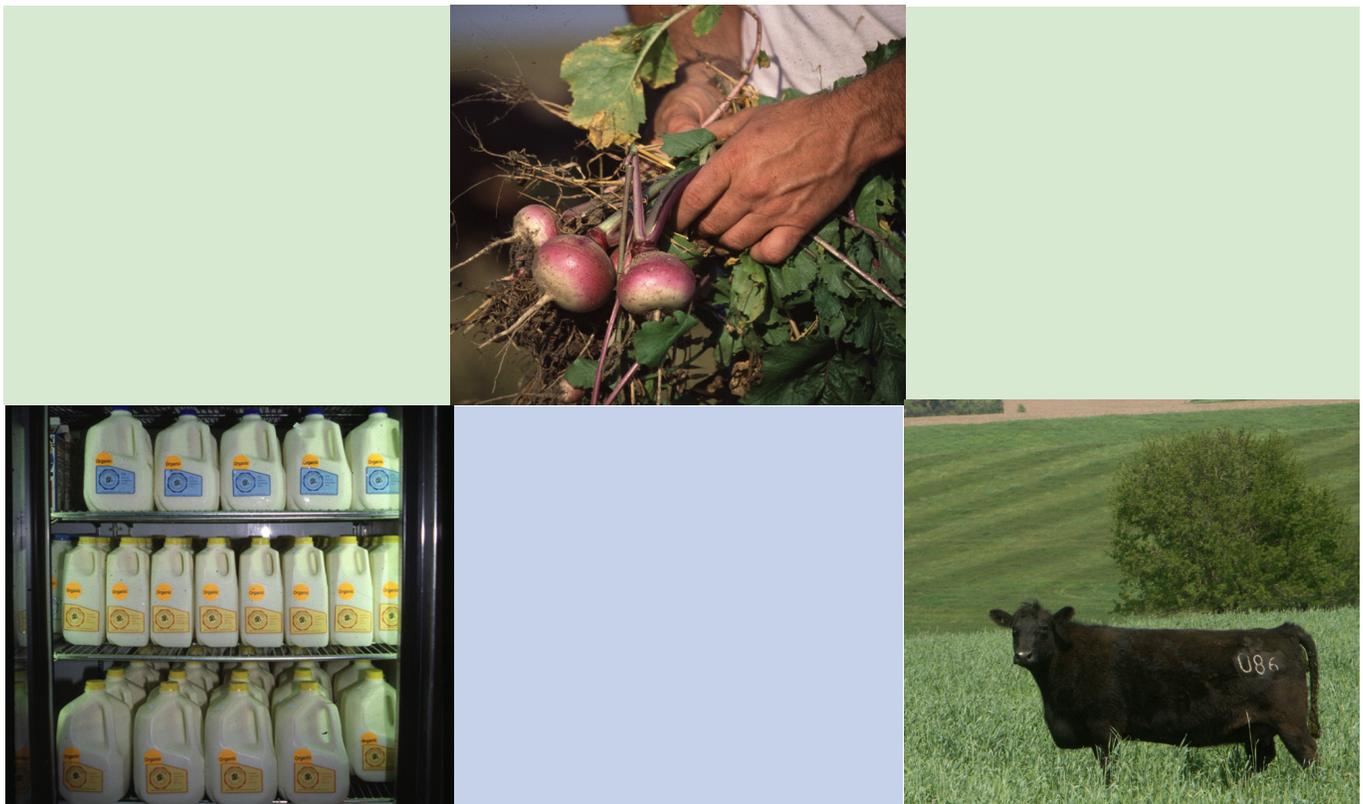


Food Facts: Results from Marketing and Food Systems Research

*Key research findings from projects supported by
the Marketing and Food Systems Initiative
of the Leopold Center for Sustainable Agriculture*

Revised June 2013



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Key research findings from projects supported by the Marketing and Food Systems Initiative of the Leopold Center for Sustainable Agriculture

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How to use this document

Use information in this publication to:

- Conduct market research for your farm or business enterprise,
- Prepare a grant proposal or journal article,
- Write an article for a newspaper or magazine, or
- Learn more about markets and food systems.

This document is available on the Leopold Center website at:
<http://www.leopold.iastate.edu/pubs-and-papers/food-facts>

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LEOPOLD CENTER

The Leopold Center for Sustainable Agriculture explores and cultivates alternatives that secure healthier people and landscapes in Iowa and the nation. The Leopold Center was established by the Iowa Legislature as part of the Iowa Groundwater Protection Act of 1987. Its legislatively mandated goals are to identify and reduce negative environmental and socio-economic impacts of agricultural practices, contribute to the development of profitable farming systems that conserve natural resources, and cooperate with Iowa State University Extension to inform the public of new findings.

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About this document

Here are key findings from research, demonstrations, studies and surveys that have been supported since 2000 by the Leopold Center's Marketing and Food Systems Initiative.

Links to the full publication or research report are included with each project, as well as an appropriately formatted citation for further use and reference. Summaries of all completed research projects are available on the Leopold Center website.

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Introduction

Since its establishment by the Iowa Groundwater Protection Act of 1987, the Leopold Center for Sustainable Agriculture at Iowa State University has funded more than 480 competitive grant projects with nearly \$18 million in funding from the state of Iowa. At the completion of each Leopold Center project, a report is prepared by the project investigator and summaries are made available to the public.

The Center often is challenged by its advisory board and various partners to more effectively synthesize project findings to make them more readily available for use in a variety of applications.

Among the possible applications are:

- Data and knowledge for use in farmer production and marketing decisions;
- Information to be incorporated into presentations, articles, speeches, and reports on a variety of topics;
- Research results that can be cited in proposals for potential grant funding as well as articles for peer-reviewed journals; and
- Background or lead information for use by the media in articles or segments on sustainable agriculture-related topics.

Synthesis of research results also may lead to increased insights in our understanding and management of sustainable agriculture systems that can better serve Iowa's citizens, businesses, and natural resources.



Community-Based Food Systems

Potential Midwestern Foodsheds

- This project investigated whether eight Midwestern states could become self-sustaining in food production (without taking into account seasonality, storage requirements or quality).
- Within this region, the average per capita cropland requirement was approximately half an acre per consumer, based on the U.S. Department of Agriculture's dietary recommendations.
- The region had 9.3 times the amount of cropland it needed to become self-sustaining.
- Fifty-six percent of the population could be supplied by production occurring less than five miles away.
- Major metropolitan areas could become self-sustaining in relatively small travel distances: Chicago (76 miles), Minneapolis (37 miles), St. Louis (27 miles), Kansas City (24 miles) and Des Moines (10 miles).

Hu, Guiping, Randy Boeckenstedt, Lizhi Wang and Susan Wohlsdorf-Arendt. 2012. Mapping potential foodsheds in Iowa: A systems optimization modeling approach. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/m2010-04>

Local Food Prices

- A survey conducted June, July and August 2009 at farmers' markets, supermarkets, natural food stores and butcher shops in Des Moines, Cedar Rapids, Ames and Iowa City compared the prices of local (Iowa-produced) and non-local food. The survey found:
 - The average price per pound for a farmers' market vegetable basket is \$1.25, compared \$1.39 for a non-local supermarket basket (no statistical difference).
 - The total cost if a consumer bought one pound each of string beans, cabbage, cucumbers, onions, tomatoes, sweet corn, summer squash and zucchini would be \$8.84 at the farmers' market and \$10.45 at the supermarket.
 - If a family of four purchased a two-week supply of each vegetable (based on Iowa per capita consumption), it would cost \$15.03 at the farmers' market and \$16.91 at the supermarket.
 - Local zucchini and summer squash were highly competitive with non-local prices.
 - The average price for a pound of lean ground beef was \$3.09 for local butcher shop meat, and \$3.66 for non-local supermarket meat.
 - The average price for a pound of bone-in pork chop was \$3.20 for local butcher shop meat, and \$3.12 for non-local supermarket meat (no statistical difference).
 - The average price for a dozen brown free-range eggs was \$2.78 at the farmer's market, and \$2.97 at the supermarket (no statistical difference).

Pirog, Rich and Nick McCann. 2009. Is Local Food More Expensive? A Consumer Price Perspective on Local and Non-Local Foods Purchased in Iowa. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2009-12-local-food-more-expensive>

Collaborative Community Supported Agriculture

- A research project showed that collaborative Community Supported Agriculture (multiple producers collaborating to provide food and fiber products to members) serves as a business incubator for new growers and helps existing growers expand and diversify their operations.

