

Exploring Small-Scale Meat Processing Expansions in Iowa

A Technical Report Submitted to the
Leopold Center for Sustainable Agriculture



Dave Swenson
Department of Economics
Iowa State University

April 2011

Edited by Mary Adams and Rich Pirog
Design by Tina Davis,
Leopold Center for Sustainable Agriculture

209 Curtiss Hall
Iowa State University
Ames, Iowa 50011-1050
(515) 294-3711
leocenter@iastate.edu



Overview of Findings

Iowa is a national leader in both meat animal production and processing. Combined animal production and processing accounted for 3.8 percent of the state's jobs and 3.7 percent of its gross domestic product (GDP) in 2008. While the state's production and processing prominence is undisputed, there are concerns that many of Iowa's smaller meat processors may not be able to compete with larger processors over time. Given ongoing rural population declines and other factors, the state may lose substantial portions of its small processor capacity.

The recent surge of interest in local food production and consumption has given rise to investigations of whether Iowa's small meat processors can be profitable partners in helping to supply specialized meat products that are otherwise less available given the state's existing processing capacity and distribution. Fifty-six percent of Iowa's meat processing establishments had fewer than 10 paid employees in 2008. This research looks at the potential small area 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 output compared to 4.7 jobs as the statewide average (which is weighted heavily by the

state's large meat processors). Consequently, the maintenance of small processor viability has a discernible job impact in areas of the state that are not dominated by Iowa's major processors.

This research found that \$1 million in small meat processor output required 13.3 jobs that paid \$464 million in labor incomes.

- That level of sales would include the processing of 1,310 beef carcasses, 1,667 hogs, and as many as 2,143 goats or lambs.
- When that level of processing was run through an input-output model of the Iowa economy, it would have multiplied through to support a total of 17.6 jobs, \$613,117 in labor incomes, and \$738,777 in Iowa GDP.
- Alternatively, the impacts could be calculated on a per 1,000 animals processed basis. Processing 1,000 cattle in the small facilities would support a total of 7.4 jobs and \$257,509 in labor incomes. Processing 1,000 hogs would support 3.2 jobs and \$110,361 in labor incomes. And processing 1,000 goats or lambs would support 1.2 jobs and \$42,918 in labor incomes annually.



Photos provided by Small Meat Processor Working Group, USDA and Leopold Center Staff

Introduction

Iowa is a national leader in animal production and in meat processing activities. These two industries are strong contributors to the state's gross domestic product (GDP) and the livelihoods of thousands of Iowans. In 2008, according to input-output tables maintained at Iowa State University, the two industries combined supplied 3.8 percent of the state's jobs and accounted for 3.7 percent of state GDP (see Figure 1).

These two sectors not only are important contributors to the state's economy, they are nationally prominent as well. Figure 2 (next page) displays the aggregated location quotients (LQ) of all animal production and meat and poultry processors in Iowa. LQs are measures of the degree of specialization shown in a state's industry based on the number of jobs in that industry. An LQ of 1.0 would mean the state had the national average of jobs in that sector. A value greater than 1.0 suggests there are jobs producing for export sales, and a value less than 1.0 suggests the

region must import that particular commodity. The LQ for all livestock production is 3.6. This means that Iowa has 3.6 times the employment required in this industry to satisfy the existing population demand for these items. The LQ of 5.0 means the state has five times more animal processing capacity (as measured by jobs) than the national norm of 1.0.

Figure 3 (next page) provides an additional measure of the state's animal production specialization relative to the nation according to the 2007 Census of Agriculture. Here several types of animal inventories in Iowa are expressed on a per capita basis and then compared to the national average. Iowa's prominence in hog production is well known and quite apparent from the data. Iowa has nearly 29 times more hogs per capita than the national average. It also has strong concentrations (4.2 times the national norm) in cattle and calves, 3.6 for sheep and lambs, and 1.8 for goats.

