, have received much attention from scholars, academics, conservationists, and practitioners alike. The first problem stems from biodiversity and its vulnerability to extinctions. According to Global Issues, 2008, biodiversity commonly refers to the variety of life on Earth. Biodiversity is important and plays crucial role in boosting ecosystem productivity where all species—either small or large, flora or fauna, enables the ecosystem to possess the ability to naturally sustain the biodiversity. Among causes of biodiversity loss, human activity is at the forefront (GI, 2008).

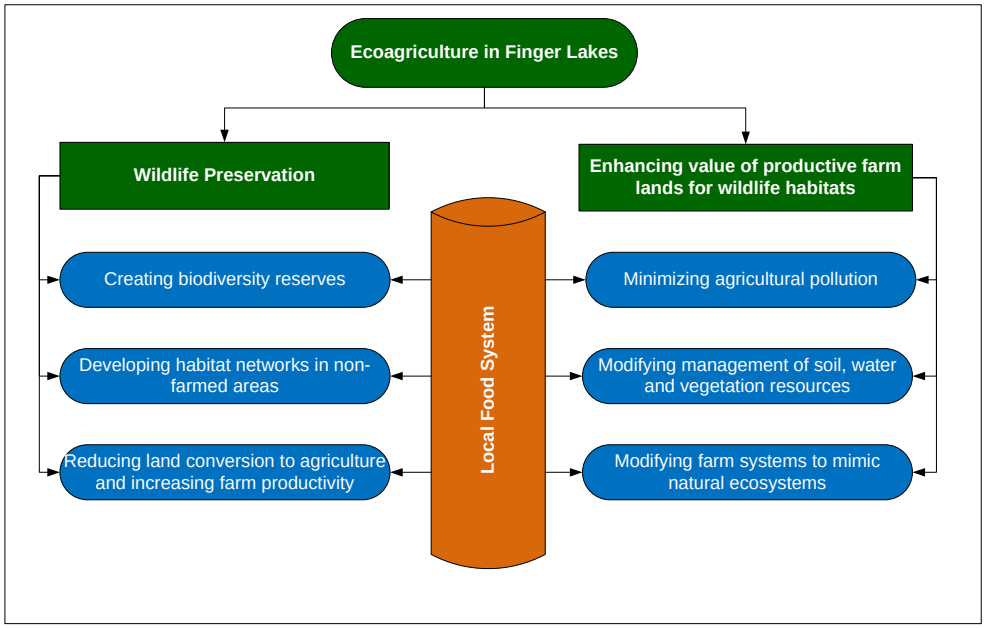
The second problem of explosive population growth has led to global concern about poverty and hunger. In September 2000, the United Nations and its member states set eight millennium development goals (MDGs) including combating poverty, which are to be achieved by 2015 (United Nations, 2002). To combat poverty, it is vital to increase agricultural production. However, this creates problems of biodiversity loss as productivity is boosted by environmentally unfriendly farm practices. For example, extensive use of fertilizers and pesticides has negative impacts on human health, and mono-crop cultivation causes soil infertility and degradation. The solutions to the two problems are normally in competition with one other.

McNeely Scherr's proposed ecoagriculture approach can help solve both of these problems, and is important to consider when evaluating environmental conservation indicators related to local food systems. Ecoagriculture can be defined as "a vision for managing land and natural resources to meet three goals simultaneously: (a) providing agricultural products and services on a sustainable basis, (b) supporting viable livelihoods for local people, and (c) conserving a full complement of native biodiversity and ecosystem services. Ecoagriculture takes a landscape scale view of land use and its consequences" (LMRC, 2008).

The local food system in the Finger Lakes Region can be viewed as an approach leading towards ecoagriculture practice. On average, the distance our food travel is about 1,500 miles before reaching us and the energy required is 57 times the energy to produce food than the energy we receive from consumption (Bauchner, 2006). Thus, moving foods from one place to another is not efficient use of energy or environmentally sound way to eat. There is a surge of popularity of local food in the past years in Ithaca, one of the cities in the Finger Lakes Region.

McNeely and Scherr propose the acceptance and expansion of a set of inclusive resource management strategies for landscapes that can both produce more food and preserve ecosystem services with a special emphasis on wild biodiversity (Buck, Gavin, Lee, & Uphoff, 2004). The term "landscape" is defined as a territory that is characterized by a particular configuration of topography, vegetation, land use, and settlement pattern that delimits some coherence of natural, historical, and cultural processes and activities. For landscape performance assessment, a landscape is best delineated functionally, within the context of a particular issue or goal (LMRC, 2008).