- Nearly half of producers said participation in cCSA helped them start, expand, or plan new farm-related enterprises.
- Producers report that participation in cCSA prepares them for off-farm careers in sustainable agriculture.
- 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.
- Benefits to participating in a cCSA were based on six categories of capital: financial/built, human, social, political, natural, and cultural. Producers received the greatest benefits in natural, social and cultural capital, and the least in political and financial gain.
- Producers were more likely to agree that cCSA participation brings greater benefits to the community than to themselves individually.
- Women producers receive more social and cultural benefits than do men.
- In contrast to producers, members ranked financial capital (in terms of economic benefits to the community) to be the greatest benefit. Political capital benefits were ranked last among members, preceded by social capital (fourth) and cultural capital (fifth).

Bregendahl, Corry. 2006. The Role of Collaborative Community Supported Agriculture: Lessons from Iowa. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2006-09-lessons-from-iowa>

CSAs in the Midwest

A 2002 survey of upper Midwest Community Supported Agriculture (CSA) operations in the United States found that:

- The typical upper Midwestern CSA farmer is 45 years old and has 14 years of farm experience.
- The farmer and his or her partner are likely to be college graduates.
- Just over half the farmers are female and have farmed for about eight years.
- Primary motivations to start a CSA operation were environmental and social values.
- CSA farms have been in operation for more than five years, on average.
- The average CSA serves 33 members and membership has increased by 350 percent since start-up.
- The average CSA occupies just over 30 acres including the CSA operation.
- Almost two-thirds of the farms raise only produce, as a CSA or a CSA/market garden combination.
- When determining share price, most CSA farmers consider what they believe to be consumers' willingness to pay rather than the market price for their products.
- In terms of labor, half of the respondents have an off-farm job but also farm 20 to 98 percent of the time.
- Family members often provide a majority of the labor—doing 75 to 100 percent of the CSA work.
- Two-thirds of the respondents hire other labor and spend \$2,920 on average per season.
- Just over half of the respondents also offer working shares to members, but for 70 percent of these, members provide just up to 5 percent of the operations' labor needs.
- Average net return per acre for these CSA farmers is \$2,467. This figure is quite high when compared to return per acre of corn (\$172.11), soybeans (\$134.46), and wheat (\$38.10) in the United States.

- In terms of family income, farm enterprises and off-farm work both provide about half the annual income. CSA operations account for about one-half of farm income on average, even though CSA land as a percentage of total land farmed is 37 percent on average, and 12 percent for those farms with additional operations beyond CSA and market garden production.
- When asked if their share price provides them with a fair wage, over half (57 percent) of these CSA farmers replied negatively.
- However, 97 percent of respondents claim to be completely satisfied or satisfied most of the time with their CSA operations.
- These CSA farmers believe their members are completely satisfied (17 percent) or satisfied most of the time (83 percent).

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.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2005-01-community-supported-agriculture>

Iowa Farmers' Markets

- A survey of over 4,500 consumers and 780 vendors at Iowa farmers' markets estimates approximately \$31.5 million in sales gross during the 2004 market season.
- In 2004, Iowa had over 180 farmers' markets, the highest per capita in the nation. Nearly 55,000 Iowans went to at least one farmers' market, and total seasonal attendance was estimated at 135,000.
- The average customer was 51-65 years of age, visited the market repeatedly during the season, traveled eight miles to reach the market and spent \$11-20 per visit.
- Approximately 72 percent of all sales were generated by five urban market areas.
- Iowa farmers' 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 equivalent of 325 full-time jobs in Iowa, plus an additional 146 full-time jobs created by the secondary impacts of the farmers' markets.

Otto, Daniel and Theresa Varner. 2005. Consumers, Vendors, and the Economic Importance of Iowa Farmers' Markets: An Economic Impact Survey Analysis. Ames, IA: Iowa State University.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2005-05-farmers-markets>



Economic Impacts - Local, Organic

Local Meat Processing

- This research looked at the potential small area economic gains that might occur if Iowa's small processors were able to increase their production of meat products for local consumption.
- Small processors in Iowa require 13.3 jobs per million dollars of meat product, compared to 4.7 jobs as the statewide average. \$1 million in small meat processing would pay \$464 million in labor incomes. That level of processing would multiply in the Iowa economy to support a total of 17.6 jobs, \$613,118 in labor incomes, at \$738,777 in Iowa GDP.
- Processing 1,000 cattle in small facilities would support 7.4 jobs and \$257,509 in labor incomes annually.
- Processing 1,000 hogs in small facilities would support 3.2 jobs and \$110,361 in labor incomes annually.

- Processing 1,000 goats or lambs in small facilities would support 1.2 jobs and \$42,918 in labor incomes annually.

Swenson, Dave. 2011. *Exploring Small-Scale Meat Processing Expansions in Iowa*. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2011-04-exploring-small-scale-meat-processing>

Metropolitan Demand

- The majority of fresh fruits and vegetables consumed in Iowa are imported from other states and countries. This study examined the effect on jobs and incomes if the fruit and vegetable demand in metropolitan areas (having a population of 50,000 or more) was met by the surrounding farms (within 100 miles).
- The metropolitan demand for 28 fresh fruits and vegetables would require 10,548 crop acres and generate almost \$40 million in farm-level sales.
- This demand would result in a net gain of 343 Iowa jobs, accounting for the jobs lost by a reduction in corn and soybean acres.
- Jobs and incomes could be increased if Iowa farmers directly marketed half their produce to consumers, generating more than \$68 million in direct sales, requiring 595 jobs at fruit and vegetable establishments, and creating more than \$15 million in labor incomes.
- Nine counties in Iowa could supply more than 250 acres of fresh fruit and vegetable production. Pottawattamie County ranked highest at 809 acres, followed by 425 acres in Polk County and 365 acres in Linn County.

Swenson, Dave. 2011. *Measuring the Economic Impacts of Increased Fresh Fruit and Vegetable Production in Iowa Considering Metropolitan Demand*. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2011-04-metropolitan-demand>

Midwest Fruits and Vegetables

- This study considered the economic impact of increasing the production of 28 types of fresh fruits and vegetables for local consumption in Illinois, Indiana, Iowa, Michigan, Minnesota and Wisconsin. An analysis that considered each state separately found the following:
 - More than 270,000 acres of cropland would be needed in the six-state region to partially fulfill the yearly demands for the 28 fresh fruits and vegetables, producing over \$882 million in farm-level sales and \$3.31 billion in retail sales.
 - The production would result in 9,302 jobs in the six-state region, earning \$395 million in labor incomes. The same land in corn and soybean production supported only 2,578 jobs and \$59 million in labor incomes.
 - If farmers sold half their produce in producer-owned markets, the region would need an additional 9,652 jobs earning \$287.64 million in labor incomes.
- A second analysis that ignored state boundaries and considered production at a county level found the following:
 - More than 195,000 acres of cropland would be needed to supply fruits and vegetables to 28 Midwest metropolitan areas, producing over \$637 million in farm-level sales.
 - The production would result in 6,694 jobs earning \$284.6 million in labor income. The same land in corn and soybean production supported 1,892 jobs and \$42.5 million in labor incomes.
 - Distributing half the produce at producer-owned metropolitan markets would support 6,021 jobs earning \$180.7 million in labor incomes.

Swenson, Dave. 2010. *Selected Measures of the Economic Values of Increased Fruit and Vegetable Production and Consumption in the Upper Midwest*. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2010-03-selected-measures>

Southwest Iowa Fruits and Vegetables

- This analysis looked at the potential economic impact on 10 counties in southwest Iowa from increases in production of 22 locally-grown fresh fruits and vegetables.
- One scenario, where farmers grow enough produce to meet expected local demand during the growing season, would result in 902 new acres of fruits and vegetables, \$2.42 million in farm sales, \$5.2 million in retail sales, 16 new jobs and \$928,373 in labor incomes.
- Another scenario, where farmers grow enough produce to partially satisfy demands in metropolitan markets in Omaha, Council Bluffs and Des Moines during the growing season, would result in 2,107 new acres of fruits and vegetables, \$4.62 million in farm sales, \$11.41 million in retail sales, 29 new jobs and \$1.75 million in labor incomes.
- When both scenarios are combined, the ten-county area could have 45 new jobs and \$2.67 million in labor incomes.