FIGURE 1

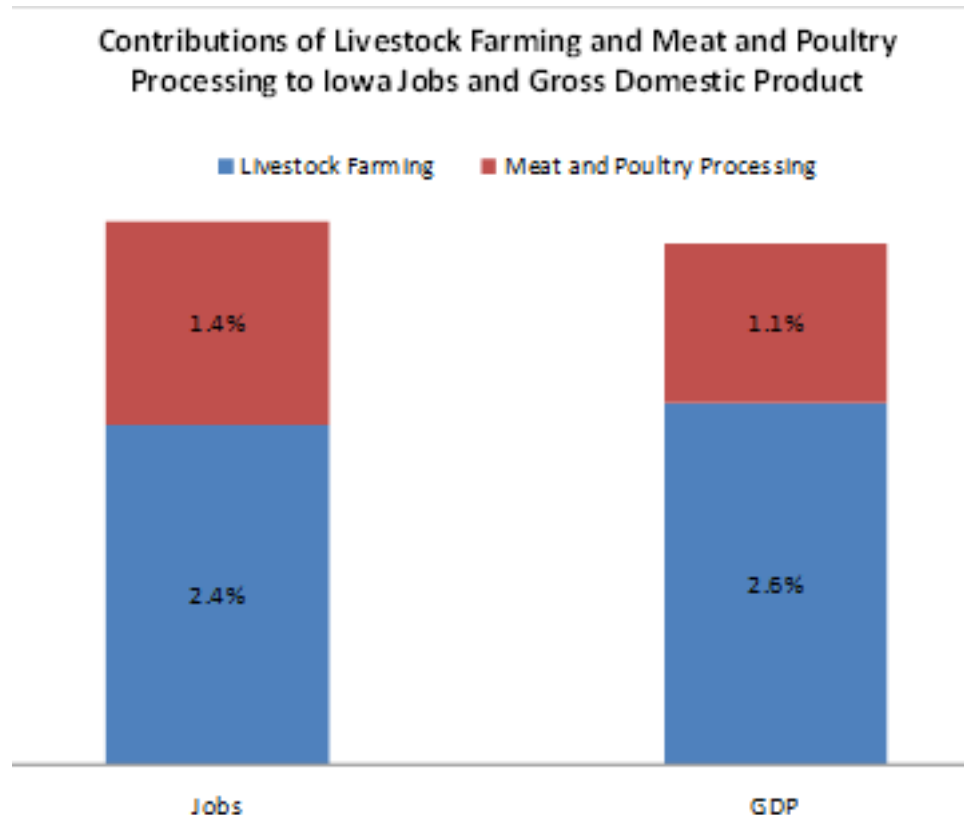


FIGURE 2

Location Quotients as Measures of Industrial Specialization

(Expected Value 1.0)

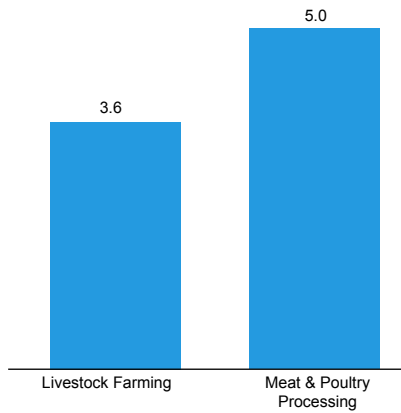
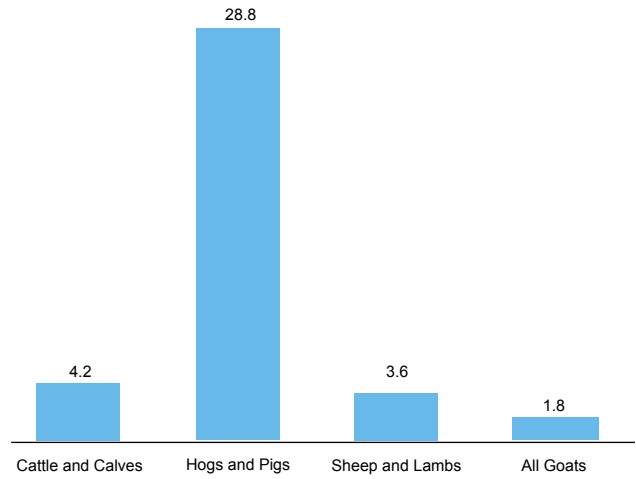