Six main strategies are identified for ecoagriculture. Three of them are concerned with making space for wildlife preservation within agricultural landscapes whereas the other three emphasizes to enhance the wildlife habitat value of productive farmland itself (Figure 4). Strategies aimed at wildlife preservation include: (1) creating biodiversity reserves, (2) developing habitat networks in non-framed lands, and (3) reducing land conversion to agriculture and farm productivity. Strategies for enhancing value of productive farm lands for wildlife habitats consists of (1) minimizing agricultural pollutions, (2) modifying management of soil, water and vegetation resources, and (3) modifying farm systems to mimic natural ecosystem (Buck et al., 2004).



Local food systems encourage and provide strong incentives to farmers to use environmentally sound practices. Agricultural practices in the local food system may have both direct and indirect impacts, which can be measured by indicators of nutrient use, pesticide use, energy use and greenhouse gas emissions, crop diversity and land use diversity, water use and water quality, soil quality, and wildlife habitats.

Nutrient use indicates the intensity in use of chemical fertilizers and soil improvers per hectare (ha). It is an important indicator of the direct impact on the environment from the perspective of the management of nutrients. High values indicate a high risk for eutrophication of habitats and recipients (OECD, 2004). Pesticide use indicates the intensity in the use of crop protection chemicals per ha. In general, the use of pesticides has a strong relationship with negative impacts on the environment. This can lead to biodiversity and habitat loss as well as contamination of soil and water resources (OECD, 2004).

Third, energy use is a rough indicator of the use of nonrenewable resources. The energy use has positive relationship with the green house gas emission leading towards global warming. Energy use directly for machinery, heating and electricity is included (OECD, 2004). Third, greenhouse gases can be measured by emission of carbons from agricultural farming activities. There is a negative relation between greenhouse gases emission and environmental sound practices (OECD, 2004).

Crop diversity can be expressed in values ranging between 0 (lowest) and 1 (highest). In addition to being an indicator of agricultural production, crop diversity is evaluated as an environmental indicator in terms of the heterogeneity of the cropping pattern on arable land only. Heterogeneity is positively related to biodiversity. High heterogeneity means the more complex crop patterns in arable land. Heterogeneity provides better biodiversity conservation. High heterogeneity means more complex cropping with smaller fields and a potentially higher proportion of field boundaries. The indicator can be calculated on the share of the arable land taken up by cereals, other field crops, vegetables and flowers, forage crops excluding permanent and rough grazing and other arable crops (OECD, 2004). Crop diversity relates directly to the quality of the soils. Soil quality can be measured by organic matter content that indicates soil quality and health. Land use strongly influences the soil quality. When organic matter content is high, the soil is very productive and well functioning (OECD, 2004).

Land use diversity can be expressed in values ranging between 0 (lowest) and 1 (highest) indicating the heterogeneity in land use. Generally, heterogeneity is positively related to environment. The indicator can be calculated on the share of land taken up by woodland, fallows and set aside, permanent and rough grazing, permanent crops and arable land. “However, this indicator should be interpreted with care since from a nature conservation point of view farms with large areas of semi-natural grassland may be homogeneous in character, with low land use diversity score, but valuable in habitat quality” (OECD, 2004).

Water use by agriculture can be indicated by the area and type of crops grown with the aid of full or supplementary irrigation (OECD, 2004). Second, water quality can be measured by inclusion of heavy metals and organic chemicals residues in surface and groundwater. In addition, nitrates/pesticides in water indicate the trend in concentrations of nitrate and pesticide loads in ground and surface waters. This indicates the state of water quality (OECD, 2004).

The final indicator of environmental conservation, wildlife habitats, can be measured by estimated number of wildlife habitats in the region. Environmentally sound agricultural practices are highly related to populated wildlife habitats (OECD, 2004).

Indicators for Livelihood Security and Economic Viability

A local food system, like any other venture, must be economically viable in order to persist. Similarly, livelihood security must increase for the additional sake of social and ethical viability. In this section, we identify several indicators of livelihood and economic vitality: employment terms; financial analysis and the local retention of money; and the more abstract notion of system resiliency.

Employment Terms

It is not possible to have a stable, secure food system without the provision of adequate working conditions to those associated with the food system, whether on the side of production or distribution. Underpaid, overworked, exploited, and otherwise dissatisfied employees breeds unrest and inefficiency, as well as being unethical and disharmonious with the tenets of ecoagriculture. Therefore, the first measurable indicator of livelihood security examines fair terms of employment.

At the very least, the US Department of Labor's Occupational Safety and Health Administration's (OSHA) regulations must be met (a list of these regulations can be found on their website). Agriculture is one of the most hazardous industries in the nation, and farming accidents (since, unlike in private industry, families often share the work and live on the farm) pose a dramatic risk to the welfare of an entire family unit. According to OSHA's website, fatal injuries constitute a significant burden on the agricultural sector, as indicated by the annual average of 806 fatal occupational injuries that occurred during the decade from 1992-2002; many of these deaths occurred among youths under age 20. Fortunately, the rate of fatal injuries on farms has decreased in recent years.