Swenson, Dave. 2010. *The Economic Impact of Fruit and Vegetable Production in Southwest Iowa Considering Local and Nearby Metropolitan Markets*. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2010-01-fruit-and-vegetable-production-metro-markets>

Southeast Iowa Local Foods

- This study examined the economic impact of locally producing eight fruits and vegetables (tomatoes, peppers, greens, squashes, beans, potatoes, eggplants and apples) and a set of meat products (chicken, egg, lamb and goat) in southeast Iowa.
- This scenario would add 5.3 jobs and \$215,350 in labor income to the regional economy, after considering reductions in corn and soybean farming. Direct sales of half of those products would add 17.7 jobs and \$239,345 in labor incomes.
- If the list was expanded to 22 local products, this scenario would add 11.6 jobs and \$475,870 in labor incomes. Direct sales of half of those products would add 37.8 jobs and \$510,733 in labor incomes.
- If the region attained self-sufficiency in chicken and egg production, it would gain 19.8 new jobs and \$653,466 in labor income.
- If the region supplied a quarter of its consumers' chicken and egg demand, the retail value would be \$1.88 million.
- If the region added small meat slaughtering and processing capacities to accommodate an increase in locally produced lamb/goat and poultry consumption, each locker plant would add 5.1 jobs to the region and \$178,937 in labor incomes.
- All of these scenarios together could create 50 to 75 new jobs in rural areas and communities.

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

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2010-01-local-foods-southeast-iowa>

Significant Gains in Local Food Sales

- For every grant dollar raised to do the work of the Northern Iowa Food and Farm Partnership, \$14.60 was invested in local/regional food and farm business—a tremendous return on investment.
- Although the region's farmers produce \$1.19 billion of food commodities per year (1999-2005

average), they spend \$1.24 billion to raise them. This means farmers lose an average of \$51 million in production costs each year, for a total loss of \$357 million over the last seven years. These losses make them highly dependent on \$184 million of subsidies that are given to farmers each year. Despite these subsidy payments, one of every three of the region's farmers reported net losses in 2002. Moreover, farmers spend more than \$500 million buying inputs from outside the region.

- Local consumers spend more than \$580 million buying food grown somewhere else. If residents were to buy only 10 percent of this food and energy directly from local sources, it would bring \$60 million into the region's economy.
- The diverse, family-owned, direct-marketing farms in the area have strong supply chain linkages with the regional economy. 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. Among the study's findings:
 - 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.
 - The labor income multiplier for the studied farms is 1.86, and the regional average is 1.44.
 - The farms in the study have a 1.83 jobs multiplier, and the job multiplier for an average regional grain farm is 1.56.
 - The industrial output multiplier of the studied restaurants is 1.94, while the job multiplier for the average regional restaurant is only 1.53.
 - 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.
 - The jobs multiplier for the restaurants in the study is 1.54 while the average regional restaurant has a multiplier of 1.20.
 - If residents of Black Hawk County region purchased locally grown fruits and vegetables just three months out of the year, it would translate to 475 new jobs and \$6.3 million in labor income added to the local economy.

Enshayan, Kamyar 2009. Community Economic Impact Assessment for a Multi-County Local Food System in Northeast Iowa. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/m2008-05>

Potential Impact of Increased Local Food Consumption

- This economic study of five northeast Iowa counties simulates the value of meeting the daily recommended requirement for a healthy diet in significant part with local food production. Seasonal produce considered were Iowa-grown apples, tomatoes, carrot, squash, spinach, and potatoes; non-seasonal products included milk, pork, beef, egg, whole wheat and oats.
- More than 8,000 acres of fruit, vegetable, and grain production would be required to meet a quarter of the daily diet with local commodities (equivalent to three months' worth of consumption).
- Considering all economic linkages, meeting a quarter of the regional demand with seasonal produce and all of the regional demand with non-seasonal produce would result in 46.7 new jobs and almost \$2 million in income gains (2006 prices). These figures reflect adjustments for existing production of the commodities and losses to corn and soybean producers because of acreage reductions.
- Additional gains could be made if farmers directly sell half their produce, with the remainder distributed via wholesalers to existing grocers. Considering all economic linkages, this scenario would result in 408 jobs, \$10.6 million in labor income, and almost \$91 million in total industrial output.

Swenson, Dave. 2008. Estimating the Production and Market-Value Based Impacts of Nutritional Goals in NE Iowa. Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2008-02-ne-iowa>

Organic Crop Conversion

- A study of the potential region-wide economic impact of switching from conventional farming to an organic alternative showed that organic rotation farming produced 52 percent more gross sales revenue, 110 percent more value added, 182 percent more labor income and 56 percent more jobs than from the same 1,000 acres farmed using conventional corn-soybean rotation practices.
- The study also showed that conventional rotation produces \$379,205 in annual output, while the organic corn, soybean, oat, and alfalfa (CSOA) rotation produces \$510,750 annually.

Swenson, David, Liesl Eathington, and Craig Chase. 2007. *Determining the Methods for Measuring the Economic and Fiscal Impacts Associated with Organic Crop Conversion in Iowa*. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2007-03-determining-methods>

Increased Produce Production, Consumption

- A study on the economic impact of increasing fruit and vegetable production and consumption in Iowa showed that eating five servings of fruit and vegetables every day could mean an additional \$302 million in sales and more than 4,000 jobs added to the Iowa economy if the fruit and vegetables are Iowa grown for three months of the year.
- The study used production estimates generated by the Iowa Produce Market Potential Calculator.

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

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2006-05-fruit-and-vegetable-production-phase-two>

Food Economies - Wright County

- A 2004 study of Wright County, Iowa showed that in 2001, farmers earned \$167 million from farm commodities, but spent \$187 million to produce those same commodities, which is a \$20 million loss.
- Wright County consumers spend \$30 million annually for food; \$17 million for food eaten at home and \$13 million for food eaten away from home. Of the dollars spent for food at home, \$7 million is going toward purchases of meat, poultry, and fruits and vegetables—items that can be supplied by local producers. However, according to USDA statistics (1997), only eight farms were listed (1997) as selling directly to consumers. These farms generated only \$10,000 in sales. This represents significant potential for local producers to meet local demand.

Libbey, Jan. 2005. *Local Food Capacity in North Central Iowa: Nutritional Need, Economic Strategy*. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/2004-m21>

Melons Compared to Commodity Crops

- A muskmelon commercial budget was developed in 1996 and distributed by ISU Extension. The budget indicated production costs were about \$5,000 per acre. Assuming production costs have risen 10 percent to \$5,500 per acre since 1996 and yields are 40,000 lbs. per acre, a price of \$13.75 per cwt (hundredweight) would be needed just to cover production costs. A watermelon budget was developed as well and indicated production costs of \$2,640 per acre and a 40,000 lb. yield. A breakeven price of \$6.60 per cwt would be needed to cover production costs.
- There were 816 Muscatine County farms in 2002 selling \$72.1 million worth of agricultural products. Of the 816 farms, six produced cantaloupe and muskmelons on 49 acres. Assuming average sales of \$7,200 per acre, a total of \$352,800 in sales would occur from these farms. However, if farmers in Muscatine County reverted to their 1964 production of 271 acres, total sales would be about \$1.95 million. Assuming watermelon average sales of \$3,600 per acre, a total of \$298,800 in sales would

occur from the 58 acres in 2002. Again, reverting back to 1964 acres would have provided \$1.36 million.

- Average net cash returns for cantaloupe would be estimated at \$1,700 per acre and \$960 per acre for watermelons. If Muscatine farmers reverted back to 271 acres of cantaloupe and 379 acres of watermelon, total net returns would be approximately \$825,000. Average net cash income for a corn-soybean rotation would be around \$20 per acre. To achieve a total net cash income of \$825,000, 41,250 acres of corn and soybean would need to be farmed. Purely from a net cash income viewpoint, the 650 reverted cantaloupe and watermelon acres would equal 26 percent of all corn and soybean acres in Muscatine County and would significantly contribute to the economic activity of the county.

Futrell, Sue and Craig Chase. 2004. Muscatine Melon: A Case Study of a Place-based Food in Iowa. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2004-10-muscatine-melon>



Food Miles and Greenhouse Gases

External Transportation Costs

- This project estimates the actual costs associated with local, regional and conventional food system, which include external costs like carbon emissions, air quality, pavement deterioration, energy, congestion and safety.
- Moving fresh fruits and vegetables locally (within a county) costs 97 cents per pound in Story County and 14 cents in Adam and Talyor County.
- Moving fresh fruits and vegetables regionally (within Iowa) costs \$76 per pound.
- The external costs of moving food on regional and conventional food systems far surpass the total revenue the state brings in for transportation-related programs.