FIGURE 3

Iowa Animal Inventory Per Capita Indexed to National Averages

(Expected value in each category is 1.0)

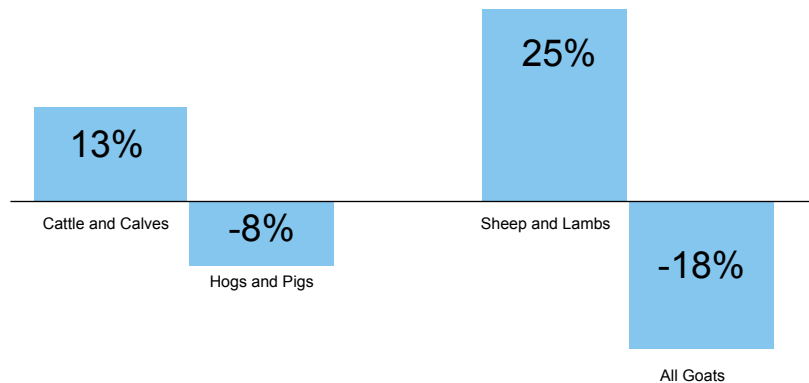


The two graphs demonstrate the state’s competitive potency in these two highly related industries. Animal production in Iowa, however, is heavily concentrated compared to national production, and the data collected in the two previous U.S. agriculture censuses indicate that production concentration is increasing. Figure 4 shows that the number

of farms with both cattle and hogs declined by 8 percent and 18 percent, respectively, between those two census years, while cattle inventories expanded by 13 percent and hogs by 25 percent. These two patterns indicate that the number of animals per cattle farm in Iowa increased by 22 percent, and hog inventories per farm increased by 53 percent.

FIGURE 4

Changes in Iowa Animal Inventories and Farms, 2002 to 2007



Figures 5 and 6 clearly demonstrate the spatial production concentrations for Iowa's cattle and hog production. The shading clearly depicts the areas where animal numbers are more concentrated per farm. Western Iowa has very high cattle production concentrations, especially in the northwest area where dairy production and feeder operations are prominent. Similar, but not as widespread, concentrations are evident

in the northeast corner of the state. In all, 22 counties averaged 150 cattle or more per farm, 18 of these located in the western third of the state.

In terms of hog production, north central Iowa contains the highest number of animals per farm. Of the 19 counties in Iowa where hog farms averaged 3,000 or more animals, 15 were in the state's northern counties.

