

Summary of Key Points: Evidence-based Support for Local Food Systems, Proposed Research, and the Role of Extension

Summary of Key Points

Supporters of Local Food Systems (LFS) often draw on a standard list of benefits which are assumed to accrue to such systems. The benefits range from reductions in carbon dioxide emissions and energy use, stimulation of local economies, and creation of a greater sense of community. A group of North Carolina Cooperative Extension Agents participating in a 2010-2011 Professional Development Program to increase Extension activity in the area of LFS requested a list of “hard facts and sound statistics” that could be paired with these more general statements about the benefits of local food systems.¹ This *Summary of Key Points* and *Annotated Bibliography* (appendix to this report) responds to this request.

This document supplies informational bullets and accompanying citations to U.S. research on LFS. The information can be used by Extension personnel and others to understand the benefits of LFS and to make an accurate and data-driven case for public and political support of these systems. The most relevant bibliographic references are cited within the *Key Points*. The full *Bibliography* contains additional references. Unless otherwise noted, the Key Points in this summary cite peer-reviewed literature appearing in refereed scientific journals. Book chapters and working papers are other sources, and these are noted where applicable.

It is important to distinguish between the benefits that accrue to LFS and those that accrue to sustainable agricultural practices. This review is focused on research related to LFS.

The citations are derived from a search of the following databases: USDA National Agricultural Library (<http://www.nal.usda.gov/>), ProQuest ABI/Inform Database; Dissertation Abstracts Database; AgEconSearch (<http://ageconsearch.umn.edu/>), Social Science Research Network (<http://www.ssrn.com/>), searches using Google Scholar, and the search and review of sources cited in the collected literature.

My comments and recommendations are given within “<<” and/or in italicized text. These annotations include suggestions for future research projects in NC and contributions that could be made by NC Cooperative Extension personnel

¹ The Professional Development Program (PDP) is administered by the USDA’s National Institute of Food and Agriculture’s Sustainable Agricultural Research and Education Program. The Center for Environmental Farming Systems, a partnership between North Carolina State University, North Carolina Agricultural and Technical State University, and the N.C. Department of Agriculture and Consumer Services, administered the PDP in 2010-2011, involving 12 counties in a “train-the-trainer” model to generate and disseminate information and initiatives related to local and community based food systems. For more information, see <http://www.cefs.ncsu.edu/whatwedo/foodsystems/sarepdpnew.html>.

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Economic Benefits to Producers and Communities:

Notes:

- **Economic impact:** Numerous studies indicate that food (typically fruits and vegetables) produced and consumed locally creates more economic activity in an area than does a comparable food produced and imported from a non-local source. Economic activity is measured by calculating the economic impact with regard to the following: (1) income generated directly by farm sales or indirectly by sales at nearby businesses, as would be the case for well-located farmer's markets; (2) induced income that results when money that is retained in the local system is re-spent locally, and (3) increases in employment.
- **Entrepreneurial culture:** A less cited but very promising area which LFS proponents could highlight is the role that local food production and distribution play in sparking a culture of entrepreneurship in communities. Farms that produce, market and distribute their product are small businesses. Framing discussions of LFS as communities of small businesses helps to shift thinking away from the idea of hobby farmers engaged in niche marketing of goat cheese (the picture that some individuals may have in mind when "local food" is mentioned), to the idea of small family businesses engaged in building the entrepreneurial culture of a community. A thriving community of small business can also offer youth a place to find meaningful work without leaving the community.
- **Potential Research Studies for NC**
 - LFS are more likely to expand in areas where existing producers have already proven the profitability of local food distribution chains and helped forge initial connections to buyers. Case studies of these successes can be useful to prospective farmers to the degree to which economic information can be generalized to their own operation. In other words—producers who are considering a switch in production or marketing techniques need decision-making tools that succinctly and accurately compare the costs and returns of moving away from conventional agricultural practices. Le Roux et al.'s 2009 working paper is a good example of such a comparison, and could serve as a template for a similar study at a county or multi-county level in NC.
 - Beyond the comparison of production and local marketing options, a broader comparison of marketing channels is needed in NC, as it is difficult to compare the potential for local aggregation and/or distribution when the conventional distribution system remains opaque. King et al. (2010) provides a very useful template for a study of distribution channels that could be used for NC.

- *At the very local level, Extension personnel can provide convincing numbers on the benefits to local businesses of farmer's markets by conducting Rapid Market Assessments that include consumer spending at nearby businesses on market day. Several NC Extension agents have conducted these assessments. In addition to the quantification of dollars spent at and around the market, there are other indicators of success that Extension can collect and report. For example: (1) in addition to the growth in the number of consumers or sellers at the market, consider (and count and describe) any increase in the range of products sold, as these are an indicator/measure of small business innovation, (2) count and describe the connections established among producers, which can lead to joint endeavors, (3) count and describe the connections established between producers and other potential markets, such as restaurant owners, who may begin to buy produce at the market, (4) count and describe the involvement of farmers in other community activities, such as heritage festivals, or as members of community boards or civic organizations. This last point shows the impact of the farmer's market in building community organizations and a sense of community. Use all of these measures to track the growth and development of business and community networks. These measured outcomes can be used as indicators of Cooperative Extension's involvement in and ability to network across the diverse and often times unconnected groups within communities.*

Key Points

- *Aggregate statistics in the U.S. indicate that 15.8% of each dollar spent on food is retained by the farm (Canning 2011). <<Shorter supply chains translate into fewer intermediaries between the farmer-producer and the consumer, allowing more of each food dollar to accrue to the farmer.>>*
- *In 2004, the farm share of receipts from a retail basket of fresh vegetables was 23.5% and for fruit 26.6%. This compares to 1982 figures of 34% and 33% for vegetables and fruit, respectively (Stewart 2006). <<These statistics are more accurate ones to use when making the case for local foods, as the value of direct sales is dominated by sales of fresh fruits and vegetables. The trend is clearly toward a smaller share of the food dollar retained by the farmer.>>*
- *A national study of 15 food supply chains found that producers received a much greater share of retail prices in local food supply chains than they do in mainstream (e.g. conventional wholesale) chains, with producer net revenue per unit in local chains ranging from about equal to more than seven times the prices in mainstream chains (King et al. 2010).*
- *A study of local and mainstream food supply chains found that while farms in direct market supply chains retain nearly 100 percent of the retail price, costs incurred to bring their product to market total between 13 and 62% of the retail price (King et al. 2010). <<Thus it*

is important to recognize that local food systems can substantially increase the cost of marketing for producers.>>

- A consumer survey by Darby, Batte and Roe (2008) finds that consumers willingness to pay for local food is independent from the values associated with product freshness and farm size. *<<This means that for food that is of similar quality, consumers are willing to pay more for food known to be “local.” >>*
- Analysis of a national survey of consumer behavior and motivations for direct food purchases concludes that consumers attribute a public goods aspect to the attribution “local,” and thus are willing to pay more in dollars or time for that attribute (Thilmany, Bond, & Bond 2008). *<<This is important in that it means that given equal characteristics (of quality, convenience, etc.) for direct-marketed and non-direct marketed foods, consumers are willing to pay more for local foods.>>*
- An experiment conducted in Arizona found that consumers are willing to pay more for locally grown spinach marked with the Arizona Grown label over locally grown spinach that was not labeled, indicating, according to the authors of the study, that consumers see locally grown as an indicator of safety in their food supply (Nganje, Hughner, and Lee 2011). *<<These findings also indicate the need to label local product in a way that consumers can easily identify.>>*
- Consumers seem to equate and place similar value on products produced “in state” and “nearby” (Darby, Batte, and Roe 2008). *<<This finding confirms what others have noted anecdotally—that “local” does not have one distinct meaning and varies by consumer. >>*
- A survey of spending at eight farmers markets in Maine finds that consumers spend more when they visit the market as a family (Hunt 2007). *<<This indicates that promotions of farmer’s market visits as family outings could result in higher sales on market day, and, by extension, to higher sales at nearby businesses.>>*
- An input-output analysis for Michigan estimates the income and job impacts of a scenario in which residents meet USDA fruit and vegetable consumption guidelines by eating more seasonally available Michigan-grown fresh produce. The study finds that almost 2000 jobs and \$200,0000 in income would be generated (Connor et al. 2008).
- An analysis of the potential economic impacts of increased fruit and vegetable production and consumption in Iowa determined that there is a potential for substantial economic development to occur through import substitution (Swenson 2006; Swenson 2009, both working papers). The 2009 study reports that 4,000 jobs and \$302 million in sales would be added to the Iowa economy if Iowans ate five servings of fruit and vegetables every day and

25 percent of those servings were Iowa-grown. <<These two working papers by Swenson calculate the potential number of jobs and/or added income if consumers in the state sourced more of their existing fruits/vegetables from in-state, and/or if Iowa residents consumed more fruits and vegetables and sourced the increase from Iowa.>>

- Research in Iowa indicates that collaborative CSAs (those comprised of more than one farm) serve as business incubators for new growers and help existing growers expand and diversify their operations and their livelihoods (Bregendahl 2006, working paper). For example, nearly half of the CSA-participating producers surveyed said participation in the CSA helped them start, expand, or plan new farm-related enterprises. <<This information supports a benefit of LFS that has not received sufficient attention—their role as catalysts in entrepreneurship, new business innovation, and community business networking.>>
- Research on farmers markets in California, New York and Iowa show that participation in markets increased the likelihood that vendors diversified to additional markets beyond the farmers markets (Hinrichs et al. 2004). <<See point, on entrepreneurship, above>>
- CSA producers note that participation in a CSA helped prepare them for off-farm careers in sustainable agriculture. (Bregendahl 2006, working paper). <<See point, above, on entrepreneurship.>>
- In a working paper by LeRoux et al. (2009, working paper), the authors compare the relative costs and benefits of using alternative wholesale and direct marketing channels in central New York state, including risk, owner and paid labor, profits, and lifestyle preferences and sales volume. <<This working paper provides a good template for comparing costs/benefits across different marketing options. The template could be used to construct a comparison for North Carolina farmers who are considering a switch away from conventional-wholesale to local-direct marketing. This paper also provides evidence that producing for a local market will not necessarily be an attractive option for all farmers.>>
- A study in northeastern Iowa indicated greater income and employment was generated by farms with local sales than by regional grain farms (Enshayan 2008, working paper).
- A study of farmers markets in West Virginia estimated net income gain of \$1.08 million and 82 jobs attributable to existence of the markets (Hughes et al. 2008, working paper).
- In a study of Oklahoma farmers markets, researchers found that direct sales of \$3.3 million generated a total economic impact of \$6 million. A total of 113 jobs were associated with employment in the markets and in jobs generated in the rest of the economy (Henneberry et al. 2009).

- A Mississippi study found that the state's farmer's markets generated a total of \$1.6 million in revenues (Myles & Hood 2010, Extension fact sheet).
- Research indicates that shoppers at farmers markets are highly likely to spend at neighboring businesses.
 - An Oregon study of farmers markets found that between 1/3 and 2/3s of those surveyed also did additional shopping at neighboring businesses on the same trip. Of these, for every dollar spent inside the market shoppers also spent \$0.60 outside of the market (Lev, Brewer, and Stephenson 2003, working paper).
 - A Maryland study of farmer's market shoppers found that average consumer-reported expenditures outside of the market (to nearby businesses) ranged from \$76 to \$116 (Myers 2004, working paper).
- Research in Seattle finds that dollars spent at local food restaurants and grocers result in more than twice the usual impact on the local economy compared to household spending at typical restaurants and grocers (Sonntag 2008, working paper). This same study estimated that for every \$100 spent at an average grocery store, \$25 is re-spent locally; for every \$100 spent at a farmers market, \$62 is re-spent locally.
- Research on farmers' markets in Iowa indicate that these markets generated \$20.8 million in total sales in 2004, with these sales resulting in an additional \$12.2 million of economic activity. The same analysis showed farmers markets representing 325 jobs, plus an additional 146 full-time jobs created by the secondary impacts of farmers markets (Otto & Varner 2005, working paper).
- A Colorado study estimates that a marketing campaign to encourage consumption of Colorado apples within the state could result in an increase of \$263,000 in profit annually for apple farmers (Hu et al. 2011, conference presentation).
- Research indicates that farmer's markets are key catalysts in building local and regional food systems because they make local food visible in public spaces on a regular basis and they encourage enterprise diversification and business incubation (Gillespie et al. 2007, book chapter).
- A New York city study finds that the opening of a community garden had a statistically significant and positive impact on the value of residential properties within 1000 feet of the garden, and that the impact increased over time. The researchers also found that the opening of a garden is associated with other changes in the neighborhood, such as increasing rates of homeownership, and thus may be serving as a catalyst for economic development of the community (Voicu and Been 2008).

- A study of three northeast Iowa institutions showed that it is possible to buy locally raised and processed meat (traceable to a particular farm with a known method of production) at a price that is competitive with conventional sources (Gomes and Enshayan 2005, working paper). <<Indicates that food that is locally sourced can be competitive with conventionally sourced food.>>

Economic Benefits to Consumers

Notes:

Very little research on economic benefits to consumers was found in the literature. Future research could address questions of cost, comparing spending across households who source various portions of their food budgets from local sources. The amount of waste generated by local food vs. non local food purchases is also an important area of needed research .

Key Points

- Research in Massachusetts indicates that members of CSAs achieve significant savings on organic produce, saving 60 to 150% of the price of retail organics through their participation (Cooley & Lass 1998).
- Gomes and Enshayan (2005, working paper), in a study of three northeast Iowa institutions, showed that it is possible to buy locally raised and processed meat (traceable to a particular farm with a known method of production) at a price that is competitive with conventional sources.