Smadi, Omar, Inya Nienanya, Marwan Ghandour and Silvina Lopez Barrera. 2011. The actual cost of food systems on roadway infrastructure. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/m2009-15>

Local Food Distribution Fuel Efficiency

- A study was conducted to determine the fuel efficiency and CO₂ emissions of Community Supported Agriculture (CSA) in Iowa. Findings showed that delivery by the farmer using a Toyota Prius resulted in 2.77 times lower fuel usage and CO₂ emissions than consumer pick-up using U.S. average fuel economy for passenger vehicles. If all CSA customers who used vehicles for pickup drove a Toyota Prius, farmer distribution would still be more fuel efficient, but only 1.35 times more than that of customer pick-up.
- Increased efficiencies for delivery routes, optimized placement of pick-up centers to minimize travel, combining and/or minimizing car trips to pick up or buy food, and use of more fuel efficient vehicles or non-fossil fuel powered transportation are all options that farmers and their customers should consider to reduce the environmental impact of the CSA in the local food distribution system.
- Combining or minimizing car trips to shop for food offers an option that could be enhanced by cooperation across market venues. For example, having farmers' markets in the parking lots of retail food stores could decrease consumer fuel use and CO₂ emissions as well as increase overall sales for both the direct market farmers and the food retailer.
- Direct farm food delivery may increase net profitability for the farmer, but delivery likely will de-

crease interaction among CSA members and their farmer partners.

Pirog, Rich and Rebecca Rasmussen. 2008. Assessing Fuel Efficiency and CO2 Emissions of Two Local Food Distribution Options in Iowa. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2008-06-assessing-fuel-efficiency>

Multiple Ingredient Food Product

- According to a study that calculated the weighted total source distance of a multiple ingredient food product, the primary ingredients for an eight-ounce container of strawberry yogurt processed in Des Moines, Iowa—milk, strawberries, and sugar—travel more than 2,200 miles before reaching the supermarket shelf.
- The weighted average source distance (based on percent weight in the final product) the ingredients travel is about 277 miles, with a total travel distance of 2,216 miles.

Pirog, Rich and Andrew Benjamin. 2005. Calculating food miles for a multiple ingredient food product. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2005-03-calculating-food-miles>

Local vs. National

- According to research done on food miles, in 2001, the weighted average source distance (WASD) for locally grown produce to reach institutional markets was 56 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.
- Conventional carrots, sweet corn, garlic, onions and spinach all traveled at least 50 times farther than locally grown counterparts.
- 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.

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.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2003-07-food-odometer>

Food Travel, Greenhouse Gas Emissions, Economics

- 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.
- A WASD was calculated for a sampling of data from three Iowa local food projects where farmers sold to institutional markets such as hospitals, restaurants, and conference centers. The food traveled an average of 44.6 miles to reach its destination, compared with an estimated 1,546 miles if these food items had arrived from conventional national sources.
- 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.

- Growing and transporting 10 percent more of the produce for Iowa consumption in an Iowa-based regional or local food system would result in an annual savings ranging from 280 to 346 thousand gallons of fuel and an annual reduction in CO2 emissions ranging from 6.7 to 7.9 million pounds, depending on the system and truck type.
- Based on consumption estimates of a selected 28 fruits and vegetables, if an additional 10 percent of these produce items were grown and sold in Iowa, it would result in \$54.3 million in sales for Iowa farmers (based on wholesale prices). These dollars would multiply several times in Iowa communities rather than communities in other states or countries.
- A common dinner of chuck roast, potatoes, carrots, and green beans could travel a collective distance of 5,375 miles through conventional channels before reaching the dinner table while the same meal grown locally could travel a collective distance of just 90 miles before reaching the dinner table.

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.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2001-06-food-fuel-freeways>



Grape and Wine Industry

A Regional Wine Culture

- The Iowa Wine Trail had seven participating wineries at the beginning of 2007. A survey of Iowa Wine Trail visitors yielded these results:
 - Over half (52 percent) of visitors had previously visited the wineries.
 - Initial wine visitors' expenditures of \$1.82 million generated \$2.65 million in terms of sales and created 53 new jobs.
 - The Iowa Wine Trail brings new and repeat customers to a wide variety of businesses and service providers, such as bed and breakfast inns, motels, restaurants, gas stations, and many other visitor destinations.

Bell, John E. and Warren Johnson. 2007. Development of a Rural Wine Culture in Iowa. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/2005-m14>

Iowa Grape Juice

- A survey of buying clubs showed that respondents were more concerned with characteristics related to the perceived healthiness or nutritional value of a food product rather than where it was grown or its appearance. "Certified organic" and "price" were ranked as important by nearly 67 percent of the people who responded.
- When asked about alternative grape juice products, 90 percent of the respondents indicated they would be willing to purchase a locally grown organic product. Fifty percent of the respondents said they would be willing to purchase a local product if the producers used limited pesticides, meaning the product is not organic. Only 35 percent of the respondents were interested in a product sweetened with sugar, while 83 percent preferred a product sweetened with other fruit juices.
- One-third of the respondents said they would be willing to pay more for a locally grown grape product. Sixty-eight percent were interested in purchasing a local sparkling grape juice product.

Chase, Craig. 2004. Let the Vineyards Be Fruitful: A Study of the Potential Market for Iowa Grape Juice. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/2003-m3>

Iowa Grape Industry

- According to the 1860 U.S. Agricultural Census, Des Moines, Iowa, Mills, Muscatine, and Van Buren counties led Iowa in production of farm-processed wine. Grape production in Iowa grew steadily as the state was settled. Nationally, Iowa ranked ninth in grape production in 1869 with nearly half a million pounds.
- The 1900 U.S. Agricultural Census showed that Iowa produced 7,403,900 pounds of grapes and 76,301 gallons of farm-processed wine.
- Iowa was sixth in grape production in 1919 with more than 12 million pounds. Linn, Pottawattamie, and Polk counties produced approximately one-third of Iowa's grapes in 1919, with Pottawattamie and Polk producing 1,863,000 and 1,374,000 pounds, respectively. Most of the grapes grown in these three counties were produced near the cities of Cedar Rapids, Council Bluffs, and Des Moines.
- Because of a reputation for better quality fruit than that grown elsewhere, grapes marketed by the Council Bluffs Grape Growers Association brought its members a \$56.00 per ton average for the 1926 season, \$16.00 per ton higher than the U.S. average price.
- According to research done on Iowa's grape industry, using 1998 Iowa population figures (2.862 million people), Iowa would need an estimated 279 acres of wine grapes and 54 acres of table and juice grapes to supply 5 percent of Iowa's wine and table grape consumption and 1 percent of Iowa's grape juice consumption.
- It is estimated that Iowa has 30 acres of grapes in production with two vineyards and nine bonded wineries (2000 data).

Pirog, Rich. 2002. Grape Expectations: A Food System Perspective on Redeveloping the Iowa Grape Industry. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2002-08-grape-expectations>



Market Research

Rising Food Prices, Food Safety, Climate Change

- The Leopold Center's Marketing and Food Systems Initiative conducted a marketing survey in August 2008 to examine consumer perceptions of the complex relationships among rising food and fuel prices, food safety, greenhouse gas emissions and climate change, and food systems of varying scales (local, regional, national).
- Survey respondents were more likely to react to rising food and fuel prices by taking fewer vacations and recreational trips, buying more food items on sale, eating out less, and purchasing fewer desserts. Overall, the respondents said that price increases led to a decrease in fuel use and a reevaluation of their food shopping and eating habits. Seventeen percent said they were very likely to cope with rising prices by increasing their purchases at farmers' markets or by canning or freezing more fruits and vegetables.
- The majority of respondents (55 percent) perceived the U.S. food system to be safe. However, an earlier Leopold Center survey conducted in July 2007 found that 70 percent of respondents thought the U.S. food system was safe. There was considerable concern with a global food supply chain; only 15 percent of respondents viewed such a system as safe, compared to 74 and 73 percent, respectively, for a local or regional system.
- More than 50 percent of respondents saw value in retailers putting carbon labels on their food products, with the majority willing to encourage use of such labels only if their food costs did not increase. More than 60 percent of respondents said they would not pay more for a produce item that contributes 50 percent fewer greenhouse gas emissions.

- When asked specifically about the role their carbon footprint plays in greenhouse gas emissions, only 11 percent of respondents viewed themselves as responsible for their carbon footprint. This contrasts with 37 percent of British respondents in a July 2007 consumer survey who believed they were responsible for the emissions related to their carbon footprint.
- Fifty percent of respondents saw the loss of natural habitat as a more important environmental issue than climate change, with more than 40 percent viewing water pollution as a more important environmental concern than climate change.
- More than two-thirds of the respondents said that local food traveled 100 miles or less from the farm to point of purchase, while only a third viewed the “local” definition as “grown in their state or region.” Respondents from larger western states were less likely to choose the option “25 miles or less” as their definition of local compared to their counterparts in the rest of the country.