Fatal and nonfatal injuries in the agriculture industry fall into the following general categories: ergonomics (repeated work causing bodily stress, e.g. milker's knee), respiratory (e.g. manure pits), chemical (pesticides and fertilizers), noise, biologicals (e.g. veterinary antibiotics), industry specific, psychological stress, and skin exposure. In a local food system that adheres to the values of ecoagriculture we would expect rates of many of these types of injuries to be far less than the national average. For example, because ecoagriculture prescribes sustainable farming practices, the incidence of pesticide-related respiratory illness should be lower in the Finger Lakes. Similarly, humane meat production and strong institutional support, which weaken the shock of a poor growing season, should lead to a lower incidence of psychological stress. Furthermore, legal wages, legal working hours, and other regulations must be followed. It is not necessary that local food workers be paid more or work less than the national average, but we would expect that they would not be underpaid or overworked.

Second, in order to measure the more intangible aspect of job satisfaction, we would administer a survey and/or conduct interview of various people associated with the local food system. Doing so would lend a more subjective picture as well as illuminate new issues. A

semi-structured format would inquire about feelings of safety and justice, security of the job and the industry, sources and level of stress, perception of institutional support, and levels of income. We would hope to determine such things whether producers are living paycheck to paycheck or are able to invest profit and grow their business.

In sum, the data that must be collected to measure the broad indicator of fair employment includes 1) quantitative: national and local rates of fatal and nonfatal injuries for the listed categories over time; 2) qualitative: surveys and/or interviews of those associated with the Finger Lakes food system to determine feelings of safety, fairness, and level of satisfaction.

Financial Analysis and Local Retention of Money

Perhaps the most obvious indicator of economic vitality is the amount of money generated by the individuals, individual enterprises, and institutions relating to the local food system. Like analyzing a corporation's annual report, however, it is often difficult to shed insight on the situation without making comparisons with other firms in the industry as well as across time. In this case then, we would look at financial reporting over the years in the Finger Lakes region as well as in similar situations in the state, country, and elsewhere. Using the farmers' markets in Seattle as a benchmark, for example, we could classify the Ithaca Farmers' Market, or we could compare CSAs in the northeast to determine CSA market dynamics in the Finger Lakes; for example producer concentration and supplier demand. (Incidentally, such an analysis would shed considerable light on consumer characteristics, including helpful spatial information to determine the size of the foodshed. The American Farmland Trust, 2008, defines a foodshed as "a region where local food is both produced and consumed. A foodshed can be defined in a variety of ways, but generally includes the land that the food grows on and the routes it must travel before ending up on consumers' tables".) It is likewise important to make inter-firm comparisons across time as indicator analysis is foremost interested in changes. We would expect to gather data, then, that allows for percent-change and ratio reporting. Additionally, we would adjust for inflation when performing longitudinal analysis, using the Consumer Price Index (CPI) as determined by the Bureau of Labor Statistics.

But equally indicative is the meaning of that money to those that generate it. Ithaca's thriving Farmers' Market is one of the strongest indicators of a profitable, self-sustaining local food system. An analysis of the vendors at the Farmer's Market would paint a telling portrait of the type of supplier. By definition, as mentioned in other sections of this paper, all vendors are local (that is, producing within 30 miles of Ithaca). However, it would be worthwhile to determine what percentage of these producers depend wholly, partially, or not at all (in other words, they retail at the Farmer's Market with profit not being the main motive, eg for a hobby) on a farmer's market for their income. A large percentage that depends largely on Farmer's Market sales would, for example, indicate that the existence of the Farmer's Market provides for secure livelihoods.

At the same time, it is essential to determine how much of the money stays local. Buying local does not mean that money stays local, nor does it mean that businesses use local banks for loans. While buying local means on the one hand that money is not being distributed to scattered stockholders and/or outposted managers, and ensures that local taxes are paid (some chains do not pay local taxes, for instance), it does not necessarily mean local business and/or employees are spending their money locally. However, it is generally accepted that buying local increases

the probability that the money will stay local, that business profit will be invested and that benefits will be felt directly or indirectly in the community.

It seems nearly impossible to follow the life of a dollar spent, yet there are many admirable attempts to do so. Organizations such as the firm Civic Economics, for example, report market comparisons such as a local bookstore versus a chain. In another study, the same firm found that, in Chicago, money spent in local stores stayed local because employees were paid more, owners used more local goods and services for their businesses, and contributed more to local charities (Toomey, 2004). In other words, we might be able to use more easily measurable notions such as local goods and services, charitable contributions, and wages to indicate that the likelihood that money is staying local.