Non-economic Benefits to Consumers and Communities

Notes:

- **Farmer's markets, CSAs and community gardens generate important non-economic benefits to their communities. Cooperative Extension personnel can catalog the value created and their involvement in this value creation:** *Research studies indicate that LFS provide recreational and social benefits in addition to economic value. These findings can support the efforts of the CES to document and catalog these non-economic benefits and their own involvement in creating non-economic value. For example: Agents who are active in community gardens currently document pounds produced from the garden and measure (via surveys) educational benefits that individuals accrue with regard to gardening knowledge. Agents can also document other benefits, such as the proliferation of social interactions that the community garden sparks, particularly between those who might not come into contact otherwise (racially or economically diverse groups, for example, or groups*

of youth and older individuals who might serve as mentors). Community gardens can also serve an important role in leadership development, helping empower individuals to become managers and leaders within their communities. These are benefits that can be documented by agents.

- **Potential research studies for NC:** *In addition to quantifying the number of types of social interactions and development of individual leaders, as described above, there is an opportunity for CES personnel and university researchers to conduct longitudinal qualitative research on the effect of farmer's markets, CSA's and community gardens (as well as school gardens) on individual, family, and community food consumption, including the types of food purchased, time spent in preparation, thought given to meal time, etc. Because these LFS forms have been linked to recreational and social benefits, studies conducted over time could also explore changes in civic activity (for example, changes in volunteering, or working informally to solve a community problem). On the production side of the CSA/farmer's market equation, research is needed to explore Hunt's (2007) finding (see below) that farmer's who sell directly to consumers change their production practices in response to consumer preferences. A study following growers over time could evaluate the degree to which they may have moved toward more sustainable farming practices and altered the types of products grown..*

Key Points

- Social interaction is much higher at farmers markets than supermarkets, and more than ¾ of farmer's market shoppers arrive in the company of others, compared to ¼ of supermarket shoppers (Sommer, Herrick, and Sommer 1981). *<<Farmer's markets have a recreational and social component in addition to the instrumental component of food purchase. This study's findings suggest that one way to increase the number of farmer's market shoppers may be to have a "bring a friend to the market" day. As well, because families who come to the market together spend more money at nearby businesses than those shopping alone (Hunt 2007), a campaign to "make family time at the farmer's market" might also help increase market business.>>*
- Research on benefits accruing to members of CSAs indicate that they receive non-economic benefits from their membership in the form of utility associated with picking up and preparing the CSA products (Kolodinsky, Wang & Pelch 1999, conference presentation). *<<In other words, even if a CSA and retail prices for a food item are the same, consumers would gain more from purchasing the CSA food because of non-monetary benefits (such as enjoyment) associated with picking up and preparing CSA food.>>*
- Research finds that community gardens serve as center of social activity and civic engagement (Saldivar-tanaka & Krasny 2004). *<<This study comes to this conclusion through*

the observation of activity around a community garden.>>

- In a survey of CSA members in Illinois and New Hampshire, research found that members are motivated to join a CSA largely because of their concerns over the quality of food. (Berhm & Eisenhaure 2008).
- Consumers in CSAs do not cite the importance of community-building to be an important motivator for their participation (Berhm and Eisenhauer 2008; Ostrom 2007, book chapter). *<<This is an important finding, because it is often assumed that a major reason that people join CSAs is to foster community and support farmers. While initial involvement in a CSA may not be sparked by a desire to create community or build personal ties to farmers, the act of being in a CSA can lead to both of these.>>*
- Research finds that the number of small business owners, including small and medium sized farms, contributes to community health, where indicators of community health include level of inequality, poverty, and unemployment (Goldschmidt 1946, working paper; Tolbert, Lyson & Irwin 1998). *<< The health and longevity of a community depends on a sound economic base and the existence of members who hold a vested interest in the community. LFS can support both. >>*
- Research indicates that consumer interaction with farmers at markets influences farmers willingness to reduce chemical inputs in order to meet customer demands (Hunt 2007). *<<By bringing consumers and producers together, consumers can express their preferences directly to producers, and what we see is a desire for more sustainable practices. This research is unique in that it shows that direct sales can directly encourage sustainable farming practices.>>*

Health Benefits to Individuals and Communities

Notes:

- **Recent studies have made empirical links between local foods and health outcomes:** *Largely due to interest in the health community in reducing obesity, new studies in 2011 were published which explicitly sought to test the relationship between food environments and obesity and other health-related outcomes. Ahern et al. 2011 and Salois 2011 use available quantitative data—across all counties in the U.S.—to investigate the relationship between the availability of local food (measured by direct sales figures from the USDA) and the health outcomes of obesity, diabetes, and mortality. While both of these studies show that direct sales correlate positively with health outcomes, the estimated values are fairly small. For example, Salois 2011 estimates that for each \$100 dollar increase in per capita direct farm sales, the county-level obesity rate can be expected to decline by 0.90% - 1.0%. Note that current spending on direct farm sales averages about \$7.00 per capita. Though the*

effect is small, the research evidences the fact that the health community recognizes local foods as a pathway to improved health outcomes, and that these studies have found that the degree to which local foods are available in the community (using the measures that are available) appears to have a positive effect on health outcomes.

- **Local food and nutritional content:** *It is important to recognize that not all locally-produced food will be higher in nutritional content than non-locally produced food. Locally produced fruits and vegetables are higher in nutritional content to the degree to which local sourcing shortens the time between harvest and sale. It is logical to assume that this would be the case in the vast majority of comparisons that could be made between local and conventionally sourced food items. Perhaps because of this logic, no peer-reviewed studies were found that actually test this difference. We do have studies that have evaluated the decline in nutritional quality of foods after harvest (Edwards-Jones 2010; Favell 1998).*
- **Building ties with the health community to support local foods:** *Extension agents can find new and enthusiastic partners among community health advocates, members of county health boards, hospital administrators, and leaders of health-oriented non-profits, all of whom are eager to exploit all means to improve county health outcomes. The link between local foods and health becomes institutionalized by drawing these eager members onto food advisory boards and councils, farmer's market boards, as partners in county programming, and as partners in grant proposals. Note that the Centers for Disease Control, among other organizations, is using the supply of local foods (measured by direct farm sales) and the existence of food policy councils as indicators (measures) of healthier food environments (see: http://www.fruitsandveggiesmatter.gov/health_professionals/statereport.html). NC CES personnel should make a concerted effort to involve community health leaders in their local foods efforts, and to document this involvement.*
- **Potential research for NC:** *Community gardens are linked to healthier eating, but the mechanisms are unclear. Studies provide strong support that involvement in a community garden results in greater individual consumption of fruits and vegetables. But we do not know why this is so. Is it because of the lower (or absence of) cost? Because of an altered relationship to food, brought about by an involvement in its production? And beyond eating more fruits and vegetables, how does involvement in the garden affect activity levels, weight, a sense of well-being, social ties, etc? How does it affect individuals of different ages, races and genders? How does it impact other members of the family? All of these questions are ripe for research. Similarly, the "direct sales" measure used to connect "local food" prevalence to health outcomes (see Key Points, below), also does not give any insight into how and why "direct sales" leads to better health outcomes, via, presumably, healthier eating habits.*

Key Points

- The nutritional quality of fruits and vegetables is highest right after harvest and then declines with time (Edwards-Jones 2010; Favell 1998).
- In two national U.S. studies examining the relationship between food environment and county-level health outcomes, researchers found that the level of direct farm sales was

associated with lower levels of mortality and obesity (Ahern et al. 2011), and lower levels of morality, obesity, and diabetes (Salois 2011). Salois 2011 estimated that for each \$100 dollar increase in per capita direct farm sales, the county-level obesity rate can be expected to decline by 0.90% - 1.0%. <<See note at beginning of this section on local food and health outcomes.>>

- A 2004 study estimates that the state of North Carolina spends \$2.138 billion annually on medical care arising from obesity-related illnesses (Finkelstein, Fiebelkorn, and Wang 2004).
- Specific to community gardens:
 - Survey research in Michigan finds that adults with a household member who participates in a community-garden consumed fruits and vegetables 1.4 times more per day than those who did not have a participating family member, and they were 3.5 times more likely to consume fruits and vegetables at least 5 times per day (Alaimo et al. 2008).
 - Participation in a community garden is significantly associated with greater fruit and vegetable intake, with 56% of community gardeners meeting national recommendations of fruit and vegetable consumption (5 times per day), compared to 37% of home gardeners and 25% of non-gardeners (Litt et al. 2011)
 - More research is needed to establish the nutritional effects of community gardens. This research should incorporate control groups and utilize valid and reliable dietary assessment methods, as well as examine community garden influence on weight, activity, and other health outcomes (McCormack et al. 2010).

Environmental Benefits—Energy Use²

Notes:

- **Local foods and energy use:**
 - *Locally sourced food, by definition, travels fewer miles from source to destination than non-local food. With regard to energy usage, local seasonally produced fruits and vegetables are the most likely candidates to compare favorably against non-local products. In some cases, production of local fruits and vegetables does not compare favorably to non-locally sourced products. Because logic supports the general idea that local is more energy-efficient, most published studies have concentrated on criticizing the idea that local is always more energy efficient. Our take-away message is that the logic generally holds, but that blanket statements*

² Note that environmental benefits of LFS are those that accrue due to the shorter supply chains associated with local foods. For the purposes of this document, they do not include benefits accruing to sustainable agriculture practices.

that local is always superior with regard to energy usage over non-local should not be made.

- *Life cycle assessment, whereby energy use is calculated across all stages of the life cycle of a product, is a better approach than food miles when attempting to calculate energy use or GHG emissions. Note that because agricultural production comprises only 21% of the total cost of food, it is important to look at how local food systems can reduce energy use in other parts of the life cycle, such as packaging and processing. Research is lacking in this area and could make a compelling case for public support for LFS, particularly if other costs are included—including the cost of noise, accidents and congestion due to transport, and the cost of wastage due to transport and holding practices.*

Key Points

- Food travels long distances—statistics:
 - a 1998 study examined the distance traveled for 30 conventional fresh produce items to the Chicago Terminal Market. The average distance was 1,518 miles (Pirog 2002, working paper).
 - A 2001 study found that the average distance for locally grown produce to reach institutional markets in Iowa was 65 miles, while the distance for conventionally sourced produce was 1,494 miles, nearly 27 times further (Pirog & Benjamin 2003, working paper).
 - The real cost of transportation has declined over the past 100 years, from \$0.23 per ton in 1890 to \$0.185 in 2000 (Glaeser & Kohlhase 2004).
- A New Zealand/UK analysis found that exporting some foods to the UK from New Zealand consumed less energy than producing the same food in the UK, highlighting the product-specific nature of energy use in agricultural production (Saunders and Taylor 2006, working paper).
- Estimates of energy usage within the U.S. food system as a percent of the total usage: transportation 14%; home refrigeration /preparation 31%; agricultural production 21%; restaurants/caterers 7%; food retail 4%; packaging 7%; processing 16% (Heller and Keoleian 2000, working paper).
- While local food compares favorably with regard to food miles when considering most food products, researchers agree that a more holistic approach, such as life cycle assessments, should be used to make comparisons (Heller & Keoleian 2003; Mariola 2008; Short 2001, working paper).

- The costs of accidents, noise and congestion associated with transport of food are factors not often included in transportation costs (Smith et al. 2005, working paper).
- Different foods exhibit a large range in GHG-intensity, with red meat on average around 150% more GHG intensive than chicken or fish. Weber & Matthews (2008) suggest that a dietary shift can be a more effective means of lowering an average household's food-related climate footprint than would be "buying local."

Sampling of Research Specific to School Gardens

Notes:

- *A number of quantitative studies (utilizing measures that generate numerical data that can be analyzed statistically) that have been conducted over the past 10 years indicate the positive impact of school gardens on elementary-school children's science achievement, intake of fruits and vegetables, and expressed preference for fruits or vegetables over other snacks. However, many of these studies are considered flawed in that: (1) the classes or groups were not randomly assigned to participate in the programs vs. serving as control groups (2) not enough classes/groups were replicated to make strong conclusions. Thus, there is still a strong need for research on school-based gardens that includes random assignment of classrooms/groups (to the intervention or control treatments), and includes more than a single classroom/group assigned to each treatment. More rigorous study of school gardens would help create a stronger case for their more widespread use. In any case, enough peer-reviewed research is available to make a strong case for school gardens, and to support further study of school gardens. CES has a strong presence working in school gardens in partnership with teachers, and should continue to partner with schools. Because of the growing interest in the relationship between food, activity, schools and obesity/health, CES agents should broaden their partnerships beyond science instructors to include school nutritionists and physical education teachers. These partnerships also provide the opportunity for collaborative work between the designated "local food coordinators" in each county, who are most often horticulturists, and the county's Family and Consumer Services agents.*
- *In addition to the possible positive impact on science achievement and nutrition, school gardens can play the same role in children's lives as community gardens play in the lives of adults: as a center of social activity (to involve school members, administrators, teachers, and parents, as a site to learn leadership and social skills; and as a place to reconnect with food and with nature. Qualitative research studies (utilizing observations of and/or interviews with children and others working in the gardens) have documented that school gardens provide students with feelings of self-efficacy, enthusiasm for food and nature, and excitement about learning; that they engender parental support, enthusiasm and*

involvement; and that they help reshape school culture, creating a feeling of community.