Pirog, Rich and Rebecca Rasmussen. 2008. Food, Fuel and the Future: Consumer Perceptions of Local Food, Food Safety and Climate Change in the Context of Rising Prices. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2008-09-food-fuel-and-future>

Demand Among Institutions for Local Foods

- According to a survey administered to institutional food vendors in southwest Iowa to determine the demand among regional institutions for locally grown natural, conventional, organic, or source-verified food products, 83 percent of respondents would “purchase” local products with 48 percent willing to consider purchasing either fresh or processed items.
- The survey also asked food vendors to identify the type and quantity of local foods they would use in their preparation process. The top ten food categories (in descending order) were:
 1. Tomatoes
 2. Peppers/Potatoes
 3. Onions
 4. Lettuce
 5. Eggs
 6. Strawberries
 7. Apples
 8. Green Beans/Carrots
 9. Beef
 10. 2% Milk

Ladd, Alan and Steve Adams. 2008. Southwest Iowa Institutional Foods Survey and Producer Training Program. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/m2005-12>

Organic Agriculture Education and Training

- A study was completed to determine the extent of interest in or demand for organic agriculture credit classes at Western Iowa Tech Community College. The survey addressed the following questions:
 1. Are the participants concerned about the safety of foods that are not produced using organic farming methods?
 2. If they are, are they interested in learning organic farming methods and taking courses in organic farming?
 3. Do they prefer face-to-face, online, hybrid or independent study for course delivery?
 4. Do they have specific scheduling preference(s)?
 5. What specific areas of organic farming interest them most?
 6. What barriers are hindering them from pursuing organic agriculture classes?

- Overall, women seemed to be more concerned about food safety. People who were born between 1950 and 1970 seem to be more interested in organic agriculture. Based on the findings of the survey, these participants have little or no interest in pursuing a college degree, diploma or certificate related to organic farming; however, there is some interest learning about organic farming on a non-credit basis.

Dollisso, Awoke. 2008. Organic Viability Study. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/m2007-03>

Environmental Issues and the Food System

- A 2003 survey addressed people's perceptions regarding food safety and product origin, greenhouse gas emissions in the food system, willingness to pay for food products with lower emissions, and perceptions surrounding health benefits of local food.
- Respondents to the survey placed high importance on food safety, freshness (harvest date), and pesticide use on fresh produce they purchase, with somewhat lower importance on whether the produce is locally grown, the level of greenhouse gas emissions it took to produce and transport the produce, and whether the respondent could contact the farmer who grew it.
- Seventy percent of respondents perceived the U.S. food system to be safe. When asked about the safety of fresh produce based on continent of origin, North America was perceived as the most safe (85 percent) followed by Europe (50 percent) and Australia (48 percent). When asked which specific countries raised the most concern, China was cited most frequently, with 31 percent of respondents signaling it out.
- Eighty-five and 88 percent of respondents, respectively, perceived local and regional food systems to be somewhat safe or very safe, compared to only 12 percent for the global food system.
- Nearly half of respondents were willing to pay a 10 to 30 percent premium, but a similar percentage was not. However, when looking at those respondents who had shopped at venues where locally-grown foods were more likely to be for sale, 58 percent were willing to pay more (compared to those who did not shop at venues where locally-grown foods were likely for sale), and 38 percent indicated they would pay the same.
- Fifty-seven percent of respondents in this survey "somewhat" or "strongly" agreed that organic food was healthier than conventional. More than two-thirds of respondents (69 percent) "somewhat" or "strongly" agreed that local food is better for their personal health than food that has traveled across the country.
- When respondents were asked if they perceived that science had indeed proven that local food was healthier than distant food, 40 percent of respondents "somewhat" or "strongly" agreed.

Pirog, Rich and Andy Larson. 2007. Consumer Perceptions of the Safety, Health, and Environmental Impact of Various Scales and Geographic Origin of Food Supply Chains. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2007-09-consumer-perceptions>

Using Contracts

- Based on focus groups, marketing agreements may be best used as a door opener at a requested time for producers to prove their ability to provide desired quantity and quality of products. Agreements also may be beneficial to producers wanting to expand but needing some assurance of guaranteed markets to help with production planning decisions.
- Interest in using local produce may be present in Iowa foodservice industry, but the willingness to expend extra time and resources to develop such relationships or to help this relationship flourish may be lacking.

Ellis, Jason D. 2006. Using Contracts to Expand Produce Market Opportunities. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/2005-m18>

Consumer Perceptions - Place-Based Foods

- According to an email survey of consumers in the United States, respondents were more likely to choose a local food product that offers a clear economic benefit to farmers and the community over a product that does not benefit the local economy. Respondents also were more likely to pay amounts above the conventional price for place-based food products grown in their state rather than place-based products from another state. A majority believed it to be at least somewhat likely that taste and quality of meat, produce and dairy products are influenced by the natural resource characteristics of the region where the product is grown.

DeCarlo, Thomas. 2006. Consumer Perceptions of Place-Based Foods, Food Chain Profit Distribution, and Family Farms. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/2004-msp05>

Consumer Attitudes - Beef Products

- The conjoint technique of marketing analysis was used to examine consumer opinions on a set of beef steak characteristics for a national sample of U.S. consumers. Region of origin was the highest value factor for all respondents. It was followed in importance by animal breed, traceability, animal feed and beef quality. The least important qualities as ranked by consumers were cost of cut, farm ownership, use or non-use of growth promoters and whether the product was guaranteed to be tender.
- The respondents' knowledge about the steak influenced their selection of important factors. Specifically, consumers with a greater knowledge about steak characteristics preferred region of origin, type of cut, animal breed and type of feed as factors. The factors cited in the top five slots were the same regardless of gender or environmental attitudes.
- If the product was not produced locally, respondents indicated that their preferred production states are, in order of preference, Iowa, Texas, Nebraska and Kansas.

Mennecke, Brian, Anthony Townsend, Dermot Hayes, and Steven Lonergan. 2009. A Study of the Factors that Influence Consumer Attitudes Towards Beef Products Using the Conjoint Market Analysis Tool. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: www.leopold.iastate.edu/grants/m2005-27

Consumer Knowledge - Regional Food Systems

- Research consisting of focus groups and a telephone survey were conducted to assess Iowans' understanding of regional food systems. The research showed that focus group participants would support a regional food system if the outcomes would benefit them with respect to reasonable prices, high-quality products, and convenient accessibility.
- The research also showed that 93.6 percent of the telephone survey respondents were not familiar with the regional food system concept. Food safety, higher food quality, convenient access, financial sustainability, and reasonable prices were the most important outcomes of a regional food system to the respondents who were familiar with the regional food system concept.
- Telephone respondents most trusted public health officials, doctors and food professionals as sources of information about regional food systems.

Palan, Kay M. 2005. Examining Awareness of and Support of Regional Food Systems in Iowa: Establishing a baseline of consumer knowledge about regional food systems and communication preferences. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2005-01-regional-food-systems>

Direct Meat Marketing

- The data collecting in a direct marketing study showed that CSA and buying club respondents who ate and purchased no meat accounted for less than 4 percent and 5 percent of the respondents,

respectively.

- Purchasing “bundles” of meat was not particularly appealing to customers, but this practice would help farmers avoid an over- and under-supply of certain cuts.
- Demand for meat with sustainable attributes was high among the groups studied. Both CSA and buying club members cited “antibiotic free” and “hormone free” as desirable attributes for meat purchases.

Huber, Gary and Rick Hartmann, Rick. 2006. Supporting direct meat marketing in Iowa. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/2004-m17>

Consumer Perceptions - Ecolabels

- According to a 2003 Internet survey of Midwestern consumer perceptions of ecolabels and local foods:
 - When asked how closely terms such as grown locally, pesticide-free, organic, grown in your state, product of U.S.A., and humanely raised were related to the term “family farm,” the majority of respondents believed that grown locally was the most closely related term (68 percent for those who viewed ecolabels and 60 percent for those who did not). None of the other terms were viewed as being most closely related to the term family farm by more than ten percent of respondents.
 - More than 70 percent of respondents who viewed the simplified set of ecolabels (with one tagline comparing locally grown strawberries delivered to the food store within 24 hours of harvest with strawberries grown in the United States without a “freshness” claim) thought of reasons why they would buy the locally grown berries. In addition, more than 90 percent of these respondents preferred the locally grown label with the “freshness” claim over the more generic strawberry label stating the product was grown in the U.S.A.
 - Fifty-two percent of respondents viewing the more text-heavy set of ecolabels with two taglines thought of reasons why they would buy local strawberries.
 - Nearly 37 percent of those respondents who did not view ecolabels selected “grown 25 miles or less from purchase point” at the definition of local, compared to 32 percent for those who did view ecolabels. Thirty-four percent of respondents who viewed ecolabels selected “grown in your state” compared to 29 percent who did not see the ecolabels.
 - Only 12 percent of respondents who viewed ecolabels (compared to 10 percent who did not) perceived that more than 50 percent of the fresh meat, poultry, and produce available for sale in their community were raised within their county of residence. Upon widening the question from county to state, respondents’ perceptions of the percent for sale grown locally in the 26 to 50 percent range increased by more than 15 percent. Less than 16 percent of the respondents believed that more than half of their food items came from within their state.
- Nearly 30 percent of respondents in Iowa and adjacent metropolitan areas in Nebraska and Illinois indicated they are frequently mindful about where and how their food is produced. This group of respondents is clearly interested in locally grown foods, with more than 50 percent indicating high to very high levels of interest.
- Twelve to 18 percent of consumer respondents in an Iowa-based Internet study were willing to pay 30 percent or more for food products (depending on the food item) that combine the attributes of locally grown with environmental and community stewardship.