Another extremely notable attempt comes from the Sustainable Seattle endeavor. In order to more fully describe an emerging local food economy in the Puget Sound area, researchers launched an investigation of associated market dynamics from which emerged a relationship-based model of the economy (Sonntag, 2008). Main findings included that locally directed spending supports a web of relationships, which results in healthier and more prosperous communities, with benefits eventually trickling down ecological restoration. Furthermore, the analysis shows that locally directed spending by consumers more than doubles the number of dollars circulating among businesses in the community. Simply put,

> The report makes the case that the emerging local food economy represents a fundamentally different way of organizing production and consumption. Whereas market efficiency is the focus of the industrial food economy, relationship-building is the focus of community economies. Practices in community building and care of the community's resources are key to the vitality of the local food economy (ibid).

The report, additionally, emphasizes the importance of community linkages in keeping money local. Perhaps, then, a second viable proxy to determine whether money stays in the region is to examine the social and institutional linkages, whereby strong, numerous, and diverse linkages indicate a greater proportion of money staying local.

There is no reason to reinvent the wheel, and so it behooves those working to classify and build the local food economy in the Finger Lakes to glean lessons and borrow methodology from this effort in Seattle*. We might take the research questions posed by the authors of this report and mold them to act as indicators for our purpose:

- Do the goals, strategies, practices, and challenges of local food economy businesses differ from those of classical or traditional for-profit businesses, and how?
- Do the critical economic linkages for developing a sustainable regional food system, as defined by the Seattle study, exist in the Finger Lakes?
- Do these economic linkages contribute to environmental and community stability?
- Based on analysis, what are the strategies for strengthening the local food system? How feasible are these strategies?

Borrowing methodology from firms such as this one would elucidate dollar dynamics as well as suggest ways to improve the situation in the Finger Lakes.

System Resiliency

Third, more abstract, and related to the previous two points is the idea of system resiliency. In order to be sustainable, a system must be able to absorb shocks. Examples of unsustainable food systems that were unable to absorb shocks were the potato famine in Ireland, for which a homogenous crop and lack of institutional support were largely to blame, and the more recent E. coli outbreak in the country's spinach, for which over-connectedness and lack of transparency were at fault. Seemingly the best shield is a balanced level and diversified portfolio of product and social and institutional linkages. Analysis indicating such would mean that the food system is more sustainable than not. Multivariate regression analysis might yield a model to predict the sustainability of the region, with factors such as social linkages, diversity of linkages, product diversification, number of institutions, a multiplier that indicates probability of local retention of money, in- and out-migration, etc. Such a model is, as of now, beyond the scope of this paper, but it seems plausible that the statistics could be worked out with insights from the literature and expert assistance.

If residents of a foodshed are not satisfied with their employment, the infrastructure of their community, and the amount on their paycheck, it is impossible to have a sustainable local food system. Measuring these indicators, comparing them to indicators in other regions, nationwide, and across time, will significantly help determine the existence of a local food system in the Finger Lakes.

Indicators for Institutional Support Systems

In order for a local food system to be successful, a community must embody certain characteristics and agree with the values and norms of a place-based economy. Farmers can want to sell locally and provide directly to consumers in the area, but the community members must also want for the success of these farmers and for the unity and interdependence of the community. Organizations and groups may arise to help small farms begin their operations or move from the global market into the local market; however their success is ultimately dependent upon the participation of the local community. There are several indicators that one can use to determine the extent of the institutional support of a local food system. This list could be very long, but a key piece of a useful indicator is that it can be measured.

As defined by the Landscape Measures Resource Center (LMRC), 2008, an institution is "the governance structures, markets, social capital, cultural norms and human capacities that enable an integrated, multifunctional (ecoagricultural) landscape to be realized". This implies that the success of a local food system, relative to the existing institutional support, depends on much more than the simple existence of governance bodies that are interested in supporting local agriculture. There must be a mindset in the surrounding community that is determined to see the success of small local farmers; the community must be capable of providing support and resources necessary for the local food system; and there must be markets that are available and accessible to any and all interested parties, including farmers and consumers. A landscape might be fully suitable for the development and maintenance of a local food system, as in Ithaca, but without the necessary institutional support, the food system will eventually deteriorate. The Finger Lakes encompasses both a fully capable landscape and a successful collaboration of markets, social capital, ideas and leaders, which together have allowed for the maintenance of a local food system.

