

2-1-2013

Estimating Local Food Capacity in Publicly Funded Institutions

Andrew J. Knight

Nova Scotia Department of Agriculture, knightaj@gov.ns.ca

Hema M. Chopra

Nova Scotia Department of Agriculture, choprahm@gov.ns.ca



This work is licensed under a [Creative Commons Attribution-NonCommercial-Share Alike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/).

Recommended Citation

Knight, A. J., & Chopra, H. M. (2013). Estimating Local Food Capacity in Publicly Funded Institutions. *The Journal of Extension*, 51(1), Article 28. <https://tigerprints.clemson.edu/joe/vol51/iss1/28>

This Feature Article is brought to you for free and open access by the Conferences at TigerPrints. It has been accepted for inclusion in The Journal of Extension by an authorized editor of TigerPrints. For more information, please contact kokeefe@clemson.edu.

Estimating Local Food Capacity in Publicly Funded Institutions

Andrew J. Knight

Senior Planning and Development Officer

Halifax, Nova Scotia (Canada)

knightaj@gov.ns.ca

Hema M. Chopra

Business Development Specialist

Truro, Nova Scotia (Canada)

choprahm@gov.ns.ca

Nova Scotia Department of Agriculture

Abstract: *This article presents three approaches to estimate the size of the publicly funded institutional marketplace to determine what opportunities exist for local farmers and fishers. First, we found that estimates from national foodservice sales statistics over-estimate local capacity opportunities. Second, analyzing budgets of publicly funded institutions for foodservice expenditures proved more difficult than anticipated. Third, a consumption production model from data provided by the institutions and comparing it to production statistics enabled us to estimate local capacity in publicly funded institutions for specific commodities. The consumption production model provided the most useful estimates for Extension and government decision makers.*

Over the past few years, farm-to-school programs have gained prominence as part of the expanding local food movement (Izumi, Wright, & Hamm, 2010). Local food initiatives have also been adopted at other institutions, including hospitals, continuing care facilities, and universities and community colleges. One view is that local food initiatives at institutions support the creation of an alternative agriculture and food system. Farm-to-school programs, for example, have the potential to coalesce advocates concerned with alternative agriculture, anti-hunger, and public health and nutrition (Allen & Guthman, 2006). They also emphasize the principles of civic agriculture by providing fresh, local foods that create ties between institutions and local communities (Allen & Guthman, 2006; Lyson, 2004).

Another view is that institutions provide an additional marketplace for local foods beyond direct and retail sales (Bloom & Hinrichs, 2010; Day-Farnsworth, McCown, Miller, & Pfeiffer, 2009; Friedmann, 2007). Hendrickson (2010) suggests that institutional marketplace offers the following advantage: 1) it is suitable for large volumes of produce; 2) it requires little marketing from the grower; 3) it requires a low degree of contact with the end consumer; 4) it is suitable for perishable foods; and 5) it offers price stability. The assumption of this view is that additional markets will lead to community and economic development. A limitation is that these arguments are assumptions that have not been tested empirically.

Without a measure of how much local food is present in a given place, it is difficult to assess what opportunities exist, to set goals, or to measure change (Timmons, Wang, & Lass, 2008). While many initiatives and programs have been created in an attempt to increase the amount of local food in institutions, the size of this marketplace remains relatively unknown, and it is difficult to evaluate whether such ventures are worth the time and effort expended by Extension personnel.

This article presents our experiences in trying to estimate the size of the publicly funded institutional marketplace to determine what opportunities exist for local farmers and fishers. In particular, two questions are addressed.

- What percentage of the local food market do publicly funded institutions represent?
- Is it worth focusing Extension resources to promote local food procurement in publicly funded institutions?

Estimating the Market Size of Institutions

Previous local food estimates have focused primarily on (a) mapping local food systems (Kremer & DeLiberty, 2011; Morrison, Nelson, & Ostry, 2011) and (b) determining food self-sufficiency at the national and/or state/provincial levels. Markham (1982) and Riemann (1987) used wholesale value of production and consumption to estimate the level of self-sufficiency in British Columbia. The B.C. Ministry of Agriculture and Lands (2006) argued that a better methodology would be to use farm gate data. Farm gate data eliminated some of the challenges with wholesale data by linking food self-sufficiency with land and water resources. Similarly, Timmons et al. (2008) estimated local food capacity using USDA Census of Agriculture data, calculated as per capita farm gate production value. The most comprehensive local food estimate studies have been conducted by Dave Swenson in a series of technical reports for the Leopold Center for Sustainable Agriculture (Swenson 2009; 2010a; 2010b; 2011). In these papers, Swenson estimates local food capacity at the state and regional levels by comparing production and consumption data from numerous sources primarily collected by the federal government.