- *The list below is a sampling of quantitative and qualitative findings in this literature. The most recent reviews of the school-garden literature over the past two decades (both with helpful tables summarizing the studies and findings) are Robinson-O'Brien, Story, & Heim (2009) and Blair (2009).*

Key Points

- Fruit and vegetable intake: McAleese & Rankin (2007) evaluate the impact of an in-school intervention on fruit and vegetable intake among sixth-grade students from three southeast Idaho elementary schools. The experimental design compares three groups: a control, one receiving nutritional education alone; and one combining nutritional education with participation in a school garden. Students participating in the nutrition education combined with garden experiences increased significantly their daily intake of fruits and vegetables from 1.9 to 4.5 servings, when compared to 2.1 to 2.2 servings among students in the nutrition-education-only group and 2.4 to 2.0 servings among students in the control group. In addition, students participating in the nutrition education combined with garden experiences significantly increased vitamin A, vitamin C and fiber intake.
- Science achievement scores: In a study of 647 students from seven elementary schools in Texas, Klemmer et al. (2005) found that those students who participated in school gardening activities as a part of their science curriculum scored significantly higher on the science achievement test than those students who had not.
- A qualitative (observation & interview-based) evaluation of an elementary school garden indicate positive effects on children, who gained pleasure from growing food and learned the anger and frustration when things were harmed out of neglect or violence (Alexander, North and Hendren 1995).

Example Interventions to Increase Sales of Local Foods

- *There are few peer-reviewed studies that examine the efficacy of interventions to increase consumption of local foods. Below are two examples of interventions in the peer-reviewed literature that have shown particular promise in increasing sales of local foods. These move beyond CES's traditional work of connecting individual growers to individual consumers (e.g., one grower to one restaurant).*
 - Inconvenience is a major barrier to purchasing local foods. A Maine non-profit tested an intervention at worksites. Employees at three worksites were offered tastings of locally grown produce, information, and an opportunity to order produce at their workplaces. Changes in purchases of locally grown produce in the four

weeks after the intervention had ended compared with changes among employees at three control sites. Purchases of local foods increased significantly in the intervention group (Ross et al 1999).

- Research indicates that nutrition interventions targeted to individuals are unlikely to significantly shift U.S. dietary patterns as a whole. Environmental and policy interventions are a more promising avenue. A review of these types of interventions indicates that worksite and university interventions (for example, making local foods more easily available at workplaces and in universities, either at dining halls or for purchase to take home) have the most potential for success, while interventions in grocery stores appear to be the least effective. Interventions at “limited access” sites (where few other choices were available) had the greatest effect on local food sales (Seymour et al 2004).

The Cooperative Extension Service and “Local Foods” as Concept and Practice:

- A 1995 survey of the public’s awareness and view of CES indicated that among those issue areas receiving the greatest support were in the areas of family, youth, and natural resources. There is also strong support for increased spending on nutrition and health; and economic development (Warner 1995). *<<These findings indicate that the public would very likely support more CES involvement in LFS initiatives that connect to family and youth and are seen as protecting natural resources. We can speculate that shifting CES focus and effort to areas of demand, as evidenced by public surveys, could reduce the decline in use of the Extension service (the proportion of survey respondents who reported using the extension service “in the past year” declined from 12% in 1985 to 8% in 1995, Warner 1995).* This survey is dated—an updated survey measuring the support of the public for local foods initiatives (a category not included in the 1995 survey), would be a valuable addition to the Extension literature. Extension or popular press articles on Extension’s valuable work in networking diverse community partners (e.g., health, tourism, schools, Chamber of Commerce, restaurants, non-profits, traditional ag clients, etc.) could increase excitement and support behind local foods initiatives.

Appendix

Table of Measurements Used to Quantify the Benefits of Local and Community-Based Food Systems

This table lists the measures that have been used in the literature to evaluate the benefits/effects of local food systems. The table is not a listing of all of the articulated benefits of LFS to producers, consumers, and communities—it is a listing of the actual measures that have been used in the papers reviewed for this *Summary*.

Benefits - >	Economic	Health	Environmental	Other non-economic
Benefits to producers	Measured by: retention of a greater proportion of the food dollar by the producer; increases in rates of entrepreneurship and innovation among producers; increase in number of marketing channels; preparation of farmers for off-farm careers in sustainable agriculture			
Benefits to consumers	Measured by: cost savings accruing to consumers who buy direct from farmers	Measured by: increased fruit/vegetable consumption by those involved in community and school gardens		Measured by: consumer perception of higher quality/safety of food attained via direct sales or with direct marketing labels; increased non-economic utility (enjoyment) of direct-marketed (farmer's market, CSA) products vs. mediated purchases (through groceries).

Benefits - >	Economic	Health	Environmental	Other non-economic
Benefits to communities	Measured by: direct and indirect effects of direct farm sales on economic activity and income (farm income and other non-farm enterprises); the positive association between the presence of a community gardens and real estate value	Measured by: lower incidences of obesity, diabetes, mortality by those living in areas with greater levels of direct farm sales (USDA measure)	Measured by: producer willingness to reduce chemical inputs to meet customer demands within context of direct farm sales; reduction in GHG emissions related to transportation costs alone	Measured by: association between civic engagement/ social activity and the presence of community gardens; increased levels of social interaction among community members who shop at farmers markets vs shop in grocery stores; relationship between a higher number of small and medium sized farm operations in an area and lower levels of inequality, poverty, and unemployment
Benefits of school gardens, to children				Measured by: impact of garden-based nutrition education on fruit and/or vegetable intake, willingness to taste fruits and vegetables, preferences for fruits and vegetables; science achievement; self-efficacy.

Annotated Bibliography

Ahern, Melissa, Cheryl Brown, and Stephen Dukas. 2011. "A National Study of the Association between Food Environments and County-Level Health Outcomes." *The Journal of Rural Health* 27(4): 367-379. (online availability, retrieved 8/4/2011).

This national, county-level study examines the relationship between food availability and access, and health outcomes (mortality, diabetes, and obesity rates) in both metro and non-metro areas. Methods: This is a secondary, cross-sectional analysis using Food Environment Atlas and CDC data. Linear regression models estimate relationships between food availability and access variables (direct-to-consumer farm sales, per capita grocery stores, full-service restaurants, fast food restaurants, and convenience stores) with health outcomes. Controls include smoking, race/ethnicity, gender, age, education, poverty, primary care availability, recreational facility availability, and mobility/distance-from-grocery-store. Findings: *Non-metro findings:* Lower adjusted mortality rates were associated with more per capita full-service restaurants and grocery stores, and greater per capita direct farm sales. Lower adjusted diabetes rates were associated with a lower per capita supply of fast food restaurants and convenience stores, and more per capita full-service restaurants and grocery stores. Lower adjusted obesity rates were associated with more per capita full-service restaurants and grocery stores. Unexpectedly, obesity rates were positively associated with per capita grocery stores and negatively associated with fast food restaurants. *Metro findings:* More per capita full-service restaurants, grocery stores, and direct farm sales are associated with positive health outcomes; fast food restaurants and convenience stores are associated with negative health outcomes. Conclusions: The food access/availability environment is an important determinant of health outcomes in metro and non-metro areas.

health; direct farm sales; food desert; obesity; diabetes; mortality; survey

Alaimo, Katherine, Elizabeth Packnett, Richard Miles, and Daniel Kruger. 2008. "Fruit and Vegetable Intake among Urban Community Gardeners." *Journal of Nutrition Education and Behavior* 40(2): 94-101.

Data were analyzed from a cross-sectional random phone survey of 766 adults in 2003 in Flint, Michigan. Statistical findings indicate that adults with a household member who participated in a community garden consumed fruits and vegetables 1.4 more times per day than those who did not participate, and they were 3.5 times more likely to consume fruits and vegetables at least 5 times daily.

nutrition; health; community garden; survey

Alexander, Jacquelyn, Mary-Wales North, and Deborah K. Hendren. (1995). "Master Gardener Classroom Garden Project: An Evaluation of the Benefits to Children." *Children's Environments* 12(2): 123-133.

The Master Gardener Classroom Garden Project provides many inner-city children in the San Antonio Independent School District with an experiential way of learning about horticulture, gardening, themselves, and their relationships with their peers. To evaluate the benefits of participation in the Classroom Garden Project, data was collected on 52 second and third grade students. Qualitative interviews indicate that participation in the gardening project has had many positive effects on the school children. The children have gained pleasure from watching the products of their labor flourish,

and have had the chance to increase interactions with their parents and other adults. In addition, the children have learned the anger and frustration that occur when things of value are harmed out of neglect or violence.

school garden; qualitative; interviews

Anderson, Judith V., Deborah I. Bybee, Randim M. Brown, Donna F. McLean, Erika M. Garcia, M. Lynn Breer, and Barbara A. Schillo. 2001. "5 A Day Fruit and Vegetable Intervention Improves Consumption in a Low Income Population." *Journal of the American Dietetic Association* 101(2): 195-202.

This study evaluated the Michigan Farmers' Market Nutrition Program in one Michigan county to determine its effect on fruit and vegetable consumption behavior. Subjects/Setting: Subjects were selected from WIC and Community Action Agency populations: 564 low income women completed the pretest; 455 completed the posttest. Attrition rate was 19.3%. Intervention: Subjects were assigned to one of 4 interventions: education about the use, storage and nutritional value of fruits and vegetables, distribution of farmers' market coupons, both education and coupons, or no intervention. Design: Education-only and coupon and education groups were randomly assigned; clinic appointment timing determined assignment to no-intervention and coupon-only groups. Main Outcome Measures: A self-administered questionnaire before and after intervention measured attitudes about fruit and vegetable consumption and intake of fruits and vegetables. Results: Both the education interventions and the coupon interventions had positive effects. Coupons had a direct effect on increasing fruit and vegetable consumption behavior but no effect on attitudes. Education had a direct effect on attitudes and seemed to exert an effect on consumption behavior through attitudes. The maximum impact of the intervention was achieved through a combination of education and coupons.

farmer's market; coupon; vouchers; nutrition; health; health disparities; experimental design; intervention;

Berhm, Joan M, and Brian W. Eisenhauer. 2008. "Motivations for Participating in Community Supported Agriculture and Their Relationship with Community Attachment and Social Capital." *Southern Rural Sociology* 23(1): 94-115.

Using quantitative data from the memberships of CSA operations in both Central Illinois and New Hampshire, this research identifies the perceived benefits of CSA involvement, the motivations CSA members identify as important to their involvement, and the effects of CSA activity on community social capital. Analyses reveal that CSA member motivations are similar to those found in past empirical work, with concerns over quality of food being the strongest motivators. The importance of community building and development of social capital are not considered significant motivators for joining a CSA, nor are they perceived to be particularly important benefits of membership.

CSA; attitudes; social capital; survey

Blair, D. 2009. "The Child in the Garden: An Evaluative Review of the Benefits of School Gardening." *Journal of Environmental Education* 40: 15-38.

Article reviews the U. S. literature on children's gardening, taking into account potential effects, school-gardening outcomes, teacher evaluations of gardens as learning tools, and methodological issues. Quantitative studies showed positive outcomes of school-gardening initiatives in the areas of science achievement and food behavior, but they did not demonstrate that children's environmental attitude or social behavior consistently improve with gardening. Validity and reliability issues, largely due to lack of random sampling of participants, reduced confidence in these results. Qualitative studies documented a

wider scope of desirable outcomes, including an array of positive social and environmental behaviors. Gardening enthusiasm varies among teachers, depending on support and horticultural confidence. <Article provides thorough review of studies between 1995 & 2005 and gives helpful a table listing the studies and features. Sampling of studies reviewed appear in the current Annotated Bibliography>
school garden; academic achievement; review article;

Bloom, J. Dara, and C. Clare Hinrichs. 2011. "Moving Local Food through Conventional Food System Infrastructure: Value Chain Framework Comparisons and Insights." *Renewable Agriculture and Food systems* 26:13-23.

Using a qualitative comparative case study approach, the paper examines how features of the value chain structure and governance mechanisms operate in two food distribution networks that are transitioning toward localization in a rural and an urban region of Pennsylvania. Case study analysis focuses on conventional wholesale produce distributors as the link between local producers and local buyers. Interviews with the distributors, producers and buyers reveal the sources and outcomes of challenges affecting how the distributors organize their purchasing and selling of local produce. Policy-makers and practitioners seeking to support the 'scaling up' of local and regional food systems should consider targeted development of technical infrastructure in processing and distribution, as well as outreach on appropriate shared ownership models. Future research should be longitudinal to determine the longer-term role and contribution of the conventional food system infrastructure in transitioning to more sustainable local and regional food systems.

distribution networks; wholesalers; scaling-up; case study; interviews

Bregendahl, Corry. 2006. *The Role of Collaborative Community Supported Agriculture: Lessons from Iowa*. Ames, IA: Leopold Center for Sustainable Agriculture. Retrieved August 20, 2011 (<http://www.ncrcrd.iastate.edu/projects/csa/leopoldworkshop.pdf>).

A research project focused on three of the four collaborative Community Supported Agriculture (cCSA) businesses in Iowa. Contains survey questions and findings for the cCSA members and producers. Findings: (1) Indicates that cCSAs serve as business incubators for new growers and helps existing growers expand and diversify their operations (2) Nearly half of producers said participation in cCSA helped them start, expand, or plan new farm-related enterprises. (3) Producers report that participation in cCSA prepares them for off-farm careers in sustainable agriculture. (4) Participation in cCSA increases practical farming knowledge; improves producers' marketing skills; allows producers to specialize in specific crops; increases grower confidence and pride; assists producers to make critical decisions about starting their own CSA; is essential for helping new producers enter local food system production; and in rare cases, helps producers make educated decisions on leaving local food system production. (5) Women producers receive more social and cultural benefits than do men. // Benefits to participating in a cCSA were based on six categories of capital: financial/built, human, social, political, natural, and cultural. In contrast to producers, members ranked financial capital to be the greatest benefit. Political capital benefits were ranked last among members, preceded by social capital (fourth) and cultural capital (fifth).