Pirog, Rich. 2004. Ecolabel Value Assessment Phase II: Consumer Perceptions of Local Foods. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2004-05-ecolabel-value-assessment-phase-two>

Consumer Perceptions - Food Company Green Policies

- According to a 2004 survey about company environmental and societal positions, an environmental positioning strategy (that is, acting in an environmentally responsible manner) positively influences consumer perceptions about agricultural producers, resulting in more favorable intentions to purchase the firm's products and an increase in the likelihood that consumers would choose its offerings.
- Differentiating a company based on an environmental platform also increased the perception that the firm's products were of higher quality and freshness, with the accompanying willingness to pay a premium for such products.
- An environmental positioning strategy resulted in the creation of customer perceptions that the producer employed agricultural processes that were more sustainable than other firms.
- Producers who buy locally and pay their farm workers a fair wage accrue benefits with consumers. Their reputation was improved by providing consumers with information about safeguarding farm workers against potentially dangerous pesticides.
- Respondents associated smaller, local firms with more favorable perceptions of quality, while associating larger conglomerates with more favorable perceptions of produce freshness and community support.

DeCarlo, Thomas E. and Michael J. Barone. 2005. Company Environmental and Societal Positions as Sources of Competitive Advantage: Implications for Sustainable Agriculture Producers. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/2004-m5>



Niche Meat

Hoop Barns for Beef Cattle

- A survey of six Iowa State University extension livestock specialists estimated that Iowa had 680 hoop barns used for beef cattle as of January 1, 2011. Eighty-three percent were used for feeding beef cattle in bedded confinement. Other barns were used for calving, bull housing, open shelter, or calf feeding.
- Average capacity of hoop barns for feeding beef cattle was 325 head per hoop barn.
- The survey estimates that existing hoop barns could house 15 to 20 percent of the beef cattle fed in Iowa annually.

Honeyman, Mark, and Jay Harmon. 2010. Iowa Hoop Structures Used for Confined Beef Cattle Feeding: A Survey. Iowa State University, McNay Memorial Research and Demonstration Farm.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2010-12-iowa-hoop-structures-survey>

Niche Pork Efficiencies

- An analysis of 18 Iowa niche pork producers found differences in efficiencies between the top 6 farms (sorted by returns to capital, unpaid labor and management) and the bottom 6 farms.
- All farms received similar prices for market hog sales. However, the top 6 farms received an average wage of \$9.23 per hour while the bottom 6 farms received an average wage of -\$9.82 per hour.
- The top 6 farms produced more pork and had lower operating, fixed, and labor costs compared to the bottom 6 farms. Close attention to controlling feed costs is important. The top 6 farms consumed less feed (420 pounds per hundredweight produced, compared to 525 pounds for the bot-

tom 6 farms) and also required half the amount of labor per hundredweight produced.

- The average total cost of producing a market hog was \$225.
- For all 18 producers, the margin over costs (including labor valued at \$15 per hour) was essentially a zero return for labor.

Stender, David, James Kliebenstein, Richard Ness, John Mabry, and Gary Huber. 2009. Costs, returns, production and financial efficiency of niche pork production in 2008. Iowa Pork Industry Center.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2009-09-costs-returns-2008>

Quality Management Systems

- Niche market producers could benefit from better utilization of record systems, according to results from an educational assessment. First, there is a lack of understanding of the need for using organized record systems and the economic benefits that these systems can offer. Second, few niche market producers currently are using any computerized management system. However, as input costs have been rising steadily, there is increased interest in determining and managing the pig flow and cost structure in the cooperating niche market farms. It will take a long-term, carefully focused effort for these farms to transition from more traditional production attitudes to a more business-oriented mindset.
- Tools developed to assist in these efforts include:
 - Sow Group Tracker software (available at www.ipic.iastate.edu/information/ST.brochure.pdf) to help producers lower costs of production by more efficiently managing their sow herd, labor, facilities, and other resources;
 - Educational materials describing different market access or value-added programs and their requirements;
 - Stewardship Management System program (a curriculum and manual showing producers how to develop management systems for their farms), which focuses on continuous process improvement that helps farmers see cost saving benefits in nutrient management, labor efficiency and cost of production tracking; and
 - Management System Template developed by the Iowa Beef Center along with training for extension field staff in farm management, agricultural engineering, and beef, pork, and dairy production in the use of the template.

Lawrence, John, John Mabry, and Mary Holz-Clause. 2008. Functional Quality Management Systems for Livestock Producers. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/m2006-03>

Pork Quality Considerations

- Results show a positive relationship between pH and pork eating quality. Using pH as a predictor of quality was moderately reliable (30 to 40 percent). Combining pH with two other variables—Instron (tenderness) and marbling—improved the predictability of eating quality to 50 percent.
- About 57 percent of the hogs would need to be sampled to achieve an acceptable accuracy level, and the cost would be about \$0.97 per hog.

Kliebenstein, James, Brent Hueth, and Maro Ibarburu. 2008. Business Organization and Coordination in Niche Hog Marketing. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/m2004-22>

Poultry Quality and Production System

- A survey was done to compare certain features of organic, free-range, and conventional broiler chickens. The survey yielded these results (significance level $P < 0.05$):

- o Ultimate pH (pHu) for organic breast meat was higher when compared to free range and conventional. Organic thigh meat pHu was only higher than the free range.
- o Raw organic breasts and thighs were lighter and less yellow ($P < 0.05$) in color when compared to free range and conventional.
- o Raw free range breast and thigh thiobarbituric acid reactive substances were lower when compared to that of organic and conventional.
- o Protein content of raw organic and free range meat was higher compared to conventional.
- o Cooked color values for organic and free range breast, thighs, and skin remained less yellow compared to conventional.
- o Cooked organic breast and thigh protein content was higher when compared to conventional, consistent with raw basis comparisons.
- o Conventional and free range broilers yielded a higher percentage of cooked light meat compared to organic.
- o Free range whole carcass cooked yields were similar to organic but higher when compared to conventional.
- Fatty acid analysis showed that organic breasts and thighs were lower in saturated and mono-saturated fatty acids and higher in polyunsaturated, omega-3 and omega-6 fatty acids when compared to free range and conventional.
- A trained sensory panel evaluated breasts and thighs for chicken aroma, tenderness, chewiness, moistness and chicken flavor. Results from the panel indicated that conventional thighs were more tender and less chewy when compared to thighs from free range and organic broilers. Other sensory parameters were not significantly different among attributes for breasts and thighs.

Sebranek, Joseph G., Ryan Husak, Dong Ahn, and Sam Beattie. 2007. A Survey of Broilers from Organic, Free-Range and Conventional Systems for Cooked Meat Yields, Meat Composition and Relative Value. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/2006-m01>

Organic, Natural and Grass-Fed Beef

- A cash flow analysis showed that with organic premiums of 30 and 40 percent over conventional prices, the grain-fed organic system produced a higher net present value than the conventional system. Grass-fed systems needed premiums of 60 and 70 percent higher to produce a higher net value.
- Conventional beef production is the most profitable system. Natural beef was the second most profitable, given the premiums assumed (2005). The natural niche is a rapidly growing beef market and there is greater market access than even two years ago.

Smith, Margaret and John D. Lawrence. 2006. Organic, Natural and Grass-Fed Beef: Profitability and Constraints to Production in the Midwestern U.S. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/m2005-30>

Whole Animal Local Meat Purchases

- 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, 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.