While these studies provide a useful methodology to estimate self-sufficiency, this research's goal was limited to estimating the potential of local food procurement in publicly funded institutions. Thus, alternative methods needed to be explored. We detail three methodologies employed to estimate the size of the publicly funded institutional marketplace and discuss the trials and tribulations of each.

Publicly funded institutions included academic institutions (universities and community colleges), public schools, provincial correctional facilities, and hospitals and continuing care facilities. The number of publicly funded institutions by type is presented in Table 1. There are a total of 757 publicly funded institutions in Nova Scotia. However, as will be detailed later, the number of institutions can be a misleading indicator of market size and of potential opportunities for local producers and processors.

Table 1.

Number of Publicly Funded Institutions in Nova Scotia

| Institution | Number of Institutions |
|------------------------------|-------------------------------|
| Academic institutions | 24 |
| Universities | 11 |
| Community colleges | 13 |
| Public schools | 559 |
| High schools | 103 |
| Middle schools | 152 |
| Elementary schools | 304 |
| Corrections | 6 |
| Health | 168 |
| Hospitals | 31 |
| Health centers | 12 |
| Continuing care | 125 |
| Total | 757 |

Approach 1: Institutional Market Data

This section estimates institutional market size through industry secondary data. The Canadian Restaurant and Foodservices Association (CRFA) publishes a report estimating sales revenue for numerous institutional sectors including health care, education, and corrections. Revenue estimates were derived from two sources: Statistics Canada's Monthly Restaurant, Caterers and Taverns Survey and fsSTRATEGY Inc. While the sales estimates are reported nationally, provincial estimates were derived by the following formula:

- $(\text{Number of institutions provincially}) / (\text{number of institutions nationally}) * (\text{total sales revenue in Canada})$

Two advantages of this approach are that it is easy to calculate and the results are in dollars. However, there are three drawbacks to this approach.

- Individual and commodity categories cannot be calculated.
- Volume data are not presented.
- As the estimates are national level data, certain assumptions have to be made that may impact the results on a state or provincial level.

There is one community college system in Nova Scotia with 13 community college branches. Using 13 individual institutions instead of one college system for the calculation of estimated food sales would have over-estimated food sales, especially knowing that most community colleges are commuter based and only serve lunch. To address this issue, the number of institutions in Table 1 was not used to calculate

the estimated food sales presented in Table 2. Instead, institutional numbers were sourced through official organizations or associations. A problem was that definitions of publicly funded institutions were not consistent.

Table 2.

2009 Estimated Nova Scotia Food Sales for
Healthcare, Education, and Corrections (in Millions)

| Institutional Sector | Estimated Food Sales (2009) |
|-----------------------------|------------------------------------|
| Hospitals | \$77.6 |
| Retirement homes | \$35.4 |
| Public high schools | \$19.1 |
| Colleges | \$0.8 |
| Universities | \$56.1 |
| Corrections | \$4.0 |
| TOTAL | \$193.0 |

Approach 2: Institutional Budgets

This approach focuses on estimating institutional market size through institutional budget data. Theoretically, each institution's food expenses would be detailed in their annual budgets, and because they are public, budget information should be easily accessible. In reality, this approach generally led to a dead-end for two reasons.

- Institutions were generally not forthcoming when asked to provide budgetary information about foodservice expenses.
- Foodservice was often included as an ancillary expense, which includes revenues and expenses from other services such as bookstores, rent, equipment, and maintenance.

We were able to parcel through the corrections budget and total all food-related expenses. Food-related expenses totaled \$1.8 million. This approach indicates that Approach 1 is likely over-estimating food sales as corrections estimates were over-estimated by more than 200%.

Approach 3: Consumption Production Model

The approach discussed in this section used consumption data from institutional invoices and then compared it to government production data for individual commodities. The consumption production model resembles the approaches outlined by Timmons et al. (2008) and British Columbia Ministry of Agriculture and Lands (2006). The model estimates local food capacity at publicly funded institutions by estimating the maximum volume of food that could be sourced from Nova Scotia farmers and fishers. The consumption production model compares how much of a particular commodity is consumed by institutions and how much of that commodity is produced in the province.

This approach avoids some of the challenges described with approaches 1 and 2, and the approaches detailed by Timmons et al. (2008) and British Columbia Ministry of Agriculture and Lands (2006). Four advantages are listed below.