CSA; entrepreneurship; case study

Brown, Cheryl, and Stacy Miller. 2008. "The Impact of Local Markets: A Review of Research on Farmers Markets and Community Supported Agriculture (CSA)." *American Journal of Agricultural Economics* 90(5): 1296-1302.

Authors' conclusion of the review: The authors found that farmers markets encourage the production of a greater diversity of food products, which would be needed for a more localized food system. This greater diversity attracts a greater variety of shoppers as well as helping to strengthen local farm operations. In addition, farmers markets serve as business incubators that then increase the density of local food networks and relations, an important development to expand the reach of local food markets. The authors' final point is that the economic interactions that take place at farmers markets are combined with a variety of social interactions that make the markets valued community institutions. Thus, the variety of impacts of farmers markets documented in the literature presented here combine to create the basis for the emergence of new local food systems. <Relevant citations from the review article are contained in the Annotated Bibliography>

farmers markets; CSA; review article

Canning, P.A. 2011. *A Revised and Expanded Food Dollar Series: A Better Understanding of our Food Costs*. ERR 114. Washington, D.C.: USDA Economic Research Service.

15.8% of each dollar spent on food accrues to the farm. <See Stewart 2006 for figures on just fruits and vegetables, which is much higher, approximately double>

food dollar

Colloredo-Mansfeld, Meenu Tewari, Dorothy C. Holland. 2010. *Cultural Assets, Local Food, and Value Chain Partnerships: Food Retailing and Enterprise Development in Orange and Chatham Counties, NC*. Food and Enterprise-Final Report-6.17.2010. Retrieved August 20, 2011 (http://help.unc.edu/CCM3_021325).

This project investigates the importance of retailers--from national chains to corner stores--for sales, consumer awareness, and community linkages in this market. The work concentrates on Chatham and Orange Counties, North Carolina. With information from semi-structured interviews, researchers both document the scope of local food retailing and record examples of successful partnerships between growers and stores. Findings show a gap between consumers' large hopes for local food and the generic, geographical definition of "local" that many retailers use. However, case studies of specific retailer-grower partnerships show the entrepreneurial opportunities that arise when trying to bridge that gap. Further, with more enterprises entering markets for local food, they are also fostering social entrepreneurship as emergency food relief providers tap new infrastructure to distribute locally grown fresh produce.

distribution networks; scaling-up; case study; interviews

Connor, David S., William A. Knudson, Michael W. Hamm, and Christopher Peterson. 2008. "The Food System as an Economic Driver: Strategies and Applications for Michigan." *Journal of Hunger & Environmental Nutrition* 3(4): 371-383.

Authors present results of an input-output analysis for Michigan measuring income and job impacts of a scenario in which residents meet USDA fruit and vegetable consumption guidelines by eating more seasonally available Michigan grown fresh produce. Our study finds that almost 2000 jobs and

\$200,000 in income would be generated.

economics; input-output analysis; consumption guidelines; nutrition

Cooley, J.P. and D.A. Lass. 1998. "Consumer Benefits from Community Supported Agriculture Membership." *Review of Agricultural Economics* 20(1): 227-37.

Study focuses on cost savings to CSA consumers, estimated using weekly shares for 3 CSA farms in MA, comparing shares and retail values. Benefits ranged from 60% to 150% of share prices for the CSA farms studied, based on retail prices for organic produce.

CSA; consumer benefit; economics; case study

Cuellar, Amanda D., and Michael E. Webber. 2010. "The Embedded Energy in Food Waste in the United States." *Environmental Science & Technology* 44(16): 6464-6469.

Article estimates the energy embedded in wasted food annually in the United States. We calculated the energy intensity of food production from agriculture, transportation, processing, food sales, storage, and preparation for 2007 as 8080 ± 760 trillion BTU. In 1995 approximately 27% of edible food was wasted. Synthesizing these food loss figures with our estimate of energy consumption for different food categories and food production steps, while normalizing for different production volumes, shows that 2030 ± 160 trillion BTU of energy were embedded in wasted food in 2007. The energy embedded in wasted food represents approximately 2% of annual energy consumption in the United States, which is substantial when compared to other energy conservation and production proposals. To improve this analysis, nationwide estimates of food waste and an updated estimate for the energy required to produce food for U.S. consumption would be valuable.

food waste; GHG emissions

Darby, K. M.T. Batte, S. Ernst, and B. Roe. 2008. "Decomposing Local: A Conjoint Analysis of Locally Produced Foods." *American Journal of Agricultural Economics* 90(2) 476-86.

Article uses stated preference data from a choice-based conjoint instrument to address two issues surrounding consumer demand for locally produced goods: (1) what is the geographical extent of "local," and (2) is the value consumers place on "local" production distinct from other factors that are often confounded with locally produced foods such as farm size and product freshness? We find our subjects place similar value on products produced "in state" and "nearby" and that consumers' willingness to pay for local production is independent from values associated with product freshness and farm size.

attitudes; preferences; willingness to pay

Day-Farnsworth, Lindsey, Brent McCown, Michelle Miller, & Anne Pfeiffer. 2009. "Scaling Up: Meeting the Demand for Local Food." University of Wisconsin-Extension Agricultural Innovation Center. University of Wisconsin Center for Integrated Agricultural Systems. Retrieved August 15, 2011 (<http://www.cias.wisc.edu/farm-to-fork/scaling-up-meeting-the-demand-for-local-food/>).

Research based on case studies (via phone interviews) of eleven local food entrepreneurs from across the United States. Authors identify bottlenecks that make it difficult to move significant amounts of local product into mainstream markets, and possible solutions to these.

marketing; entrepreneur; scaling up; distribution networks; case study; interview

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Draper, Carrie, and Darcy Freedman. 2010. "Review and Analysis of the Benefits, Purposes, and Motivations Associated with Community Gardens in the United States." *Journal of Community Practice* 18(4): 458-492.

In a review of the scholarly literature from 1999 to 2010, rigorous quantitative research studies on the effects of community gardens are found to be sparse; however, a larger body of qualitative data is available. Eleven themes related to the purposes, benefits of, and motivations for participating in community gardens are identified. Community gardens can serve as an effective tool for community-based practitioners in carrying out their roles within the arenas of organizing, development, and change.
community garden; review article

Duram, L. and L. Oberholtzer. 2010. "A Geographic Approach to Place and Natural Resource Use in Local Food Systems." *Renewable Agriculture and Food Systems* 25(2): 99-108.

Abstract: Through a review of current literature on local food systems, with a particular emphasis on place and natural resource use, this article presents a framework of key topics on local food, outlines the relevant environmental variables in the geography of local food, and provides an analysis of future paths for the study of place in local food. This article gives an overview of the issues, but does not make conclusions for local foods based on various attributes (such as climate change).

food system; theory; overview

Edwards-Jones, Gareth. 2010. "Does Eating Local Food Reduce the Environmental Impact of Food Production and Enhance Consumer Health?" *Proceedings of the Nutrition Society* 69: 582-591.

Abstract: The concept of local food has gained traction in the media, engaged consumers This review examines the evidence base supporting claims about the environmental and health benefits of local food. The results do not offer any support for claims that local food is universally superior to non-local food in terms of its impact on the climate or the health of consumers. Authors note that evidence to date does suggest that the nutritional quality of fruits and vegetables is "probably highest straight after harvest and then declines with time."

energy; GHG emissions; health; nutrition; review

Enshayan, Kamyar 2008. *Community Economic Impact Assessment for a Multi-County Local Food System in Northeast Iowa*. Leopold Center for Sustainable Agriculture Final Report M08-05.

An economic analysis determining the industrial output, labor income, and job multipliers of selected Iowa farms and restaurants showed that the farms and restaurants in the study have an overall higher multiplier than the average regional grain farm and restaurant. The diverse, family-owned, direct-marketing farms in the area have strong supply chain linkages with the regional economy, resulting in higher economic multipliers when compared to the average grain farm. Among the study's findings (1) Farms in the study have an industrial output multiplier of 1.92, which is higher than the 1.35 multiplier of the average regional grain farm (2) The labor income multiplier for the studied farms is 1.86, and the regional average is 1.44 (3) The farms in the study have a 1.83 jobs multiplier, and the job multiplier for an average regional grain farm is 1.56 (4) The industrial output multiplier of the studied restaurants is 1.94, while the job multiplier for the average regional restaurant is only 1.53 (5) The labor income multiplier gap is smaller, with the studied restaurants having an income multiplier of 1.65 and the average regional restaurant at 1.54 (6) The jobs multiplier for the restaurants in the study is 1.54 while

the average regional restaurant has a multiplier of 1.20 (7) The investigators collected detailed (confidential) financial data from five local farms and a restaurant. This included information on the amount of inputs purchased from local suppliers and number of suppliers, amount of products sold to local buyers and number of buyers, number and payroll of local people hired for each business or farm.
economic impact; multiplier

Favell, D.J. 1998. "A Comparison of the Vitamin C Content of Fresh and Frozen Vegetables." *Food Chemistry* 62(1):59-64.

Examines the changes in nutritional value of fresh peas, green beans, broccoli, carrots, and spinach, compared with their frozen counterparts, but in doing so it also quantifies the dramatic decrease in nutrient content over time when fresh vegetables are stored before consumption. Spinach, for example, had only 10% of ascorbic acid remaining after 3 days of storage at 20 degrees Celsius and 20% after 7 days when stored at -4 degrees Celsius. Other fresh vegetables deteriorated less rapidly, but all deteriorated over the three weeks they were tested under three different storage conditions duplicating conditions typical of stored fresh vegetables.

nutrition; health

Finkelstein, Eric A., Ian C. Fiebelkorn, and Guijing Wang. 2004. "State-Level Estimates of Annual Medical Expenditures Attributable to Obesity." *Obesity Research* 12(1): 18-25.

Estimates \$2.138 billion annual medical spending by the state of North Carolina on obesity-related illnesses.

nutrition; health

Garnett, T. 2011. "Where are the Best Opportunities for Reducing Greenhouse Gas Emission in the Food System (Including the Food Chain)?" *Food Policy* 36(Supplement 1): 523-532.

This paper reviews estimates of food related greenhouse gas (GHG) emissions at the global, regional and national levels, highlighting both GHG-intensive stages in the food chain, and GHG-intensive food types. It examines approaches that have been proposed for mitigating emissions at each stage in the chain and looks at how these sit within wider discussions of sustainability. It finds that efficiency-focused technological measures, while important, may not only be insufficient in reducing GHGs to the level required but may also give rise to other environmental and ethical concerns. It gives evidence showing that in addition to technological mitigation it will also be necessary to shift patterns of consumption, and in particular away from diets rich in GHG-intensive meat and dairy foods. This will be necessary not just in the developed but also, in the longer term, in the developing world. This move, while potentially beneficial for food secure, wealthier populations, raises potentially serious nutritional questions for the world's poorest. A priority for decision makers is to develop policies that explicitly seek to integrate agricultural, environmental and nutritional objectives.

GHG; food system

George, Valerie. 2011. *Scaling Up and Preserving Local Food Values: A Value Chain Analysis of Local Food Procurement in a Metropolitan Public School System*. Michigan State University. Masters Thesis. Michigan State University. 109 Pages.

Using a values-based value chain framework for analysis, this qualitative case study explores local food

procurement in a large public school district across the supply chain, including: farmers, distributors, food service company representatives, and school district representatives. These perspectives provide necessary insight to examine supply chain practices, embedded values and participant-perceived values. The results illustrate differences between perception, marketing, and reality of local food procurement within this supply chain. The findings also highlight the practical complexities of such a value chain. A farm-to-school values-based supply chain provides viable market opportunities for mid-scale farmers while at the same time retaining local food attributes. Addressing the scalability of value chain principles and how they fit into farm-to-school can help scholars and practitioners aid in building and improving local food systems.

distribution networks; farm-to-school; case study

Gillespie, Gilbert, Duncan L. Hilchey, C. Clare Hinrichs, and Gail Feenstra. 2007. "Farmer's Markets as Keystones in Rebuilding Local and Regional Food Systems." Pp. 65-84 in *Rebuilding the North American Food System: Strategies for Sustainability*, edited by C. Clare Hinrichs and Thomas A. Lyson. Lincoln, NE: University of Nebraska Press.

Relies on case studies of fifteen farmers' markets in NY, Iowa, and CA between 1999 and 2002 to support the argument that FMs are catalysts in building local/regional food systems by making local food visible in public spaces on a regular basis, encouraging enterprise diversification and business incubation, and facilitating economic interactions that are complemented by shared social interactions.

farmers markets; entrepreneurship; case study

Glaeser, E. and J. Kohlhase. 2004. "Cities, Regions and the Decline of Transport Costs." *Papers in Regional Science* 83:197-228.

The real cost of transportation has declined over the last 100 years, from \$0.23 per ton mile in 1890 to \$0.185 in 2000.

transportation; energy use; economics

Goldschmidt, W.J. 1946. *Small Business and the Community: A Study of the Central Valley of California and the Effects of Scale of Farm Operation*. Washington, D.C.: U.S. Senate.