Find it on the Web: <http://www.leopold.iastate.edu/grants/2004-m6>



Place-Based Foods

Iowa Foodways Project

- According to research done by the Iowa Foodways Project: Taste of Place, most of the foods that Iowans and others identify with Iowa fall into four categories.
 1. Food that is grown and processed in Iowa and has a heritage basis such as pork tenderloins, Maasdam's sorghum syrup, Amana® rhubarb wine, mettwurst, black walnuts, Muscatine melons, and pawpaws.
 2. Food that is processed here and has a heritage basis such as Dutch letters, lefse, kolaches, Swedish pancakes, Norwegian kringle, Danish aebleskiver, Mexican flour and corn tortillas, and other ethnic dishes.
 3. Food that is grown and processed in Iowa but has no substantive heritage basis such as several kinds of salsa, cows' milk and goat milk cheese from Cresco and the Goat Sisters, Java chickens and most other heritage poultry, emerging vineyards and wineries, a variety of local organic and natural dairy products, and farmed fish from western Iowa.
 4. Food that is grown and processed here that does have a heritage basis but is not produced organically or naturally. Examples are buffalo from northwest Iowa, Amana® meats, pork tenderloins, Maidrite® sandwiches, hybrid sweet corn, and soy nuts.
- The project developed an Iowa Place-Based Foods website: www.iowaartscouncil.org/programs/folk-and-traditional-arts/place_based_foods/index.htm

Saltzman, Rachele H. 2006. Taste of Place: Place-based Foods in Iowa. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/2005-m02>

Iowa's Geography of Taste

- In 1920, the number of different commodities produced for sale on at least 1 percent of all Iowa farms was at a high of 34 crops. In 1997, the number of different crops fell to just ten.
- Most Iowans are not aware that Iowa was a top apple-producing state through the 1920s and that the Delicious apple is of Iowa origin.
- For the past decade the percentage share of the market for the Delicious apple has waned significantly, as other varieties have become more popular with U.S. consumers.
- Harrison County, in particular the hilly areas in the bluff-line along the Missouri River near Mondamin, was known to be one of the best Jonathon apple-producing regions in the country during the early part of the 20th century.
- Iowa was the sixth-largest grape producing state in the nation in 1919, with more than 12 million pounds produced. Historically, one of the largest commercial grape-growing regions in Iowa was within the Missouri Loess soil area near Council Bluffs.
- The sandy soils along the Mississippi River south of Muscatine have been renowned since the late 1800s as a source of exceptionally sweet and juicy melons.
- A number of Germans who settled in Scott County near the Mississippi River began growing onions after the Civil War. By the 1920s, the Pleasant Valley section of Scott County and the St. Ansgar area in Mitchell County were the two most prolific onion-producing areas in Iowa.
- Ida and Sac counties remained the primary popcorn growing regions in Iowa in the 1920s. In 2002, Iowa's popcorn was grown primarily in western Iowa with Sac, Crawford, and Monona as the produc-

tion leaders.

- More than 80,000 acres of potatoes were cultivated in Iowa in the mid-1920s, while the 2002 Agricultural Census indicated that there were slightly more than 1,000 acres in production.
- According to a 1922 report, Iowa led the world in canned sweet corn production. In 1924, Iowa processed locally grown sweet corn at 58 canning factories in 36 different counties. According to the 2002 Agricultural Census, sweet corn is produced on nearly 4,900 acres on 462 Iowa farms.
- Throughout the 1930s, southeastern Iowa was part of the commercial sweet potato-growing region for the central states—one of three primary sweet potato growing regions in the United States.
- In 2004, 27 food festivals were held across Iowa. Of these food festivals, five featured apples, 11 featured sweet corn, four featured strawberries, and seven featured watermelons.

Pirog, Rich and Zach Paskiet. 2004. A Geography of Taste: Iowa's Potential for Developing Place-based and Traditional Foods. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2004-10-geography-of-taste>

Muscatine Melons

- An estimated 90 percent of the open-pollinated melon varieties available 100 years ago are extinct and today growers in the Muscatine area plant the same varieties as in other parts of the country.
- By 1921, production of melons from Muscatine County totaled 750 carloads of watermelons, produced on around 2,000 acres of land; and 100 carloads of muskmelon and cantaloupe, grown on around 500 acres.
- The number of farms growing cantaloupe and watermelons, like most U.S. agricultural products, fell dramatically from the 1960s to today. By 2002, there were only about 17,600 farms compared to 36,800 in 1964. The number of acres where cantaloupe is grown has remained relatively constant at about 105,000 to 115,000 acres. Watermelon acres, however, have fallen nearly one-third to 165,000 acres. California and Texas alone contribute about 117,000 acres from 2,300 farms. In Iowa, both the number of farms and acres have fallen by a little more than half since 1964. In 2002, there were 155 farms in Iowa growing cantaloupe and watermelon on 623 acres.
- Per capita melon consumption from 1970 to 2000 rose about 25 percent from 21.6 lbs. to 26.9 lbs. Demand has increased as a result of Americans making more healthy food choices with products available year-round. Approximately 40 percent of this increase has come from imports.
- Cantaloupe per capita consumption has approximately doubled over the past 20 years from 5.8 to 10.8 lbs./person. Roughly one-half of the increase in demand is met through increasing imports as consumers want a product available year-round.
- According to the U.S. Department of Agriculture, there were 12 commercial melon growers left in Muscatine County who produced cantaloupe and watermelons on 107 acres in 2004. There likely are another 10 to 20 producers growing small quantities.
- The Muscatine Island Grower's Association had 50 dues-paying members for 2004, of which about 30 were actual producers. Twenty years ago there were three times as many: 120 members, 90 of them growers. All of the association growers have small-scale operations of ten acres or less.

Futrell, Sue and Craig Chase. 2004. Muscatine Melon: A Case Study of a Place-based Food in Iowa. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2004-10-muscatine-melon>



Business and Transaction Costs

Capital Flow to Niche Ag Producers

- How does capital flow to niche agriculture producers in Iowa? A survey administered to potential providers of capital to niche agricultural producers yielded these results:
 - Primary reasons for funding rejections are lack of applicant collateral, weak/nonexistent business plan, and failure to meet funding criteria.
 - Improving the flow of capital to producers calls for increased technical assistance and more capital being available to the granting agency.
 - Little technical assistance is being offered by providers of capital.
 - The flow of capital is limited because dissemination of information is scarce; few, if any, applicants have a comprehensive understanding of capital availability; and funding agency advertising likely fails to reach many producers.
- Niche agricultural producers also were asked about their knowledge of the flow of capital. Their survey responses showed that:
 - Producers are most familiar with capital from the U.S. Department of Agriculture, friends/family, community banks, and savings. Producers are not familiar with other potential sources of capital.
 - Capital is obtained primarily from USDA, friends/family, community banks, and savings. Few other sources of capital are accessed.
 - Community banks are the most common source of technical assistance. Few other agencies are used for technical assistance.
- Findings from the two surveys were combined to illustrate both aspects of the flow of agricultural capital. These were the joint results:
 - Information dissemination appears to be ineffective.
 - Little coordination occurs between funding agencies.
 - The gap in providing technical assistance to applicants is significant.
 - Producers are likely to acquire capital from those lenders who are familiar to them.

Van Auken, Howard. 2008. Development of a Niche Agriculture Small Business Money Map and Process to Disseminate Information. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/m2007-06>

Selling Local Food to Retail, Foodservice Markets

- Producers face a gap between the growing demand for local foods in larger markets and the high volume of food supplied to distributors from non-local sources. Foodservice distributors were interviewed and provided these thoughts about the future for local food.
 - Distributors recognize a need to consider buying locally.
 - Producers would benefit from meeting with distributors to learn what products the distributors' clients want to buy.
 - Consistent quality and quantity of product supplies are important to food distributors, although they recognize that some high-demand products are seasonal.
 - Producers need to follow basic guidelines regarding storage, packing, and shipping of products to maintain quality and offer ease of handling.
 - Forming producer supply groups would facilitate contacts and shipments to distributors.

- Foodservice distributors emphasized the importance of having a “product with a story,” where the story became part of the value for which customers are willing to pay.
- Responses from foodservice distributors suggest that their customers would prefer products that are locally grown as long as the supply is consistent or predictable for seasonal products. Supply and consistency problems could be mitigated with more effective coordination between producers and distributors. Ultimately, producer supply groups may be able to provide adequate and consistent supplies, and the presence of sales managers acting as intermediaries would help improve communications with the distributors.