The institutional support system of a region can take on several different forms – public, private, civic and hybrid. Public support may be seen in certain public policies, public agencies or in the existence of not-for-profit markets or spaces available for farmers to sell their goods. Private support could exist in the form of monetary donations from businesses or profit-making markets, such as Wegman's supermarkets. Civic support refers to the social capacity to support the local food system – the mindset, the way of life, and the desire to see it succeed. Hybrid organizations include universities and other groups that utilize public and private influence. The institutional support system that exists in the Finger Lakes is a mixture of public, private, civic and hybrid organizations. Having such a diversity of supporting establishments positively influences the success of a local food system because it is dependent on more than just one form of institution.

Based on the foregoing, we have chosen three indicators that we think are most useful in tracking the changes in the institutional support of a local food system. First is the number of farms selling direct to consumers. Direct sales to consumers are a major component of a

successful local food system, for one because direct sales cut out the middle man. Second is the number and types of venues that sell locally produced agricultural goods. This includes farmers markets, community-supported agriculture (CSAs), and local grocery stores. Finally, we propose that the types, number and effectiveness of organizations that are supporting local agricultural practice, education and research can reveal much about a community's willingness to maintain a local food system.

Direct Sales From Farmers to Consumers

A major component of a local food system is the trusting relationship that exists between farmers and consumers. This relationship often initiates through direct sales of agricultural goods from farmer to customer. While selling directly to his or her customers is the fastest way for a farmer to make a profit, it often is not the easiest. This is unfortunate because selling direct does much more than immediately put the money in the farmer's pocket. Selling direct offers the farmer and the customer the opportunity to get to know one another. It gives the farmer the chance to meet customers interested in supporting small and local farms and to come to know and understand the people that make up the local community. Buying direct from the farmer offers the customer a chance to meet the man and or woman who grew the food, to ask questions and learn about farming practices, and to build an understanding of the importance of small farms and sustainable farming practices. Because selling direct to customers offers many benefits to the farmer, the customer and the community as a whole, we suggest that measuring or quantifying direct sales of agriculture products in a region would be a useful indicator of the norm of a local food system.

Currently much data exist that categorizes and characterizes farms across the United States. Primarily these data come from the USDA's National Agriculture Statistics Service (NASS) and includes information on value of farmers' direct sales. Another useful resource for data regarding number of farm operations selling directly to consumers comes from a report done by Duncan Hilchey and Gil Gillespie from the Department of Development Sociology at Cornell University. Their report, *Local Agriculture and Food System Indicators*, helps to understand why indicators of local agriculture are important and discusses methods to develop these indicators. One of the indicators Hilchey and Gillespie cover in their report is direct-to-consumer sales, which they refer to as D2C. Most of their information comes from the USDA's NASS and the Bureau of Labor Statistics. Unfortunately these data are not specific enough for use in this report, but we offer additional methods to quantify this information.

First, we would want to find a total number of small farms that exist within the Finger Lakes region. This number would only include farms that are locally operated and managed, that sell goods only within 100 miles of their own farm, and that do sell their agricultural goods for a profit to local consumers. The Cornell Cooperative Extension and the Ithaca Farmers Market would also be good resources for determining a final value for total number of operating farms, which is the term we will use to denote farms in a region selling their goods locally. Next, we would have to determine how many of these farms sell directly to their customers. We will define selling direct as exchanging local farm-grown agricultural goods for US dollars with a member of the local community. For now we will not include sales or purchases made through a local grocery store; the exchange must be direct from farmer to customer. In order to collect these data, we would have to interview either in person, by phone or by email, each farmer individually and inquire whether or not that farmer sells directly to customers at any time during

the year. We could then compare the number of farmers selling direct to the total number of farmers in the region. This would give us a good baseline indicator of number of direct sales in a region.

Down the road, we could determine total volume and value of direct sales for each farmer and a total for the region. We could also determine total volume and value of sales made indirectly (such as to a local grocery store). With these values, we could compare the total profit made from direct sales to the total profit made from indirect sales. Understanding the difference between direct and indirect sales in a region could be useful in developing programs to help foster more direct sales, or to set up new opportunities for farmers to sell direct to customers. Because direct sales is a component of a successful local food system, knowing how direct sales compare to indirect sales would help assess how well the local food system is functioning. An increase in direct sales would suggest that farmers and consumers are interacting more closely and more frequently, whether it is the result of more customers or the same customers purchasing a larger portion of their food products directly from the farmers.