Pointed to as perhaps earliest argument made for preference of small locally controlled farms over production agriculture for the economic and social health of communities. In a 1944 study of two farming communities in CA, author finds that the quality of economic and social well being was greater in the former type of community. "the scale of operations...inevitably had one clear and direct effect upon the community: It skewed the occupation structure so that the majority of the population could only subsist by working as wage labor for others...[this] means that a large portion of the population has little vested interest—economic or social—in the community itself." (pp 415-415)

community benefits; distribution system; economics; social inequality

Gomes, Jason and Kamyar Enshayan. 2005. *Documenting the Costs and Benefits of Whole Animal Local Meat Purchases by Three Northeast Iowa Institutions*. Ames, IA: Leopold Center for Sustainable Agriculture. Retrieved August 20, 2011 (http://www.leopold.iastate.edu/research/grants/2005/2004-M6_Institutional_Purchases_of_Local_Whole_Animals_%5B_Consumer_Food_Systems_%5D.pdf).

A study of three northeast Iowa institutions showed that it is possible to buy locally raised and

processed meat (traceable to a particular farm with a known method of production) at a price that is competitive with conventional sources.

distribution systems; meat

Heim, S. J. Stang, & M. Ireland. 2009. "A Garden Pilot Project Enhances Fruit and Vegetable Consumption among Children." *Journal of the American Dietetic Association* 109: 1220-1226.

A 12-week pilot intervention was designed to promote fruit and vegetable intake among 4th to 6th grade children (n=93) attending a YMCA summer camp. Children participated in garden-based activities twice per week. Weekly educational activities included fruit and vegetable taste tests, preparation of fruit and vegetable snacks, and family newsletters sent home to parents. The pilot intervention was evaluated using a pre and post survey to determine participant satisfaction and the short-term impacts of the program. Impact data suggest that the intervention led to an increase in the number of fruits and vegetables ever eaten ($P<0.001$), vegetable preferences ($P<0.001$), and fruit and vegetable asking behavior at home ($P<0.002$). Garden-based nutrition education programs can increase fruit and vegetable exposure and improve predictors of fruit and vegetable intake through experiential learning activities.

school garden; nutrition; health; experiment; intervention

Heller, Martin C., and Gregory A. Keoleian. 2000. *Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System*. Ann Arbor, MI: Center for Sustainable Systems, University of Michigan. Report No. CSS00-04. http://css.snre.umich.edu/css_doc/CSS00-04.pdf

Life cycle assessment (LCA) is being used as a better alternative than food miles. It is a method used to analyze the consumption and environmental burdens associated with a product. LCA takes into account energy input and output involved in all stages of the life cycle including production, processing, packaging, transport and retirement. Life cycle evaluation accounts for a matrix of sustainability indicators beyond greenhouse gas emissions, including resource depletion, air and water pollution, human health impacts and waste generation. This method provides a more holistic approach to assessing the impact our food choices have on the environment. Stats on energy use within the food system: transportation 14%; Home refrigeration/preparation 31%; agricultural production 21%; restaurants/caterers 7%; food retail 4%; packaging 7%; processing 16%.

food miles; local foods; life cycle assessment; energy; economics

Heller, Martin C. and Gregory A. Keoleian. 2003. "Assessing the Sustainability of the US Food System: a Life Cycle Perspective." *Agricultural Systems* 76: 1007–1041.

This paper presents a broad set of indicators covering the life cycle stages of the food system. Indicators address economic, social, and environmental aspects of each life cycle stage: origin of (genetic) resource; agricultural growing and production; food processing, packaging and distribution; preparation and consumption; and end of life. The paper then offers an initial critical review of the condition of the US food system by considering trends in the various indicators. Current trends in a number of indicators threaten the long-term economic, social, and environmental sustainability of the US food system. Key trends include: rates of agricultural land conversion, income and profitability from farming, degree of food industry consolidation, fraction of edible food wasted, diet related health costs, legal status of farmworkers, age distribution of farmers, genetic diversity, rate of soil loss and groundwater

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withdrawal, and fossil fuel use intensity. We suggest that effective opportunities to enhance the sustainability of the food system exist in changing consumption behavior, which will have compounding benefits across agricultural production, distribution and food disposition stages.

food system; indicators

Henneberry, S.R., B. Whitacre, and H.N. Agustini. 2009. "An Evaluation of the Economic Impacts of Oklahoma Farmers' Markets." *Journal of Food Distribution Research* 40: 64-78.

Farmers markets generate total direct sales of \$3.3 million with a total economic impact of almost \$6 million. Jobs: A total of 113 jobs were linked to market activities—81 were full-time equivalent (FTE) jobs directly related to the \$1.3 million in personal income estimated by IMPLAN (IMPLAN is a widely employed regional economic analysis software used to predict economic impacts). An additional 31 jobs were created throughout the rest of the economy. Note the 81 FTE's are attributed to the combined activity of the 795 seasonal vendors and their paid and unpaid helpers.

economic multiplier; farmer's markets; IMPLAN

Hinrichs, C.C., G.W. Gillespie, G.W. Feenstra. 2004. "Social Learning and Innovation at Retail Farmers' Markets." *Rural Sociology* 69(1): 31-58.

Abstract: Retail farmers' markets are seen as key institutions in a more "civic agriculture," but little is known about how they promote small business entrepreneurship. Drawing on research in economic sociology and economic geography, this paper examines the role of social learning in vendor innovation. Data from a 1999 mail survey of farmers' market vendors in California, New York and Iowa show that business innovation, as represented by intensity of vendors' innovative marketing practices and vendors' successful enterprise expansion, was modest. Social learning through engagement with customers contributed to more innovative marketing by vendors, while social learning through engagement with customers and fellow vendors increased the likelihood of vendors diversifying to additional markets beyond the farmers' market. Certain individual and enterprise characteristics also influenced vendor innovation. This suggests that, although important, the beneficial effects of social learning for vendors at farmers' markets remain moderated by human capital and structural factors.

farmer markets; entrepreneurship; survey

Hopp, Steven L, and Joan Dye Gussow. 2009. "Comment on 'Food-Miles and the Relative Climate Impacts of Food Choices in the United States.'" *Environmental Science & Technology* 43(10): 3982-3983.

Entire Comment: "Weber and Matthews (2009) conclude that eating less red meat would contribute to a greater reduction of greenhouse gas (GHG) emissions than buying local foods. This conclusion is fundamentally inaccurate because they define local food as conventional food produced locally. They argue that "buying local" removes only the final delivery step in the industrial food chain, and that this is the only way to reduce GHG in localized food systems. Here is where the authors make their logical mistake. Purchasing local food from existing systems does not just remove the final step, it potentially reduces GHG in every one of the steps in the industrial food chain. To say it another way, their conclusion would only apply if shoppers went to a local farmers' market and purchased local feedlot meats, local twinkies, and local frozen microwavable pizzas. In reality, these items simply do not exist.

GHG emissions

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Hu, Wenjing, Yuko Onozaka, and Dawn Thilmany-McFadden. 2011. "What Are the Economic Welfare Effects of Local Food Marketing? Exploring Impacts with the Case of Colorado Apples." 2011 Annual Meeting of the Agricultural and Applied Economics Association, July 24-26, Pittsburgh, Pennsylvania. Retrieved August 16, 2011 (<http://purl.umn.edu/103500>).

This paper explores the welfare changes as a result of changes in prices and quantities of Colorado labeled apples relative to domestically produced apples, using equilibrium displacement model with two-regions: Colorado State and the rest of the United States. The results showed that in the short run producers would lose \$300, while in the long run producers would increase supply to capture \$263,000 in increased surplus.

marketing; economics; certification

Hughes, David W., Daniel Eades, Kenneth Robinson, Carlos Carpio, Olga Isengildina, and Cheryl Brown. 2007. *What is the Deal with Local Food Systems: Or, Local Food Systems from a Regional Perspective*, Working Paper 11-2007-01, Clemson University, Clemson, SC.

Provides a brief preliminary critique of the current literature on local food systems and how regional science may be used in analyzing these. Concludes policy analysis is needed, including an inventory and evaluation of regions in terms of activities of various types of local food systems, and the tendency of food systems to cluster.

food systems; regional science

Hughes, D.W., C. Brown, S. Miller, and T. McConnell. 2008. Evaluating the Economic Impact of Farmers' Markets in an Opportunity Cost Framework: A West Virginia Example." *Journal of Agricultural and Applied Economics* 40(1): 253-265.

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

farmer's markets; economic impact; multiplier

Hunt, A. 2007. "Consumer Interactions and Influences on Farmers' Market Vendors." *Renewable Agriculture and Food Systems* 22(1): 54-66.

Relies on a survey of 216 shoppers at 8 farmers markets in Maine. Shows that some consumer social interactions, such as enjoying the market, talking with farmers about seasonal products and making a trip to the market a family event, are significant and positive influences on spending at farmers' markets. Vendors at these markets were also surveyed, with 65 of the 81 vendors being farmers. Through direct farmer/consumer relations, farmers indicated a willingness to reduce chemical inputs to meet customer demands, suggesting that customer interaction has the potential to affect environmental quality. By examining the linkages between producers and consumers at a direct market—often embedded with a sense of local identity—there is the potential to better understand social interactions that can support the economic and environmental sustainability of local agriculture. Article findings indicate non-economic gains, toward more sustainable practices, that derive from the

social relationships between farmers and consumers}
farmer's markets; consumer benefit; sustainable practices

King, Robert P., Michael S. Hand, Gigi DiGiacomo, Kate Clancy, Miguel I. Gómez, Shermain D. Hardesty, Larry Lev, and Edward W. McLaughlin. 2010. *Comparing the Structure, Size, and Performance of Local and Mainstream Food Supply Chains*. Economic Research Service Economic Research Report (ERR-99), 81 pp.

A series of coordinated case studies compares the structure, size, and performance of local food supply chains with those of mainstream supply chains. Interviews and site visits with farms and businesses, supplemented with secondary data, describe how food moves from farms to consumers in 15 food supply chains. Key comparisons between supply chains include the degree of product differentiation, diversification of marketing outlets, and information conveyed to consumers about product origin. The cases highlight differences in prices and the distribution of revenues among supply chain participants, local retention of wages and proprietor income, transportation fuel use, and social capital creation.

Supply chain; comparative case study

Kim, Brent, Leana Pitkevits Houser, Anne Rosenthal and Roni Neff . 2008. *Literature Review of Methods and Tools for Quantifying the Indirect Environmental Impacts of Food Procurement*. Center for a Livable Future, Johns Hopkins Bloomberg School of Public Health. Retrieved August 25, 2011 (http://www.universityofcalifornia.edu/sustainability/documents/jhufoodprint_rpt.pdf).

The Johns Hopkins Center for a Livable Future (CLF), an interdisciplinary academic center based at the Johns Hopkins Bloomberg School of Public Health, conducted a comprehensive literature review of methods and tools for quantifying the indirect GHG emissions associated with food procurement on an institutional level. The results of this review are intended to provide Clean Air-Cool Planet (CA-CP), a US-based non-profit dedicated to global warming solutions, with guidance for the development of a new GHG emissions inventory tool for food service providers at academic institutions. Key considerations gleaned from findings such as methods, features and data were incorporated into a suggested design that serves as a guiding example for the development of a new tool.

GHG emissions; energy; indicators

Klemmer, C.D., Waliczek, T.M., & Zajicek, J.M. 2005. "Growing Minds: The Effect of a School Gardening Program on the Science Achievement of Elementary Students." *Horticulture Technology* 15:448-452.

Study of 647 students from seven elementary schools in Texas evaluated science achievement of 3-5th grade students, with an experimental group participating in school gardening activities as part of their science curriculum in addition to using traditional classroom-based methods. Students in the control group used only the latter. Students in the experimental group scored significantly higher on the science achievement test.

school garden; academic achievement; experimental study; intervention

Kolodinsky, J.M., Q. Wang, and L. Pelch. 1999. "Community Supported Agriculture (CSA): A Hypothesis Test of Membership Activities and Utility." Paper presented at the American Agricultural Economics Association annual meeting, August 8 – 11, Nashville Tennessee.

Uses mathematical modeling to examine the results of a survey of CSA members in the Vermont (response rate of 66% of 277 CSA members) to support the argument that time spent picking up and preparing food by the CSA members yields utility beyond that related to food production. It supports the broader argument that time spent in some production activities (here, household production) yields

utility (benefits) in addition to the utility obtained from producing meals.

CSA; attitudes; benefits; survey

Landis, B, T.E. Smith, M. Lairson, K.Mckay, H. Nelson, J. O'Briant. 2010. "Community-supported Agriculture in the Research Triangle Region of North Carolina: Demographics and Effects of Membership on Household Food Supply and Diet. *Journal of Hunger and Environmental Nutrition*. 5(1): 70-84.

Community-supported agriculture (CSA) is relatively new in North Carolina and growing rapidly with approximately 60 CSA farms. CSA members belonging to 5 farms in the Research Triangle (central) region of North Carolina were administered a survey instrument designed to collect data in the following areas: (1) demographic characteristics, (2) how members first learned about their CSA and reasons for joining, (3) the different sources from which fruit and vegetables enter the household, (4) outcomes and utilization of their weekly CSA share, and (5) fruit and vegetable consumption. The survey was distributed to 448 members of 5 CSA farms during the 2007 season and a non-CSA control group (n = 97); 210 CSA member surveys were completed and analyzed. Findings indicated that CSA members tend to be Caucasian, middle-aged, married, economically secure, and highly educated. The primary ways consumers heard of their CSAs were friends/acquaintances and the Internet/CSA Web sites. Additionally, members cited supporting local farms, healthier eating, and knowing where your foods come from as major reasons for joining a CSA. CSAs provided 46% of a household's weekly produce, and the majority (75%) of produce obtained from CSAs was consumed, with only a small percentage discarded. CSA members consumed significantly more servings of fruits and vegetables and a greater variety of these foods than non-CSA controls.