Hardy, Connie and Mary Holz-Clause. 2008. Bridging the Gap: What Does It Take to Bring Small- and Medium-sized Producers and Retail and Foodservice Distributors Together? Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/m2006-05>

Restaurant Operations and Iowa Growers

- Research consisting of interviews with ten local and independently owned restaurants in Iowa and a mail survey of chefs and managers in foodservice organizations showed that time until delivery was longer for local products.
- The time spent sourcing local products was 128 hours, compared to 92 hours for national products.
- The study also showed that actual food costs based on per pound of all foods purchased were lower for local foods at an average of \$3.80 per pound compared to \$4.30 per pound for products from national vendors.
- Average receiving time was only marginally longer with the local supplier compared to the national supplier.
- When offered menu choices between local products and national products, the 323 patrons surveyed showed some willingness to pay a premium for local food. The local menu option was selected by 41 percent of the participants, with about 45 percent being unwilling to pay a premium, 31 percent accepting a \$1 premium, and 24 percent willing to pay \$2 extra.

Sharma, Amit. 2007. Economic Viability of Local Food Marketing for Iowa Restaurants and Growers/Producers. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/2005-m17>

Transaction Costs Case Studies

- “Buying local” is perceived by many consumers as benefiting the economy as well as themselves, both in terms of obtaining quality foods and supporting local producers. Another basis for supporting local foods may be that food distributed locally is viewed as more energy-efficient because it has been hauled fewer miles.
- Farmers or groups of growers and processors gave some consideration to the individual cost components that are considered to be transaction or logistics costs when they determined which customer groups to serve and which to forgo. However, few made a conscientious effort to compile or measure separately the costs involved in physically fulfilling a transaction.
- The locally grown label presents both an attractive selling point and a challenge in terms of logistics costs. Because of the physical differences in delivery vehicles, transportation costs for local foods are likely to be higher than those for food products delivered to grocery stores and restaurants by the semi-truckload.
- Local producers often are providing superior products—in terms of taste, freshness, and variety or in perceived benefits, including “customized delivery”—compared to mass-market grocery stores. Their pricing and promotion need to highlight the enhanced value of their products.
- Despite local growers’ expressed concerns about discount outlets, additional analysis probably will show distinct product and service differences between the two types of businesses. The local producer often is not in direct competition with the discounters.

Walter, Clyde K. and Randy Boeckenstedt. 2007. *Case Studies and Benchmark Transaction Costs for Select Food Products*. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/pubs-and-papers/2007-06-transaction-cost-case-studies-six-iowa-food-producers>



Other Research

Natural Dyes

- A 2003 study on natural dyes showed that natural dyes are able to produce strong, clear color that is suitable to consumer use. Of the 48 dyestuffs studied, 25 plants are potentially able to produce marketable natural dyes. These dyes produce good color and met minimal performance standards for colorfastness to light and washing. Color consistency from year one of the study to year two or from source one to source two was not acceptable. Possible sources of variations in dye lots include growing conditions, soil type and condition, mordanting, extraction, and dyeing.
- Potentially marketable dyestuffs include apple bark, apple wood, apple twigs, asparagus, blue grass seeds, bracken, chamomile, carrots, elderberries, elm bark, geraniums, goldenrod, grapes, henbit, horehound, horseweed, Jacob's ladder, lambs quarter, mint, mums, onions, pears, pear bark, tomatoes, walnuts, watermelon, wild marjoram, and white heath aster. Some are listed more than once, because different components were used.

Kadolph, Sara J. 2004. *Identification of Plant Residue with Commercial Potential as Natural Dyestuffs*. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/2003-m6>

Energy Systems in Agriculture

- This project estimated the energy needs of commercial aquaculture and greenhouse operations to determine if there would be sufficient waste energy from Iowa's dry-grind ethanol plants to provide a significant portion of the total energy requirement for either operation. Key issues identified include:
 - selection of high-value crops or fish species;
 - sufficient low-cost energy to overcome the high cost of heat and light during the winter months;
 - planning for back-up power sources; and
 - assurance of coordinated management between the ethanol plant and greenhouse/aquaculture facility to avoid costly mistakes.
- In selected regions in the United States, both greenhouse and aquaculture facilities have been operated next to power plants to reap energy savings by using waste energy from the plant. This arrangement can be beneficial, but some operators have experienced problems that forced their operations to close. Because power plants need to shut down periodically for maintenance, interruptions in power to greenhouses have killed the crops, resulting in large financial losses. Similarly, aquaculture operations have suffered fish kills after chemicals in the water coming from the power plant were transferred directly into the fish tanks.
- Coordinated management of both facilities is required and back-up heaters are a must. Water from the power plant should be used only as a source of heat, not as a water supply for either greenhouses or aquaculture tanks.
- The study concluded that there is sufficient waste heat energy from a 50-mgy ethanol plant to

provide significant supplemental heating for greenhouse and aquaculture operations. Feasibility studies are warranted for specific operations co-located with ethanol plants.

- Iowa, as a net importer of most greenhouse products and many fish species, would benefit from increased local production. Greenhouse crops and fish species must be of relatively high market value to overcome high energy costs, particularly for winter production. Possible choices might include ornamental plants and flowers and herbs for greenhouses, fathead minnows and hybrid striped bass for aquaculture.

Hansen, Ray and Connie L. Hardy. 2008. Potential to Operate Greenhouses and Aquaculture in Conjunction with Iowa's Ethanol Plants. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/m2007-08>

Food Safety - Local and Organic Food

- Iowa State University Extension developed a one-day workshop to help local food producers interested in selling products to foodservice operations better understand the needs and concerns of these potential buyers. This project created messages and materials to illustrate food safety concerns of retail foodservice operators and increase awareness of on-farm safe food handling, thus leading to greater potential for direct marketing.
- Information about the workshops was provided on a website (www.iastatelocalfoods.org); a workshop manual with helpful information for producers to use in establishing an on-site food safety plan and in approaching the foodservice market; and a series of ISU Extension publications that address procurement regulations Iowa foodservice establishments must follow when purchasing foods, on-farm food safety practices a producer should follow with information on how to work with foodservice establishments, and information for retail foodservice establishment buyers.

Strobehn, Catherine H., Sam Beattie and Neric Smith. Safe Food Handling Practices on the Farm: Meeting the Needs of Foodservice Operations. 2008. Ames, IA: Leopold Center for Sustainable Agriculture.

Find it on the Web: <http://www.leopold.iastate.edu/grants/m2007-36>



Food System Tools and Resources

Publications

Find all publications by title at: <http://www.leopold.iastate.edu/pubs>

On-farm Food Safety: Guide to Good Agricultural Practices (GAPS), PM 1974a

On-farm Food Safety: Guide to Food Handling, PM 1974b

On-farm Food Safety: Guide to Cleaning and Sanitizing, PM 1974c

What Producers Should Know about Selling to Local Foodservice Markets, PM 2045

What Retail Foodservices Should Know when Purchasing Local Produce Directly from Farmers, PM 2046

Buying Local Foods for Retail Foodservices, PM 2047

Local Foods in Iowa: Increased Opportunities for Growth

Learning about Local: A Resource Guide to Iowa Organizations and Programs Supporting Local and Regional Food Systems

Learning about Local at ISU: A Resource Guide to Iowa State University Organizations and Programs Supporting Local and Regional Food Systems

Frequently Asked Questions on Food Regulations for Small Market Food Producers

Iowa Food Marketing Regulations: A Guide for Small-Scale Producers

Grower's Manual: A Template for Grower Cooperatives

Web-Based Tools

Transplant Production Decision Tool http://www.leopold.iastate.edu/cool_tools/transplant-production-decision-tool

U.S. Food Market Estimator <http://www.ctre.iastate.edu/marketsize/>

Iowa Market Maker <http://ia.marketmaker.uiuc.edu/>

Iowa Fruit and Vegetable Market Planner <http://www.intrans.iastate.edu/marketplanner>

Produce Profitability Calculator - User's Manual <http://www.leopold.iastate.edu/pubs-and-papers/2008-01-produce-profitability-calculator-users-manual>

Iowa Fruit and Vegetable Production Budgets www.leopold.iastate.edu/pubs-and-papers/2006-02-iowa-fruit-and-vegetable-production-budgets

I-FARM: a production planning tool <http://i-farmtools.iastate.edu>

Useful Web Sites

Leopold Center Marketing and Food Systems Initiative www.leopold.iastate.edu/marketing

Local Food and Farm Program www.leopold.iastate.edu/content/local-food-and-farm-program

Iowa Beef Center www.iowabeefcenter.org

Iowa Pork Industry Center www.ipic.iastate.edu

ISU Viticulture <http://viticulture.hort.iastate.edu>

Value Chain Partnerships www.leopold.iastate.edu/marketing/vcp

Iowa Vegetables blog www.iowavegetables.blogspot.com

ISU Extension Iowa Produce website www.IowaProduce.org

ISU Extension Local Foods Hub www.extension.iastate.edu/topic/local-foods

Visit Iowa Farms www.visitiowafarms.org