- Estimates are based on consumption data provided by the institutions themselves and are not estimated from national data nor derived from forecasts and production statistics.
- Specific commodities are included in the model, not food group categories.
- Estimates are derived from volume consumed, not sales data.
- The model is able to reflect enrollment/bed differences among institutions.

While the advantages of this approach alleviate some of the challenges with estimating local capacity, the data collection process was complex. Commodities included in this analysis were selected because they have relatively high production volumes in Nova Scotia, and a preliminary analysis suggested that they were purchased by publicly funded institutions. Only foods grown, harvested, or produced in Nova Scotia were included in the model. The model included volumes for both fresh and frozen foods, but did not account for seasonality.

Consumption data were collected from institutions and industry sources. Production estimates were derived from 2009 Statistics Canada and 2008 Fisheries and Oceans Canada data. In instances where 2009 data were not available, 2008 or 2007 Statistics Canada data were used. For turkey, 2006 data were used. Chicken data were sourced from 2008 Chicken Farmers of Canada data. All data were converted into kilograms to insure standardized measurement.

Food procurement at publicly funded institutions varies among institutions and across sectors. For instance, there are two primary buying groups in the healthcare sector. These buying groups tender food products and the distribution of those foods on behalf of hospitals and continuing care facilities. Some facilities, though, purchase some foods from the buying group and procure other foods independently. Food

procurement at schools varies by school board and type of school (elementary, middle/junior high, high school). Universities contract their foodservices to foodservice management companies, and each correctional facility is responsible for its own food procurement.

In addition to the complexity of the food procurement process, menus, the type of foods ordered, the quantity ordered, and hours of operation vary among institutions. These differences posed numerous challenges.

Challenges Posed by Variation

Data Provided Were Not Standardized

Some institutions provided invoices, while others provided data in electronic form. The data had to be reviewed to select the products that were relevant to this study—foods that were grown, harvested, or processed in Nova Scotia in sufficient volumes and can meet foodservice quality standards. This process became rather labor intensive and required the services of additional personnel to review and enter data.

Invoices varied by foodservice distributor. We not only had to become proficient in understanding invoices but also quantities. Some food items on invoices measured quantities by weight, while others were measured by the number ordered. Some foodservice distributors would open cases to sell food items individually, even though the units on invoices were in cases. This practice was discovered when reviewing the invoices of schools with relatively small enrollments.

Food items on invoices were measured in various units such as pounds or kilograms. In some instances, units were not available and had to be sought. Because there are no standard sizes for fresh foods, weights were sought from industry or through the Internet. All food items were calculated into kilograms to standardize measuring units.

Varied Hours of Operation

Community colleges and public schools operate only during the school year, whereas correctional facilities, hospitals, and continuing care facilities operate year round. Foodservice may operate year round at universities, but foodservice is limited during the summer months. Foodservice at academic institutions and schools is also interrupted at other times such as in-service days and spring break.

Varied Menu Cycles

Menu cycles were not consistent across and within institutional types. Menu cycles at correctional facilities, for example, varied from 3 to 5 weeks.

Variation in Institutional Size

Enrollments or beds vary by institution.

Inconsistent Data

Upon review of the information provided, some of the information did not appear to match the information provided in the in-person interviews. The amount ordered on the invoices did not appear to be consistent with the institutional menus and the number of enrollments.

Not All Institutions Provide Foodservice

Elementary schools were less likely to provide foodservice than middle/junior and high schools.

Lack of Data

Some foodservice management companies and institutions did not provide data citing proprietary information or that it was too time consuming to do so. Our efforts led to receiving data from multiple institutions in each institutional sector. Personal connections fostered during in-person interviews aided with these requests, but we also had to make numerous follow-up contacts to request the data.

Not All Institutions Were Asked for Data

We relied on snowball non-random procedures to interview and contact institutions, which meant that our sample might not be representative of all publicly funded institutions. Still, we conducted interviews with all six correctional facilities, most of the universities, all of the foodservice management companies, six out of eight school boards, and both healthcare buying groups. Our rule for public schools was that we required data from at least one high school, one middle/junior high, and one high school for that school board to be included in the analysis.

Beggars Cannot Be Choosers

There was no method available to validate the information provided aside from the information provided in the in-person interviews.

Not All Commodities Are the Same

A review of the invoices revealed that commodities are procured in different forms. For example, potatoes may be purchased as fresh, frozen, or french fries. All of these items needed to be grouped together.