CSA; survey; health

Lass, D.A. A. Brevis, G.W. Stevenson, J. Hendrickson, and K. Ruhf. 2003. *Community Supported Agriculture Entering the 21st Century: Results from the 2001 National Survey*. Amherst MA: Dept of Resource Economics, University of Massachusetts.

Provides demographic characteristics of CSA farmers—younger, more highly educated, newer.

CSA

LeRoux, M.N., T.M. Schmit, M. Roth, and D.H. Streeter. 2009. *Evaluating Marketing Channel Options for Small-scale Fruit and Vegetable Producers*. Working paper, Cooperative Extension of Tompkins County, Ithaca, NY.

This working paper compares the advantages and disadvantages (including relative costs) of various marketing channels. An analytical framework and ranking system is developed to summarize the primary factors affecting marketing channel performance and to prioritize those channels with the greatest opportunity for success. An application of the model is conducted using case-study evidence from four small-scale diversified vegetable crop producers in Central New York. The relative costs and benefits of alternative wholesale and direct marketing channels are investigated, including how the factors of risk, owner and paid labor, profits, lifestyle preferences and sales volume interact to impact optimal market channel selection. Given the highly perishable nature of the crops grown, along with the risks and potential sales volume of particular channels, a combination of different marketing channels is needed to maximize overall firm performance.

marketing; economics; CSA; farmer's market; wholesale; case study

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Lev, L., L. Brewer, and G. Stephenson. 2003. *How Do Farmers' Markets Affect Neighboring Businesses?* Oregon Small Farms Technical Report No. 16, Small Farms Extension Program, Oregon State University, Corvallis, OR.

This fact sheet focuses on spillover sales generated by farmers market shoppers who also make purchases at neighboring businesses. Extension agents used survey instruments to see if farmer's markets were draws to a business area and if people bought from neighboring businesses while they were there. Between one-third and two-thirds of those surveyed indicated that when attending the market they also did additional shopping at neighboring businesses on the same trip. Of those individuals who spent both inside and outside the market, found that for every dollar spent inside the market shoppers also spent \$0.60 outside the market.

farmer's market; economics; multiplier; survey

Litt, Jill S., Mah-J. Soobader, Mark S. Turbin, James W. Hale, Michael Buchenau, and Julie Marshall. 2011. "The Influence of Social Involvement, Neighborhood Aesthetics, and Community Garden Participation on Fruit and Vegetable Consumption." *American Public Health Association* 101(8): 1466-1473.

Conducted a survey representing 436 residents across 58 block groups in Denver, Colorado in 2006/2007. Finds that neighborhood aesthetics, social involvement, and community garden participation were significantly associated with fruit and vegetable intake. Community gardeners consumed fruits and vegetables 5.7 times per day, compared with home gardeners (4.6 times per day) and non-gardeners (3.9 times per day). Moreover, 56% of community gardeners met national recommendations to consume fruits and vegetables at least 5 times per day, compared with 37% of home gardeners and 25% of non-gardeners. The study results shed light on neighborhood processes that affect food-related behaviors and provides insights about the potential of community gardens to affect these behaviors. The qualities intrinsic to community gardens make them a unique intervention that can narrow the divide between people and the places where food is grown and increase local opportunities to eat better.

community garden; social benefits; nutrition; health; survey

Mariola, Matthew J. 2008. "The Local Industrial Complex? Questioning the Link between Local Foods and Energy Use." *Agriculture and Human Values* 25(2): 193-196. In this essay I critique four key assumptions that underlie the connection between local foods and energy. I then describe two competing conclusions implied by the critique. On the one hand, local food systems may need a more extensive and integrated transportation infrastructure to achieve sustainability. On the other hand, the production, transportation, and consumption of local foods are fundamentally as reliant on fossil fuels as are long distance foods. A more holistic approach to energy use in the food system is needed to determine which particular socio-technical factors optimize energetic sustainability.

energy

Marsden, Terry, Jo Banks, and Gillian Bristow. 2000. "Food Supply Chain Approaches: Exploring Their Role in Rural Development." *Sociologia Ruralis* 40 (October):424-438.

Article focuses upon using theoretical and conceptual parameters to understand the diverse nature of 'alternative' or 'short' supply chains and, in turn, to comment upon what these bring to a more generalized theory of rural development. Reference is made to one case study, within a broader analysis of European cases. These help to build a more rigorous theoretical framework, which places food,

supply chains as a significant element in broader rural development debates.

distribution network; economic development

Martinez, S.W. 2007. *The U.S. Food Marketing System: Recent Developments, 1997-2006*. ERR 42. Washington, D.C.: USDA Economic Research Service.

Review of marketing developments over last decade. Major recent developments in the U.S. food system include the increasing presence of nontraditional grocery retailers, such as supercenters and drugstores, and competitive responses by traditional grocers, such as supermarket chains. These developments have contributed to sharp increases in concentration in the grocery retail sector, changing conventional relationships among retailers, wholesalers, and manufacturers. In such a competitive domestic food market, food companies are attempting to differentiate themselves from the competition by reporting voluntary activities that demonstrate social responsibility and by more-tailored advertising campaigns and product offerings.

distribution system; marketing; review

Martinez, Steve, Michael Hand, Michelle Da Pra, Susan Pollack, Katherine Ralston, Travis Smith, Stephen Vogel, Shellye Clark, Luanne Lohr, Sarah Low, and Constance Newman. 2010. *Local Food Systems: Concepts, Impacts, and Issues*. Economic Research Service Report No. (ERR-97) 87 pp, May 2010.

This comprehensive overview of local food systems (approximately as of end of year 2009) explores alternative definitions of local food, estimates market size and reach, describes the characteristics of local consumers and producers, and examines early indications of the economic and health impacts of local food systems and suggests directions for further research. Appendix A contains a helpful table summarizing findings from consumer surveys with regard to attitudes and willingness to purchase local foods.

review

Masi, B.L. Schaller, and M.H. Shuman. 2010. *The 25 Percent Shift: The Benefits of Food Localization for Northern Ohio & How to Realize Them*. Cleveland, OH: Cleveland Foundation.

Study analyzes the impact of the 16-county Northeast Ohio (NEO) region moving a quarter of the way toward fully meeting local demand for food with local production. It suggests that this 25% shift could create 27,664 new jobs, providing work for about one in eight unemployed residents. It could increase annual regional output by \$4.2 billion and expand state and local tax collections by \$126 million.

economic impact

McAleese, J.D., and L.L. Rankin. 2007. "Garden-based Nutrition Education Affects Fruit and Vegetable Consumption in Sixth-grade Adolescents." *Journal of the American Dietary Association* 107:662-665.

Authors evaluated the impact of a 12-week in-school intervention on fruit and vegetable intake among sixth-grade students from three southeast Idaho elementary schools: two intervention schools (n=70) and one control school (n=25). The intervention schools were divided into nutrition education alone (n=25) and nutrition education combined with food preparation and gardening activities (n=45), including weeding, watering, and harvesting strawberries, cantaloupe, and a variety of fall crops. Three 24-hour food recalls in the form of workbooks were completed by students at baseline and again 12

weeks later. Classroom teachers administered food-recall workbooks, which included age-appropriate instructions and portion-size illustrations. Students participating in the nutrition education combined with garden experiences increased significantly ($P < 0.001$) their daily intake of fruits and vegetables from 1.9 to 4.5 servings, when compared to 2.1 to 2.2 servings among students in the nutrition-education-only group and 2.4 to 2.0 servings among students in the control group. In addition, students participating in the nutrition education combined with garden experiences significantly increased vitamin A, vitamin C and fiber intake. A strength of this study design was that it evaluated whether garden participation would enhance intake more than nutrition education alone.

school garden; nutrition; health; intervention; experimental study

McCormack, L.A., M.N. Laska, N.I. Larson, and M. Story. 2010. "Review of the Nutritional Implications of Farmers Markets and Community Gardens: A Call for Evaluation and Research Efforts." *Journal of the American Dietetic Association* 110(3): 399-408.

This review examines the current scientific literature on the implications of farmers' market programs and community gardens on nutrition-related outcomes in adults. In total, 16 studies were identified for inclusion in this review. Seven studies focused on the impact of farmers' market nutrition programs for Special Supplemental Nutrition Program for Women, Infants, and Children participants, five focused on the influence of farmers' market programs for seniors, and four focused on community gardens. Findings from this review reveal that few well-designed research studies (eg, those incorporating control groups) utilizing valid and reliable dietary assessment methods to evaluate the influence of farmers' markets and community gardens on nutrition-related outcomes have been completed. Authors recommend additional work to be undertaken that used control groups and valid, reliable, and widely accepted dietary assessments. Future studies should also examine influences on energy intake, diet, weight, activity levels, and nonhealth benefits related to community development and community beautification.

farmer's market; community garden; review; nutrition; health

Meter, Ken and Jon Rosales. *Finding Food in Farm Country*. Crossroads Resource Center, 2001. Retrieved September 10, 2011 (<http://www.crcworks.org/ff.pdf>).

Makes 1997 estimate for Minnesota—only \$2 million of the \$500 million residents spent on food that year was spent buying food directly from farmers. In contrast, more than \$400 million is estimated to have *left* the region via food purchases from outside sources.

economics

Morales, A. 2011. "Marketplaces: Prospects for Social, Economic, and Political Development." *Journal of Planning Literature* 26(1): 3-17.

This article summarizes what we know about marketplaces in the United States, relates that knowledge to a research agenda on the subject, and makes suggestions for planning practice. This review accomplishes these three goals beginning with a historical review of marketplaces, focused mostly on the United States. The research literature on marketplaces is reviewed from political, economic, social, and health perspectives with suggestions for further basic and applied research. In short, the article shows how marketplaces were once tools of nascent planning and public policy, describes the reasons they should be again, and shows how planners and policy makers can advance public purposes through

markets.

theory; public markets

Morris, J.L., and Zidenberg-Cherr, S. 2002. "Garden-enhanced Nutrition Curriculum Improves Fourth-grade School Children's Knowledge of Nutrition and Preferences for Some Vegetables." *Journal of the American Dietary Association* 102: 91-93.

Authors evaluated the impact of a 17-week, in-school intervention (delivered every other week) on vegetable preferences, willingness to taste vegetables, and nutrition knowledge among students (n=213; fourth grade) from three California elementary schools: two intervention schools and one control school. The nutrition-education program was based on the Social Cognitive Theory. One intervention school received nutrition-education—only using a nine-lesson classroom-based nutrition curriculum developed by investigators. The second intervention school received nutrition education combined with garden activities, including experiences with planting, maintaining, and harvesting. Study evaluation was conducted in the fall (pretest) and spring (posttest), and included 6-month post intervention follow-up data. Children at both intervention sites had a significantly improved understanding of nutrition knowledge and an improved preference for vegetables compared to the control.

school garden; nutrition; health; intervention; experimental study

Moser, Riccarda, Roberta Raffaelli, and Dawn Thilmany-McFadden. 2011. "Consumer Preferences for Fruit and Vegetables with Credence-Based Attributes: A Review." *International Food and Agribusiness Management Review* 14(2): 121-142. <http://purl.umn.edu/103990>

Abstract: The food marketing sector is responding to an increased level of interest to consumer demand for products with an increasingly wide array of attributes. As evidence, there has been double digit proliferation of offerings in the produce section of retailers on an annual basis. Differentiation claims include factors related to experiential eating quality as well as credence attributes related to environmental and other social outcomes. To establish the overall importance and willingness to purchase and/or to pay for such foods, a summary of selected studies on such credence attributes and a critique of the research methodologies encountered in those studies may be informative. This study aims to identify and rank a number of attributes, focusing on how their statistical significance across consumer studies of fresh produce buying decisions.

marketing; preferences; attitudes; consumer research; survey

Myers, G.S. 2004. *Howard County Farmers' Market Economic Impact Study 2004*. Report. Howard Co. (MD) Economic Development Authority, Agricultural Marketing Program.

\$192,000 farmers market sales leads to \$307,249 direct and secondary impact on economy of Howard County, MD. Impact of \$965,388 on nearby businesses based on average consumer-reported expenditures of \$75.99 to \$116.29. Based on 2004 survey of farmers market vendors and customers.

farmer's market; economic impact

Myles, A., and K.Hood. 2010. *Economic Impact of Farmers Markets in Mississippi*. Publication 2582. Mississippi, State, MS: Mississippi State University Extension Service.

4-page fact sheet summarizes findings of an IMPLAN economic impact study. Findings: The initial impact of \$948,640 in direct farmers' market revenues (from 54 farmers markets operating seasonally) created

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a total economic impact of \$1.6 million in business revenues, 15.88 part-time jobs, \$213,720 in wages, and \$16,000 in state and local taxes in 2009.

farmer's market; economic impact; IMPLAN; multiplier

Nganje, William E., Renee Shaw Hughner, and Nicholas E. Lee. 2011. "State-Branded Programs and Consumer Preference for Locally Grown Produce." *Agricultural and Resource Economics Revitalization* 40(1): 20-32. Abstract: Revitalization of state brands is deemed important to several constituencies. Stated preference with choice experiment methods were used to elicit consumer preferences for two locally grown products: spinach, which has had a well-publicized food safety incidence, and carrots, which have had no such incidence in recent history. A full factorial design was used to implement the choice experiment, with each commodity having four identical attributes varying at different levels. Findings reveal that consumers are willing to pay a premium for locally grown spinach marked with the Arizona Grown label over locally grown spinach that was not labeled. This premium was higher than the premium that would be paid for state-branded carrots. This difference highlights consumers' perceptions of "locally grown" as an indicator of safety in their food supply. Findings have important implications with respect to providing consumer value and point to differentiated positioning strategies for state-branded produce.

marketing; state brand; preference; experiment

Ostrom, Marcia Ruth. 2007. "Community Supported Agriculture as an Agent of Change: Is it Working?" Pp. 99-120 in *Rebuilding the North American Food System: Strategies for Sustainability*, edited by C. Clare Hinrichs and Thomas A. Lyson. Lincoln, NE: University of Nebraska Press.