Available Markets for Selling Locally

Our second indicator of an institutional support system deals with the number of venues selling locally produced agricultural products. Many advocates of local food suggest that a farmers market is one of the most indicative components of a viable local food system. Ithaca, located at the south tip of Cayuga Lakes, boasts one of the largest farmers markets per capita in the nation (M. Roth, 2008), with around 150 total vendors selling at the market, which runs from April to December (Ithaca Farmer's Market, 2008). Farmers markets provide a wonderful opportunity for a variety of farmers from the same region to come together at one location and sell the agricultural products that they have grown and harvested. At the Ithaca Farmers Market, only farmers whose farms are located within a 30-mile radius of Ithaca are invited to sell their produce. Similarly, many restaurant or other food venues buy much of their produce direct from farmers in order to provide locally-grown meals to restaurant patrons. In Ithaca, restaurants such as Just a Taste, ABC Café and Smart Monkey Café provide a wide array of meals ranging from grass-fed beef to vegan options. Just a Taste, centrally located in downtown Ithaca, is proud to use locally grown foods in their menu offerings and includes a list of local vendors on their website.

Another option for farmers to sell their produce or other farm products is to set up a community-supported agriculture program, referred to as CSA. LocalHarvest.org is an online network to aid interested consumers in finding farmers markets, family farms, and other sources of sustainably grown food in an area. LocalHarvest.org defines a CSA as, "a way for the food buying public to create a relationship with a farm and to receive a weekly basket of produce". Generally, the customer pays the farmer at the beginning of the growing season, and sometimes even a year in advance. In return for the money up front, the farmer provides a weekly basket of goods to the customer, or will welcome the customer to come by the farm or the market to fill their own basket for the week. Having the money up front allows the farmer to afford payments to farm workers, buying seeds, and paying for any other farm and equipment needs. For further information on CSAs, LocalHarvest.org offers an extensive definition and explanation of why CSAs are good for the farmer and consumer.

An article from the UMass Amherst Vegetable Program, 2008, lists several reasons describing why CSAs are important. A CSA program encourages direct communication and

cooperation between farmers and consumers. Buying produce directly from the farmer helps to keep food dollars in the local community and contributes to the sustainability of a local food system. Providing the money up front allows the farmer to focus on producing high quality goods and encourages the farmer to test the biodiversity limits of the land. CSA programs create a sense of social responsibility and stewardship of local land and increase the consumer's understanding of how, where, why and by whom the food is grown (C. Roth, 2008). There are 335 farms within a 100-mile radius of Ithaca, which encompasses the Finger Lakes (LocalHarvest, 2008). Many of these farms also sell at the farmers market and have someone available for interested patrons to speak to about setting up a CSA.

Beyond direct marketing, many places are seeing the advent of large grocery stores opting to sell locally grown produce. Setting a standard for qualifying and defining locally grown food in grocery stores across the United States is something that has yet to happen. In many places across the country even Wal-Mart is selling local produce. According to an article in the Ithaca Journal in November, 2008, as of July 2008 Wal-Mart has become the largest purchaser of local foods in the nation (Schmit, 2008). The article goes on to discuss the meaning of local food and explain how each retailer selling "local" produce inevitably has a different definition of the term local. It is likely that Wal-Marts around the Finger Lakes offer local produce, but those goods could come from anywhere in New York State.

Around the Finger Lakes and across the nation, cooperative markets have sprung up, providing an alternative means for farmers to sell the produce locally and for consumers to buy agricultural goods from farmers in the area. According to the GreenStar Cooperative Market in Ithaca, a co-op is, "an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly owned and democratically-controlled enterprise" (GreenStar Co-op, 2008). Cooperatives operate on seven main principles: voluntary and open membership; democratic membership control; member economic participation; autonomy and independence; education, training and information; cooperation among cooperatives; and concern for the community.

Many cooperative markets, including GreenStar, make an effort to include locally produced goods on their shelves. In an article from the November 2008 issue of GreenLeaf, GreenStar's monthly newsletter, general manager Bini Reilly states that, "it's a mission of GreenStar to support local vendors as much as possible". Being located in upstate New York hinders the store's ability to sell only locally-produced goods, especially agricultural products. However, Reilly asserts that, "if we have a local option, that's who we want to support…We'll definitely give the local product the first shot at that shelf space". Reilly estimates that about fiver percent of the store's offered products are from local vendors, which is approximately 1,500 local products (Snyder, 2008). The seventh and final value of co-ops is concern for the community. Through policies designed and approved by co-op members, a co-operative works for the sustainable development of its community (ICA Coop, 2008).

The Finger Lakes community and the local farmers are fortunate to have a wide variety of options for buying and selling local agricultural goods. Being able to quantify the number of venues available for the sale and purchase of local food would be a useful indicator for tracking changes in value and practice of a local food system in an area. To find information on this indicator, we again would have to contact all of the farmers in the region. We would inquire of them all of the different venues at which they sell their produce – the farmers market, through CSAs, at the local grocery store or to local restaurants. Once this information was collected from every farmer, we would be able to tally the results and quantify the total number of venues at

which or by which local food is purchased and sold. Eventually we could look at the total volume and value of sales at each of the different venues and then compare total sales across the different venues to determine how frequently or infrequently each venue is used. This information could be used in future endeavors to develop programs to help foster success of certain venues or maintain the successfulness of others. Information from various regions across the nation could help determine if there are other potential venue options that do not already exist in a region, but likely could be very successful.