Availability of Production Data

Production statistics from Statistics Canada were not available by weight for some commodities, specifically beef, chicken, and pork. In some instances, the production volumes were too low in 2009, so they were not reported by Statistics Canada. Industry data were available for chicken production. For beef and pork, Statistics Canada was commissioned to calculate production totals. Where production volumes were too low to be reported, the next available year was substituted.

Calculation of Local Capacity Estimates

We are unable to detail the consumption production model estimates for each institutional sector because of the proprietary nature of the data. Considering there are only three major foodservice management companies and three major foodservice distributors, confidentiality and unanimity assurances given to respondents could not be guaranteed if this information was provided. Instead, we describe the formulas used to calculate the consumption production model for each institutional sector and present the overall results.

Local capacity estimates refer to the volume of a particular commodity consumed by an institutional sector divided by the volume that is produced in Nova Scotia multiplied by 100.

$$\text{Local capacity} = (\text{Institutional sector consumption}) / (\text{provincial production}) * 100$$

Four assumptions were made in calculating these estimates.

- All data would be calculated into annual units.
- One menu cycle was representative of food procurement throughout the year.
- Monthly totals were representative of food procurement throughout the year.
- Data gathered at different points in time were representative of food procurement throughout the year.

Corrections

Considering that data was provided by all six institutions, we only needed to account for variances in menu cycles. To do this, the appropriate multiplier was used to recalculate the data into monthly data and then multiplied by 12. For example, the data for a 2-week menu cycle was multiplied by 2 and then by 12 to provide an annual estimate. A 3-week menu cycle was multiplied by 1.33 and then 12.

Public Schools

Public school estimates were the most complex to calculate for the following reasons.

- Different types of schools

There are three types of schools (elementary, middle/junior, and high school) and eight school boards. Further, some schools may be a combination of grades where elementary and middle/junior high schools may be combined, or middle/junior and high schools are combined.

- Foodservice is not offered at all schools.
- Data were only collected from schools in two school boards.

We separated invoices by school type: elementary, middle/junior, and high school. Based on enrollment statistics, we were able to calculate how many students were enrolled at each school by grade level. A multiplier could then be applied to account for the number of students at the schools for which we had data and the schools where data were not supplied. While data on which schools have foodservice were not available, we asked school board officials to develop such a list. Using these lists, we were able to identify schools that had foodservice and those that did not. There were 195 school days in the province in 2009. The estimates do not account for snow days or other days schools were cancelled.

- Invoices provided comprised different time periods.

Invoices covered a period of 4 weeks for some schools, but 6 for others. To calculate a total estimate, we calculated a per capita estimate

for 1 day for each commodity and then multiplied that number by the number of students and then by 195 school days.

Universities

The primary issue with universities was controlling for the size of institutions because data was not provided for each institution. Because this challenge is similar to that regarding public schools, the same technique was applied. A per capita estimate was calculated and then multiplied by the number of students enrolled at all universities that offered foodservice. Data were not available for community colleges.

Healthcare Estimates

Two issues with healthcare data were that not all continuing care facilities procured food through buying groups and that continuing care facilities varied in size. A list of continuing care facilities and number beds was available so we were able to identify the continuing care facilities that procured through a buying group and/or procured outside of a buying group. Facilities provided invoices for food items purchased outside of the buying group. A further complication was that one correctional facility procures their food through a healthcare buying group so we had to remove the volumes of that correctional facility from the healthcare estimates. Using data provided from continuing care facilities, we were able to calculate estimates on a per bed basis and multiply that by the total of number beds at all facilities.

Results

The results of the consumption production model are presented in Table 3. The second column shows the maximum percentage of local food that could be purchased by all four publicly funded institutional sectors under current conditions. The total volume purchased by institutions in metric tonnes is presented in the last column. The results reveal that the percentages for most commodities are low with staple commodities accounting for less than 4% of total production and, in many cases, often accounting for less than 1%. For example, if all publicly funded institutions purchased local apples, the purchase total would account for less than 1% of all apples produced by local growers.