Based on qualitative and quantitative data gathered via participatory observation of 24 CSA farms in Minn and Wisconsin over a 10-year period the author discusses the consumer and farmer participation frameworks and the conditions needed for farms to succeed. Emphasis is placed on the individual understandings and action rationales as expressed by the farmer participants. Among the findings: farmers do not feel that they are earning adequate returns from the CSA (despite the fact that the CSA is economically preferable to other farming options); CSA consumers choose to participate based largely on the desire to obtain fresh, nutritious and local produce, with the desire to promote "community" at the bottom of the ranking. Authors link CSA's to a potential for participants to "become transformed....[as they refashion] their daily eating, cooking and shopping routines around the seasonal output of local agroecosystems." P 117.

CSA; attitudes; interview; ethnography

Otto, D., and T. Varner. 2003. *Consumers, Vendors, and the Economic Importance of Iowa Farmers' Markets: An Economic Impact Survey Analysis*. Iowa State University, Leopold Center for Sustainable Agriculture. March 2005. Retrieved August 8, 2011

(www.leopold.iastate.edu/research/marketing_files/markets_rfswg.pdf).

Based on interviews with more than 4,500 customers, these markets generated \$20.8 million in total sales in 2004. Those sales, in turn, resulted in an additional \$12.2 million of economic activity, of which \$4.3 million represents the supplies and services purchased by vendors and growers, and \$7.2 million in induced (payroll) effects. The analysis showed that farmers' markets represent an estimated 325 jobs in

Iowa, plus an additional 146 full-time jobs created by the secondary impacts of the farmers' markets.
farmer's market; economic impact; attitudes; survey

Pirog, Rich. 2002. How Far Do Your Fruit and Vegetables Travel? Leopold Center for Sustainable Agriculture. Retrieved August 20, 2011
(www.leopold.iastate.edu/pubs/staff/ppp/food_chart0402.pdf).

A 1998 study examined the distance that 30 conventional fresh produce items traveled to reach the Chicago Terminal Market. The average distance was 1,518 miles.

Pirog, Rich and Andrew Benjamin. 2003. *Checking the Food Odometer: Comparing Food Miles for Local versus Conventional Produce Sales to Iowa Institutions*. Ames, IA: Leopold Center for Sustainable Agriculture. Retrieved August 21, 2011

(http://www.leopold.iastate.edu/pubs/staff/files/food_travel072103.pdf).

According to research done on food miles, in 2001, the average weighted average source distance (WASD) for locally grown produce to reach institutional markets was 65 miles, while the conventional WASD for the produce to reach those same institutional points of sale was 1,494 miles, nearly 27 times further. Conventional produce items traveled from eight (pumpkins) to 92 (broccoli) times farther than the local produce to reach points of sale. In 2001, the sum of all WASDs for 16 produce types to reach institutions was 716 miles for the locally grown data set; slightly less than the distance from Des Moines, Iowa, to Denver, Colorado. The sum of all WASDs for 16 produce types to reach the same institutional markets was 25,301 miles for the conventional source estimations. This is the distance from Des Moines north (longitudinally) to the North Pole, south to the South Pole and back to Des Moines, with an additional 439 miles of travel north to within 70 miles of the Canadian border.

food miles

Pirog, Rich, Timothy Van Pelt, Kamyar Enshayan, and Ellen Cook. 2001. *Food, Fuel, and Freeways: An Iowa Perspective on How Far Food Travels, Food Usage, and Greenhouse Gas Emissions*. Ames, IA: Leopold Center for Sustainable Agriculture. Retrieved August 21, 2011
(http://www.leopold.iastate.edu/pubs/staff/ppp/food_mil.pdf).

Findings: The U.S. Department of Agriculture Agricultural Marketing Service produce arrival data from the Chicago, Illinois terminal market were examined for 1981, 1989, and 1998, and a weighted average source distance (WASD) was calculated for arrivals by truck within the continental United States for each year. Produce arriving by truck traveled an average distance of 1,518 miles to reach Chicago in 1998, a 22 percent increase over the 1,245 miles traveled in 1981. The conventional system of transporting food used four to 17 times more fuel than the Iowa-based regional and local systems, depending on the system and truck type. The same conventional system released from five to 17 times more CO₂ from the burning of this fuel than the Iowa-based regional and local systems.

food miles; energy

Renkow, Mitch. 2007. *The Cost of Community Services in Chatham County*. Report. Department of Agriculture and Resource Economics, North Carolina State University.

One important element of public debate over appropriate land use policies is whether or not increased

local government expenditures on community services needed to accommodate residential and commercial development exceed the contribution of that development to the local revenue base. This report presents the findings of a research project aimed at addressing this specific issue. The research quantifies the contribution to local government revenues of various types of land uses (residential, commercial, industrial, and agricultural), and the demands on local government financial resources of those same land uses. This “snapshot” of current revenues and expenditures allows an assessment of the costs and benefits of different land uses from the perspective of local government finance. The analysis presented here employs a methodology established by the American Farmland Trust, one that has been used in numerous Cost of Community Services (COCS) studies throughout the U.S. Like those studies, the current research was motivated by two questions: (1) Do the property taxes and other revenues generated by residential land uses exceed the amount of publicly-provided services supplied to them? (2) Do farm and forest lands receive an unfair tax advantage when they are assessed at their actual use value – as is the case in Chatham County – instead of their potential value in residential or commercial uses? As has been found in other COCS studies, the answers to these questions are “no” for Chatham County. The residential sector contributes only 87¢ to the county’s coffers for each dollar’s worth of services that it receives. Commercial and industrial land uses are the largest net contributors to the public purse, contributing \$3.01 in revenues for each dollar of publicly provided services that they receive. Despite being taxed on the basis of current land uses, property in agricultural land uses is found to be a net contributor to the local budget, generating \$1.72 in revenues for every dollar of public services that it receives. *<Many similar studies have been conducted for other counties in NC and elsewhere.>*

Tax revenue; cost of community survey

Robinson-O-Brien, Ramona, Mary Story, and Stephanie Heim. 2009. “Impact of Garden-Based Youth Nutrition Intervention Programs: A Review.” *Journal of the American Dietetic Association* 109(2): 273-280.

This review examines the scientific literature on garden-based youth nutrition intervention programs and the impact on nutrition-related outcomes. Studies published between 1990 and 2007 were included if they involved children and adolescents in the United States and examined the impact of garden-based nutrition education on fruit and/or vegetable intake, willingness to taste fruits and vegetables, preferences for fruits and vegetables, or other nutrition-related outcomes. Eleven studies were reviewed. Five studies took place on school grounds and were integrated into the school curriculum, three studies were conducted as part of an afterschool program, and three studies were conducted within the community. Based on the review of relevant but relatively limited literature, the evidence for the effectiveness of garden-based nutrition education is promising. Garden-based nutrition-education programs may have the potential to lead to improvements in fruit and vegetable intake, willingness to taste fruits and vegetables, and increased preferences among youth whose current preferences for fruits and vegetables are low. However, it is difficult to make conclusions based on the limited number of well-designed, methodologically peer-reviewed research studies available.

school gardens; health; nutrition; review

Ross, N.J., M.D. Anderson, J.P. Goldberg, R. Houser, and B. L. Rogers. 1999. "Trying and Buying Locally Grown Produce at the Workplace: Results of a Marketing Intervention." *American Journal of Alternative Agriculture* 14(4): 171-179.

In a rural community in Maine, the Farm Fresh Project tested an intervention designed to exploit consumers' high regard for locally grown produce and also overcome the inconvenience of buying it. Each week for six weeks in the summer of 1997, employees at three worksites were offered tastings of locally grown produce, information about the produce, and an opportunity to order it at their workplaces. Changes in purchases of locally grown produce were compared with changes among employees at three matched control worksites. More than a quarter of workers at intervention worksites ordered produce through the project. Significant numbers of employees at intervention worksites who had not bought locally grown produce earlier in the summer bought it at outlets in the community during the four weeks following the intervention. Visits to the community farmers' market, purchases at roadside stands, pick-your-own purchases, and purchases of locally grown produce, both overall and at locations other than at the farmers' market, increased significantly in the intervention group. Among workers at control sites, only roadside stand purchases increased significantly. It appears that the opportunity to taste and purchase locally grown produce at a convenient venue, the workplace, motivated consumers to overcome barriers to purchasing locally grown produce at less convenient venues outside of the workplace. Temporary farm stands at workplaces may offer a promising new direct market for farmers.

marketing; farm stands; mobile farm stands; empirical study

Saldivar-tanaka, Laura, and Marianne E. Krasny. 2004. "Culturing Community Development, Neighborhood Open Space, and Civic Agriculture: The Case of Latino Community Gardens in New York City." *Agriculture and Human Values* 21: 399-412.

To determine the role Latino community gardens play in community development, open space, and civic agriculture, the authors conducted interviews with 32 community gardeners from 20 gardens, and with staff from 11 community gardening support non-profit organizations and government agencies. In addition to being sites for production of conventional and ethnic vegetables and herbs, the gardens host numerous social, educational, and cultural events.

Community gardens; interview; ethnography

Salois, Matthew. Forthcoming. "Obesity and Diabetes, the Built Environment, and the Local Food Economy in the United States, 2007." *Economics and Human Biology*.

Obesity and diabetes are increasingly attributed to environmental factors, however, little attention has been paid to the influence of the "local" food economy. This paper examines the association of measures relating to the built environment and "local" agriculture with U.S. county-level prevalence of obesity and diabetes. Key indicators of the "local" food economy include the density of farmers' markets and the presence of farms with direct sales. This paper employs a robust regression estimator to account for non-normality of the data and to accommodate outliers. Overall, the built environment is associated with the prevalence of obesity and diabetes and a strong local food economy may play an important role in prevention. Results imply considerable scope for community-level interventions. Findings from the regression model: "A \$100 increase in per capita direct farm sales is associated with

1.1% lower obesity rate and a 1.3% lower diabetes rate," and also "An additional farmers' market per 1,000 people is associated with a 0.93% lower diabetes rate." <<These are the figures provided in the paper's results table, and these were reconfirmed in communication with the author of the paper. He notes that the text contains slightly different (incorrect) numbers.>>

Saunders, C., A. Barber, and G. Taylor. (2006). *Food Miles – Comparative Energy/Emissions Performance of New Zealand's Agriculture Industry*. Research Report No. 285, July, Agribusiness & Economic Research Unit, Lincoln University, Lincoln, New Zealand. Retrieved August 8, 2011 (www.beehive.govt.nz/Documents/Files/Food%20Miles%20Executive%20Summary.doc)

Analysis finds that exporting some foods to the UK consumes less energy than producing the same food in the UK because the agricultural system in New Zealand tends to use less fertilizer and raises year round grass fed livestock, which uses less energy than housing and feeding animals.

food miles

Schafft, Kai. A, Eric B. Jensen, C. Clare Hinrichs. 2009. "Food Deserts and Overweight Schoolchildren: Evidence from Pennsylvania." *Rural Sociology* 74(1): 153-177.

Authors use Geographic Information System (GIS) techniques to identify food desert areas in rural Pennsylvania. We then analyze student body mass index (BMI) data along with census and school district-level data to determine the extent to which the percentage of a school district's population residing within a food desert. Authors find that school districts with higher percentages of populations located within food deserts are more likely to be structurally and economically disadvantaged. Net of these district-level structural and economic characteristics, we additionally find a positive relationship between increased rates of child overweight and the percentage of the district population residing in a food desert.

food desert; GIS

Schoonover, Heather, and Mark Muller. 2006. *Food Without Thought: How U.S. Farm Policy Contributes to Obesity*. Institute for Agriculture and Trade Policy, Environment and Agriculture Program. Retrieved August 9, 2011 (http://www.iatp.org/files/421_2_80627.pdf.) //Shorter fact sheet here: <http://www.nffc.net/Learn/Fact%20Sheets/Obesity%20and%20Ag.pdf> //

Policy statement arguing for support of non-industrial food systems, including local production of food. "Intentionally or not, current farm policy has directed food industry investment into producing low-cost, processed foods high in added fats and sugars."

Nutrition; health; policy

Seymour, J.D., A.L. Yaroch, M. Serdula, H.M. Blanck, and L.K. Khan. 2004. "Impact of Nutrition Environmental Interventions on Point-of-Purchase Behavior in Adults: A Review." *Preventative Medicine* 39(Supplement 2: S108-S136.

Nutrition interventions targeted to individuals are unlikely to significantly shift US dietary patterns as a whole. Environmental and policy interventions are more promising for shifting these patterns. Article reviews interventions that influenced the environment through food availability, access, pricing, or information at the point-of-purchase in worksites, universities, grocery stores, and restaurants. Thirty-eight nutrition environmental intervention studies in adult populations, published between 1970 and

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June 2003, were reviewed and evaluated on quality of intervention design, methods, and description (e.g., sample size, randomization). No policy interventions that met inclusion criteria were found. Many interventions were not thoroughly evaluated or lacked important evaluation information. Direct comparison of studies across settings was not possible, but available data suggest that worksite and university interventions have the most potential for success. Interventions in grocery stores appear to be the least effective. Interventions in "limited access" sites (i.e., where few other choices were available) had the greatest effect on food choices.

nutrition; behavioral change; workplace; university; review

Short, Denise. 2001. *Energy Use in Agriculture: Local or Long Distance Consumer Choices*. Unpublished research paper, School of Nutrition Science and Policy, Tufts University.