Public, Private and Hybrid Support

Third, we suggest that the success of a local food system is fundamentally dependent on supporting organizations in and around the community. According to the North Carolina Farm Transition Network, 2008, the average farmer in the United States is 56.3 years old. In order to maintain current farms and help develop new farms a new generation of farmers must emerge. Various organizations and support groups are forming to address this issue and to help educate our younger generations about the importance of small farms, the general practice of farming, and sustainable farming methods. The Finger Lakes is the proud home of New York's land grant institution, Cornell University, which plays a big role in developing and sustaining local communities.

Members of the Cornell community have been very active in the small farms and local food movements. Several student and university groups exist on campus and around the community whose goals vary from developing and maintaining sustainable communities to educating new farmers to promoting local diets. To list a few, these organizations include the Cornell Small Farms Club, the New World Agriculture and Ecology Group, Dilmun Hill Student Farm, the Community and Rural Development Institute, and the Community Food and Agriculture Program. Information regarding past projects from these groups as well as what these groups intend to do can be found through their websites. One of the most influential components of these supportive organizations is the Cornell Cooperative Extension.

Cornell Cooperative Extension is an outreach of Cornell University that focuses on improving livelihoods and communities through partnerships, research and education. Among other things, CCE has an extensive list of programs aimed at agriculture, environment, health, gardening, community and economic vitality. Through these and other programs, CCE strives to identify problems in and around different Finger Lakes communities, develop research programs to assess and help correct these problems, and implement appropriate educational or supportive programs aimed at fixing these problems. A major program funded by CCE is the Finger Lakes Sustainable Farming Center, an organization focused on sustainable farming that enhances rural land development and supports community growth in three counties in upstate New York. For more information, visit the Cornell Cooperative Extension website.

Beyond university-funded programs, there are a variety of different public and private organizations in and around Ithaca that focus on maintaining land in farming, supporting small farming communities and providing research and education to the people who make up these communities. The New York Farm Viability Institute originally began as a Cornell program with a grant from the USDA, but is now an independent farmer-run non profit that funds research and outreach education projects to help farms increase profits and in turn become a model for new farms to follow. The New York Farm Bureau is an entirely volunteer-based, family-funded group whose mission is to solve economic and public policy issues that face the

agriculture industry today. The Finger Lakes Land Trust works to protect the lands that define the Finger Lakes, including gorges, forests and farmlands. EcoVillage at Ithaca, located just outside of downtown Ithaca, is a small community of families living together as part of a project to develop an alternative style of suburban living. This style of living, known as an intentional community, provides a "satisfying, healthy and socially rich lifestyle, while minimizing ecological impact" (EcoVillage at Ithaca, 2008). Included in this community is a non-profit education system, three cohousing neighborhoods, an organic vegetable farm, a U-Pick farm, community gardens and varied natural areas.

Most recently, the Center for Local Food and Farming (CLFF), which is still in its developmental stages, is coming together as an educational partnership dedicated to building the necessary knowledge and skills for creating an economically and socially sustainable food system. Education will be guided by EcoVillage at Ithaca and their independently owned West Haven Farm. West Haven Farm is an internationally recognized resource for sustainable agriculture education; they have hosted interns, apprentices, grade school and college classes, researchers and professional groups from around the world. CLFF intends to further develop the educational opportunities developed by West Haven Farm by collaborating key institutional players in the Finger Lakes region with nearby farmers and funders. CLFF hopes to be the "nation's first hands-on training center for sustainable local food systems with a formal linkage to institutions of higher learning" (Center for Local Food and Farming at EcoVillage, 2008).

Additionally, there are some government-funded programs that actively support small farms and sustainable communities by region, state and nation. SARE, the Sustainable Agriculture Research and Education program helps advance farming systems that are profitable, environmentally sound, and good for the community through research and education. SARE has four regional programs, of which the North East is one. SARE is supported by the USDA and cooperates with the University of Maryland and the University of Vermont to disseminate and deliver information about sustainable agriculture. The New York State Department of Agriculture and Markets works to promote a viable agriculture industry, foster agricultural environmental stewardship and a safe food supply. The USDA offers various statistics about farmers and their profits through their five-year Census of Agriculture Report.