Table 3.
Commodities Consumed by Publicly Funded Institutions

| Commodity | Consumption as Percentage of Production (%) | Total Consumption (metric tonnes) |
|-------------------|---|-----------------------------------|
| Fruits | | |
| Apples | 0.49 | 196.467 |
| Blueberries | 0.07 | 10.722 |
| Raspberries | 4.24 | 2.419 |
| Strawberries | 3.49 | 36.125 |
| Vegetables | | |
| Beans | 92.19 | 188.073 |
| Broccoli | 3.77 | 56.398 |
| Cabbage | 2.25 | 26.371 |
| Carrots | 0.77 | 361.841 |
| Cucumber | 82.32 | 102.072 |
| Onions | 0.75 | 87.576 |
| Peas | 192.76 | 113.731 |
| Peppers | 119.40 | 64.474 |
| Potatoes | 4.69 | 1121.775 |
| Squash/zucchini | 29.92 | 72.711 |
| Tomatoes | 159.36 | 95.618 |
| Turnip | 1.43 | 36.139 |
| Protein | | |
| Beef | 5.59 | 531.353 |
| Chicken | 1.43 | 492.389 |
| Turkey | 6.00 | 227.172 |
| Pork | 15.86 | 351.018 |
| Seafood | | |
| Cod | 0.10 | 6.848 |

| | | |
|----------|------|---------|
| Haddock | 0.68 | 138.019 |
| Salmon | 1.00 | 48.283 |
| Pollock | 0.23 | 12.212 |
| Mackerel | <.01 | 0.075 |
| Halibut | <.01 | 0.057 |
| Scallop | 0.05 | 6.946 |
| Lobster | 0.03 | 0.677 |
| Shrimp | 0.02 | 4.864 |
| Clams | 0.24 | 3.741 |

Implications

While complex and labor intensive, a consumption production model provides useful information to Extension professionals and government decision makers in addition to those stated by Timmons et al. (2008), including:

- Identifies opportunities for local food procurement.
- Provides a systemic estimate that can be used in debates surrounding local food procurement.
- Enables Extension professionals and governments to make decisions regarding the most effective use of resources.
- Allows dollar amounts to be calculated from volume information at various stages of the supply chain through multiplying by wholesale and retail prices.

The consumption production model should be analyzed in a larger context. In our case, the publicly funded institutional market is small. Due to its small size, some may argue that Extension personnel should not spend resources to help local growers, harvesters, and processors gain access to this market. However, there are broader benefits that should be considered before such a decision is made.

1. Suppliers and foodservice distributors stated that institutional markets are a viable part of their business, although some may have over-estimated the size of the institutional market.
2. Suppliers and foodservice distributors identified additional opportunities in these markets.
3. Access to publicly funded institutional markets may lead to further wholesale, foodservice, and retail opportunities. Increasing access to publicly funded institutions, for instance, may lead to additional opportunities in other sectors, including federally funded institutions, institutions managed by foodservice management companies, municipally funded institutions, restaurants, and retail grocers.
4. By seizing these opportunities, farm-to-institution programs may spur civic agriculture beyond direct marketing by fostering entrepreneurship, supporting jobs in the local community, and by bringing together diverse community groups.

The consumption production model identifies food commodities that are produced in sufficient quantity to meet the requirements of this marketplace and those where production need to be scaled up. For example, Nova Scotia apple and carrot producers can easily supply the institutional marketplace. Extension professionals can then tailor Extension services and programming to meet the needs of individual commodity producers and processors. Extension professionals, for instance, may work with apple and carrot producers and processors to determine the feasibility of accessing these markets and meeting market requirements. On the other hand, Extension professionals may work with producers and processors to determine if it is feasible to scale up production of tomatoes and peas. In the case of tomatoes, we learned that tomatoes grown in our climate are too soft for foodservice needs. However, greenhouse tomatoes are suitable for foodservice needs, but the prices are not as competitive as imported tomatoes. Given this knowledge, Extension professionals can offer producers and processors better advice.

To access these markets, Extension professionals have to work closely with the entire supply chain from producers and processors, foodservice management companies, distributors, and institutional purchasers and/or buying groups. Extension personnel can help local producers and processors address barriers to accessing this marketplace and highlight some of the benefits of procuring local foods to develop value chains (Bloom & Hinrichs, 2010). For example, price was a barrier often mentioned by institutional buyers and foodservice management companies. Because foodservice is not viewed as central to the objectives of the institution, food is often seen as an expense. However, by working together, models such as successful local pilot programs such as those initiated in Grand Rapids, Michigan and Kansas City, Missouri may be adopted, where local producers are able to receive fair pricing (Cantrell, 2009).

References

Allen, P., & Guthman, J. (2006). From 'old school' to 'farm-to-school': Neoliberalization from the ground up. *Agriculture and Human Values* 23(3): 401-415.