Calculates the energy used to produce and transport two items, potatoes and strawberries, from local or conventional sources and sold in the greater Boston area. According to this study, strawberries grown in California, the conventional case, have an average yield per acre that is over six times greater than the average yield of strawberries grown in Massachusetts, the local case. The energy per pound for California-grown strawberries was a third of the energy required to grow a pound of strawberries in Massachusetts (calculated from table, p. 6). Despite the fact that Idaho potatoes, the conventional case, are irrigated and Massachusetts potatoes, the local case, are not, production energy per pound of potatoes were similar in both cases. //This is an unpublished, non-peer reviewed paper, listed here because it is one of the few examples of this type of work, but a model for what could be done on a product-by-product basis.//

food miles; energy

Smith, Alison, Paul Watkiss, Geoff Tweddle, Alan McKinnon, Mike Browne, Alistair Hunt, Colin Treleven, Chris Nash, & Sam Cross. 2005. *The Validity of Food Miles as an Indicator of Sustainable Development*. Department of Environment, Food, and Rural Affairs. Oxon, United Kingdom. Retrieved August 8, 2011. (<http://statistics.defra.gov.uk/esg/reportsfoodmiles/execsumm.pdf>).

This report is unusual in that it also estimates the costs of food transport to include accidents, noise and congestion, which amount to over 9 billion British pounds every year or 18 billion American dollars. Report determined that food miles alone are not a valid indicator of the sustainability of the food system. In some cases, reducing food miles may reduce energy use, but there may be other social, environmental or economic trade-offs. The consequences of food transport are complex and require a group of indicators to determine the global impact of food miles.

food miles; energy

Smith, Stew. 1992. "Farming: It's Declining in the U.S." *Choices: The Magazine of Food, Farm & Resource Issues* 7(1):8-15.

<Highly cited for showing the declining share of farm income retained by farmers at the expense of input producers. There is no indication of the data sources used for the conclusions, however.>

Sommer, R., J. Herrick, and T.R. Sommer. 1981. "The Behavioral Ecology of Supermarkets and Farmers' Markets." *Journal of Environmental Psychology* 1(1): 13-19.

Authors compare the social and physical milieu of supermarkets and farmers' markets in ten California

cities. On the semantic differential, the farmers' markets were perceived by their customers as more friendly, personal, rural, smaller, and happier settings than were the supermarkets by their customers. More than three-quarters of the supermarket shoppers arrived alone while at the farmers' markets, more than three-quarters arrived in the company of others. Interaction counts showed a similar number of perfunctory conversations in the two settings but more social and informational encounters at the farmers' markets. The lack of extended interaction in supermarkets is seen as a function of its social organization, relatively low density, and traffic-dominated architectural layout.

farmer's market; attitudes; ethnography

Sonntag, Vicki. 2008. *Why Local Linkages Matter: Findings from the Local Food Economy Study*. Seattle, WA: Sustainable Seattle.

Select findings: Multiplier study (based on 2-stage spending model from the New Economic Foundation): for every \$100 spent at an average grocery store, \$25 is re-spent locally; for every \$100 spent at a farmers market, \$62 is re-spent locally. Dollars spent at local food restaurants and grocers result in more than twice the usual impact of household spending at typical restaurants and grocers.

Economic impact; multiplier

Stewart, Hayden. 2006. *How Low Has the Farm Share of Retail Food Prices Really Fallen*. ERR-24. Washington, D.C.: Economic Research Service.

For the commodities they sell, farmers have been receiving a decreasing share of what consumers pay for food at retail stores for some time, but the extent of this decrease has been overstated for at least a few commodity groups. Current estimates of farm share are based on baskets of foods representative of what households bought between 1982 and 1984. Using updated baskets based on what American households bought for at-home consumption between 1999 and 2003, this report estimates farm share for two major commodity groups—fresh fruits and fresh vegetables. Using this approach, this report found that farmers are capturing more of the consumer's food dollar than current estimates suggest. Specifics: "The updated estimates show a larger farm share than the current, unadjusted data series. The unadjusted data series estimates the 2004 farm share at 19 percent for fresh vegetables and 20 percent for fresh fruit; the updated consumer baskets yield farm shares of 23.5 percent for fresh vegetables and 26.6 percent for fresh fruit. While the updated estimates are lower than the farm share estimates for 1982 (34 percent for fresh vegetables and 33 percent for fresh fruit), they do suggest that the existing (unadjusted) series has overstated the decrease in farm share. <*Canning 2010 notes the farm share for all products is \$0.158.*>

economics; food dollar

Swenson, David. 2006. *The Economic Impact of Increased Fruit and Vegetable Production and Consumption in Iowa: Phase II*. Ames, IA: Leopold Center for Sustainable Agriculture.

This working paper measures the potential net economic impacts that could accrue to the state of Iowa were it to achieve various levels of fruits and vegetable production *and* direct and grocery sales to consumers. All scenarios offset economic losses that primarily would accumulate to corn and soybean farming and from the existing Iowa fruit and vegetable retailing sectors (primarily grocery stores). The scenarios also accounted for existing fruit and vegetable production in order to determine net potential regional or statewide economic gains. The study determines conclusively that, given the scenarios, there

is the potential for substantial economic development to occur through import substitution. <This study is not peer-reviewed. It is included here to provide an example of the various means by which the potential economic impact of local foods has been estimated.>

economics

Swenson, D. 2009. *Investigating the Potential Economic Impacts of Local Foods for Southeast Iowa*. Ames, IA: Leopold Center for Sustainable Agriculture.

This working paper describes the potential economic impacts of a nutritionist-suggested level of fresh fruits and vegetable consumption coupled with increased levels of local production of these commodities and builds off of earlier work done by the author. It combines the net economic impacts of shifting from traditional commodity crops (corn and soybeans in Iowa) to horticulture crops with an imagined producer-owned wholesale and retail distribution network to gauge overall job and income gains for Iowa or for regions in Iowa. <This study is not peer-reviewed. It is included here to provide an example of the various means by which the potential economic impact of local foods has been estimated.>

Tegtmeier, Erin and Michael Duffy. 2005. *Community Supported Agriculture (CSA) in the Midwest United States: A regional characterization*. Ames, IA: Leopold Center for Sustainable Agriculture. Retrieved August 20, 2011 (http://www.leopold.iastate.edu/pubs/staff/files/csa_0105.pdf).

Authors surveyed upper Midwestern CSA operations to evaluate their viability and provide a regional characterization of the movement a decade after a critical mass of start-ups. The survey was mailed to 144 operators on March 15, 2002. It was designed to collect descriptive information on the operations and farmers and data on finances and labor. The mailing list was compiled using the national database of the Robyn Van En Center for CSA Resources. Results (not survey questions) are provided in this report.

CSA; characteristics

Thilmany, Dawn., Craig A. Bond, and Jennifer K. Bond. 2008 "Going Local: Exploring Consumer Behavior and Motivations for Direct Food Purchases." *American Journal of Agricultural and Applied Economics* 5: 1303-1309.

Concludes that consumers do attribute a public goods aspect to the attribution "local for "local foods," and thus are willing to pay more in dollars or time for that attribute.

attitudes; surveys

Timmons, D. and A. Wang. 2010. "Direct Food Sales in the United States: Evidence from State and County-Level Data." *Journal of Sustainable Agriculture* 34(2): 229-240.

This paper uses 2007 USDA Census of Agriculture data and regression analysis to identify major factors associated with direct food sales across states and counties. Four variables, average farm size, population density, region, and available farmland, together explain most of the variation in direct food sales across states. Household income and type of farming are also significant explanatory factors at the county level. <For states where the predicted value of direct sales was more than the actual value, authors suggest this indicates the potential for more direct sales. For NC, the

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predicted number was slightly less than the actual.>

direct food sales; counties

Tolbert, Charles, M., Thomas A. Lyson, Michael D. Irwin. 1998. "Local Capitalism, Civic Engagement, and Socioeconomic Well-Being." *Social Forces* 77(2): 401-428.

Abstract: This analysis is designed to extend a newly emerging body of social stratification research grounded in theories of civil society. The goal of this larger body of research and writing is to provide an alternative social and economic development paradigm to the dominant neoclassical/rational choice/human capital perspective. In an economic world woven together by global market forces, local social structures can become key variables that influence which places prosper and which decline. We begin by hypothesizing that local capitalism and civic engagement variables are associated with positive socioeconomic outcomes (higher income levels and lower levels of income inequality, poverty, and unemployment). To test these notions, we employ data on more than 3,000 U.S. counties. Net of the substantial effects of the control variables, three measures of local civic society -- small manufacturing establishments, family farms, and civically engaged religious denominations -- vary as hypothesized in three of four models. The performance of these local capitalism and civic engagement variables suggests a robust association with beneficial local socioeconomic outcomes. We conclude by outlining needed research on civil society that would contribute further to a social development perspective. /Finds that family farms—one of the measures of local civic society—is associated with lower unemployment, a lower poverty rate, and a lower level of inequality.

civic engagement; rural development

Tuck, B.M. Haynes, R. Ming, and R. Pesch. 2010. *The Economic Impact of Farm-to School Lunch Programs: A Central Minnesota Example*. MN: University of Minnesota Extension.

Two sets of scenarios were developed to test the total economic impact of increasing farm-to-school programs: one based on the foods that could be used in the schools (utilization scenarios) and one based on the prices that might be paid (price scenarios). The utilization scenarios include a special meal option, an unprocessed substitution option, and a substitute all option. The pricing scenarios include a farm price, a school price, and an intermediate price. On the whole, the special meal scenario has the lowest overall economic impacts because locally-grown foods are only incorporated into 9 meals in a school year. The substitute all scenario has the highest overall economic impacts because it allows schools access to the highest amounts of locally-grown foods. The farm price scenarios have the highest total economic impact due to the fact that the direct impact (or amount paid to farmers for their product) is the greatest. However, the indirect or induced (ripple) effects are maximized under the school price scenarios. This is because in the farm price scenarios, the induced impact goes negative because households have to pay more for school lunches (via either higher taxes or higher school lunch ticket prices).

school lunch; farm-to-school; economics

Voicu, Ioan, and Vicki Been. 2008. "The Effect of Community Gardens on Neighboring Property Values." *Real Estate Economics* 36(2): 241-283.

Findings--We find that the opening of a community garden has a statistically significant positive impact on residential properties within 1000 feet of the garden, and that the impact increases over time. We find that gardens have the greatest impact in the most disadvantaged neighborhoods. Higher quality

gardens have the greatest positive impact. Finally, we find that the opening of a garden is associated with other changes in the neighborhood, such as increasing rates of homeownership, and thus may be serving as catalysts for economic redevelopment of the community.

community garden; economic impact

Warner, Paul D., James A. Christenson, Don A. Dillman, Priscilla Salant. 1996. "Public Perception of Extension." *Journal of Extension* 34(4). Retrieved August 1, 2011 (<http://www.joe.org/joe/1996august/a1.php>).

This article addresses the issues of how people's perception and use of Extension have changed over a 13-year period. Telephone surveys of the U.S. population in 1982 and again in 1995 asked about the awareness and use of Extension. In addition, the 1995 study documented desired spending support for the seven base programs. Awareness of Extension has remained high, although buoyed by 4-H's high visibility. Annual use of Extension registered a decline. Funding support was found to be the greatest for programs in youth and family issues, as well as in natural resources. *<The findings in this article suggests that extension work related to local and community based food systems could be well-received by the public.>*

Extension service

Weber, Christopher L., and H. Scott Matthews. 2008. "Food-Miles and the Relative Climate Impacts of Food Choices in the United States." *Environmental Science and Technology* 42(10): 3508-3513.

Abstract: Despite significant recent public concern and media attention to the environmental impacts of food, few studies in the United States have systematically compared the life-cycle greenhouse gas (GHG) emissions associated with food production against long-distance distribution, aka "food-miles." We find that although food is transported long distances in general (1640 km delivery and 6760 km life-cycle supply chain on average) the GHG emissions associated with food are dominated by the production phase, contributing 83% of the average U.S. household's 8.1 t CO₂e/yr footprint for food consumption. Transportation as a whole represents only 11% of life-cycle GHG emissions, and final delivery from producer to retail contributes only 4%. Different food groups exhibit a large range in GHG-intensity; on average, red meat is around 150% more GHG-intensive than chicken or fish. Thus, we suggest that dietary shift can be a more effective means of lowering an average household's food-related climate footprint than "buying local." Shifting less than one day per week's worth of calories from red meat and dairy products to chicken, fish, eggs, or a vegetable-based diet achieves more GHG reduction than buying all locally sourced food. *< See Hopp's rejoinder.>*

GHG emissions; energy

Xureb, Marc. 2005. *Food Miles: Environmental Implication of Food Imports to Waterloo Region*. Retrieved August 8, 2011.

(www.leopold.iastate.edu/research/marketing_les/foodmiles_Canada_1105.pdf.)

A study conducted in the Waterloo Region of Southwestern Ontario investigated the food miles associated with 58 commonly eaten, imported foods. The study found that each food item traveled an average of 4,497 kilometers or 2,811 miles, producing 51,709 tons of greenhouse gas emissions annually.

food miles

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