A variety of different support systems exist to help small farms and local foods succeed in the Ithaca area and surrounding communities. Tracking changes in these supporting institutions would provide useful data for the advancement of the potential and success of a local food system in a region. What we suggest for tracking these changes is to first determine the number of organizations that exist or were started in the region of interest. For this case, for example, we would look at all of the groups that were founded in the Finger Lakes region. A tally of these organizations would be a useful starting point. Next, we suggest determining the breadth of each group's program or programs; this includes when the program was started, who it concerns or aims to help, any research associated with the program, and any success or outcomes noted thus far. From there, it would be useful to look at future plans or intended programs and again whom these programs aim to help.

Quantifying this information will prove a more difficult task than for the first two indicators. Once we have determined a number of different organizations that are regionally based we can look at the programs they offer. We can make a tally of the different types of programs and group them into categories. These categories can be determined once the information has been gathered, but may be something like the following: new farm programs; farmer education programs; community education programs; research based programs; and

funding projects for farmers. Once we determine how many programs exist in each category, we can focus on the categories that are lacking in programs and those that could benefit from the development of new programs.

On their website, the LMRC offers very thorough instructions for tracking and assessing this indicator. The Institutional Performance Scorecard is a tool that can be used to identify key organizations and assess the overall potential of the institutional environment in an area to foster a successful landscape, which in this case would be a local food system. The institutional scorecard suggests that a landscape plan will be successful if the following three criteria are met: the existence of a mix of public, private and civic organizations; these organizations having adequate financial and human capacity; and their ability and willingness to coordinate activities and policies. To assess these three components, the scorecard provides three steps for identifying organizations, scoring their performance and discussing what this means for the landscape. A more in depth set of instructions for using the scorecard can be found at the LMRC website.

This scorecard could easily be adapted to determine the extent to which a local food system exists within the Finger Lakes region and how successful it has been. The first task would be to determine the "key informants", as suggested by the LMRC, to help us identify and categorize all existing organizations that support a local food system. The key informants would then help score the performance of each organization relative to the local food system. Finally, a major discussion would ensue to finalize the list of organizations and their performance rating. As with the first two institutional support indicators – value of direct sales and number and type of venues available for the sale of local foods – being able to categorize and assess the supporting organizations will give a very sound baseline for considering the scope of a local food system in a region. Over time this information can be monitored and compared to past years. If a local food system is successful, we would expect to see an increase in strength and number of the components of the institutional support system.

Conclusion

To define a local food system is to characterize a landscape and the community of people inhabiting this land. At this point no single definition of a local food system can be applied to every landscape. Each individual region must adapt its own definition, which can be done using the literature discussed in this report as well as additional sources. For this report we examine the Finger Lakes Region in New York State. Referring to this landscape, a local food system is one that is economically, socially and environmentally sustainable. The local food system is dependent upon sustainable agricultural methods and practices that are considerate of the local environment and wildlife biodiversity. The local food system provides adequate livelihood security to the farmers and the consumers in the Finger Lakes community, which also implies at least a partial retention of local dollars. Finally, the success of the local food system in the Finger Lakes depends heavily on the social norms, values and supporting organizations that exist in this community. This local food system is successful because a large variety of agricultural products can be and are produced and consumed within this one region; the money transacted in the exchange of these goods returns immediately to the local farmer who can then invest the money in the production of future agricultural foodstuffs. Although not all farmers in the region can survive solely on the profits made from the sale of agricultural products, many do rely on farming as their primary income.

This report has examined a variety of indicators of a local food system relating to agriculture, environment, economic vitality, and institutional support. Such a list of indicators can be tracked and used to determine the breadth of the local food system in the Finger Lakes and the extent to which it has been successful. Here we have proposed various methods for tracking each of the indicators discussed. Clearly further research and eventual fieldwork will be required to obtain primary data and to develop existing data that can more fully define this local food system and its current success. We intend to conduct this research in the near future, and therefore note that the suggestions in this report for tracking indicators are not necessarily complete and are subject to change.

Furthermore, a discussion of the various definitions, as provided in the introduction, will reveal that not all landscapes are capable of sustaining a local food system. The Finger Lakes region is very unique in its ability to provide such a variety of land uses as well as water ways and water supplies. Additionally, the community members of the Finger Lakes embody the qualities, attitudes and values necessary to maintain a local food system. Various institutions in the region exist to support local food and small farms both financially and socially. These are not necessarily characteristics that all landscapes can or do exemplify. Phoenix, as one example, would not be able to maintain a local food system of the same definition and dynamic as the Finger Lakes; this is simply because of the type of land that exists in and around the city, the way it is used, and the mentality of its inhabitants. We are suggesting that the Finger Lakes region merely serve as an example of a type of local food system that can exist. This case study can and should be used to help develop and improve local food systems elsewhere in the nation and eventually the world. As mentioned, careful context analysis for each landscape will be necessary before a definition can be determined.

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