Bloom, J. D., & Hinrichs, C. C. (2010). Moving local food through conventional food system infrastructure: Value chain framework comparisons and insights. *Renewable Agriculture and Food Systems* 26(1): 13-23.

British Columbia Ministry of Agriculture and Lands. (2006). *B.C.'s food self-reliance. Can B.C.'s farmers feed our growing population*. Retrieved from: http://www.agf.gov.bc.ca/resmgmt/Food_Self_Reliance/BCFoodSelfReliance_Report.pdf

Canadian Restaurant and Foodservices Association. (2009). *2009 institutional foodservice market report*.

Cantrell, P. (2009). *Sysco's journey from supply chain to value chain. Results and lessons learned from the 2008 National Good Food Network/Sysco Corporation Pilot Project to Source and Sell Good Food*. Wallace Center at Winrock International. Retrieved from:

http://www.ngfn.org/resources/research-1/innovative-models/NGFN%20Case%20Study_Syscos%20Journey%20From%20Supply%20Chain%20to%20Value%20Chain.pdf

Day-Farnsworth, L., McCown, B., Miller, M., & Pfeiffer, A. (2009). *Scaling up: Meeting the demand for local food*. UW-Extension Ag Innovation Center and UW-Madison Center for Integrated Agricultural Systems. Retrieved from: <http://www.cias.wisc.edu/farm-to-fork/scaling-up-meeting-the-demand-for-local-food/>

Friedmann, H. (2007). Scaling-up: Bringing public institutions and food service corporations into the project for a local, sustainable food system in Ontario. *Agriculture and Human Values* 24: 389-398.

Hendrickson, M. (2010). *Marketing vegetables in Missouri*. University of Missouri Extension. Retrieved from: <http://extension.missouri.edu/p/G6221>

Izumi, B. T., Wright, D. W., & Hamm, M. W. (2010). Farm to school programs: Exploring the role of regionally-based food distributors in alternative agrifood networks. *Agriculture and Human Values* 27: 335-350.

Kremer, P., & DeLiberty, T.L. (2011). Local food practices and growing potential: Mapping the case of Philadelphia. *Applied Geography* 31: 1252-1261.

Lyson, T. A. (2004). *Civic agriculture: Reconnecting farm, food, and community*. Lebanon, NH: Tufts University Press.

Markham, R. (1982). *Supply and demand balance in the B.C. food sector: A statistical analysis*. ARDSA Project No. 271304.

Morrison, K. T., Nelson, T. A., & Ostry, A. S. (2011). Methods for mapping local food production capacity from agricultural statistics. *Agricultural Systems* 104: 491-499.

Riemann, W. (1987). *The B.C. food balance*. B.C. Ministry of Agriculture and Fisheries.

Swenson, D. (2009). *Investigating the potential economic impacts of local foods for southeast Iowa*. Leopold Center for Sustainable Agriculture. Retrieved from: http://www.leopold.iastate.edu/research/marketing_files/seiowa.html

Swenson, D. (2010a). *The economic impact of fruit and vegetable production in southwest Iowa considering local and nearby metropolitan markets*. Leopold Center for Sustainable Agriculture. Retrieved from: http://www.leopold.iastate.edu/research/marketing_files/swiowa.html

Swenson, D. (2010b). *Selected measures of the economic values of increased fruit and vegetable production and consumption in the Upper Midwest*. Leopold Center for Sustainable Agriculture. Retrieved from: http://www.leopold.iastate.edu/research/marketing_files/midwest.html

Swenson, D. (2011). *Exploring small-scale meat processing expansions in Iowa*. A Technical Report Submitted to the Leopold Center for Sustainable Agriculture. Retrieved from: <http://www.leopold.iastate.edu/pubs-and-papers/2011-04-small-scale-meat-processing>

Timmons, D., Wang, Q., & Lass, D. (2008). Local foods: Estimating capacity. *Journal of Extension* [On-line] 46(5), Article SFEA7. Available at: <http://www.joe.org/joe/2008october/a7.php>

Copyright © by Extension Journal, Inc. ISSN 1077-5315. Articles appearing in the Journal become the property of the Journal. Single copies of articles may be reproduced in electronic or print form for use in educational or training activities. Inclusion of articles in other publications, electronic sources, or systematic large-scale distribution may be done only with prior electronic or written permission of the *Journal Editorial Office*, joe-ed@joe.org.

If you have difficulties viewing or printing this page, please contact [JOE Technical Support](#)

© Copyright by Extension
Journal, Inc. ISSN 1077-5315.
[Copyright Policy](#)