FIGURE 5

Iowa Cattle Per Farm, 2007

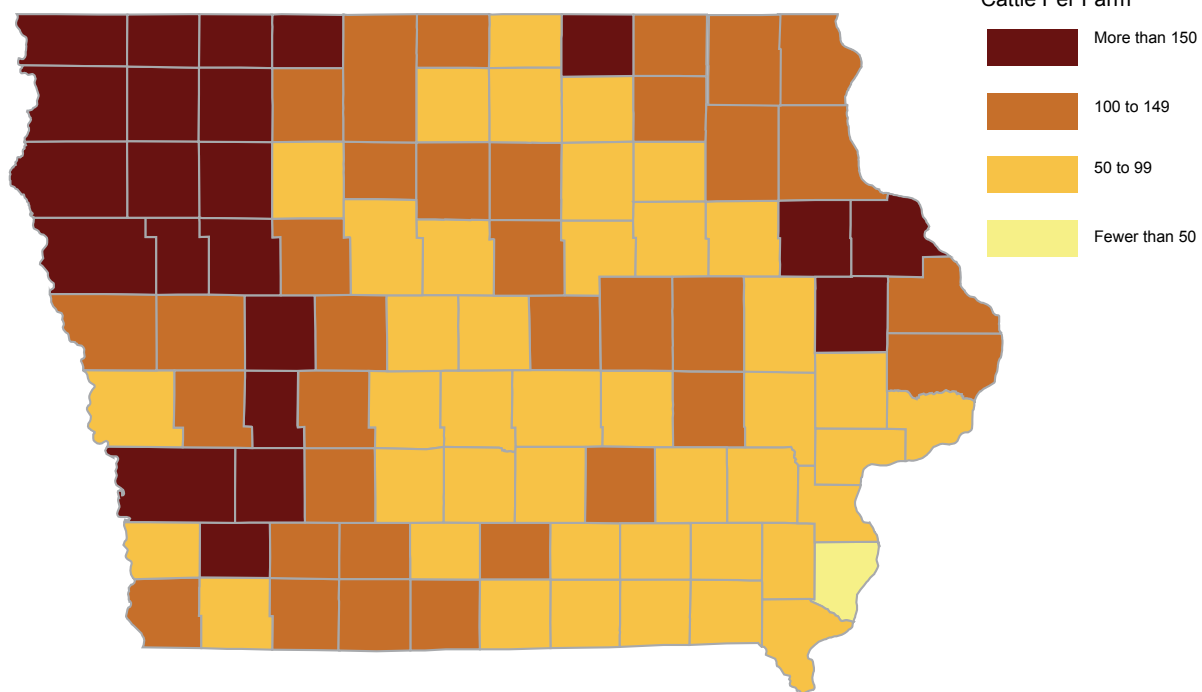
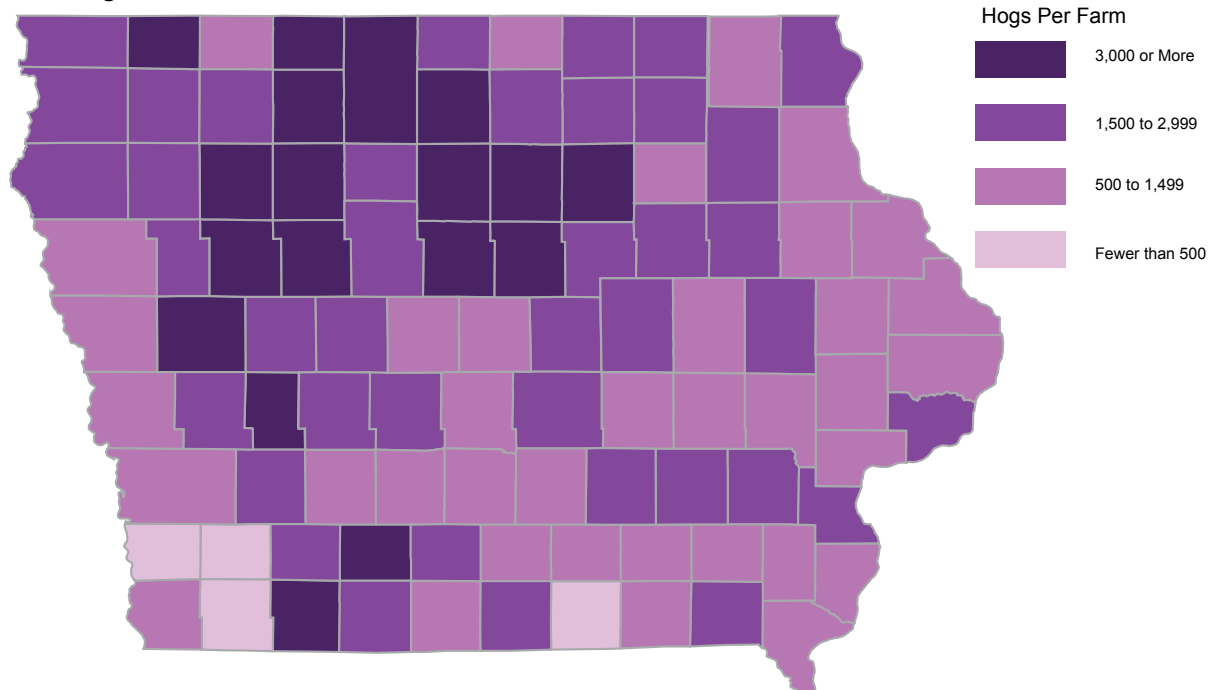


FIGURE 6

Iowa Hogs Per Farm, 2007



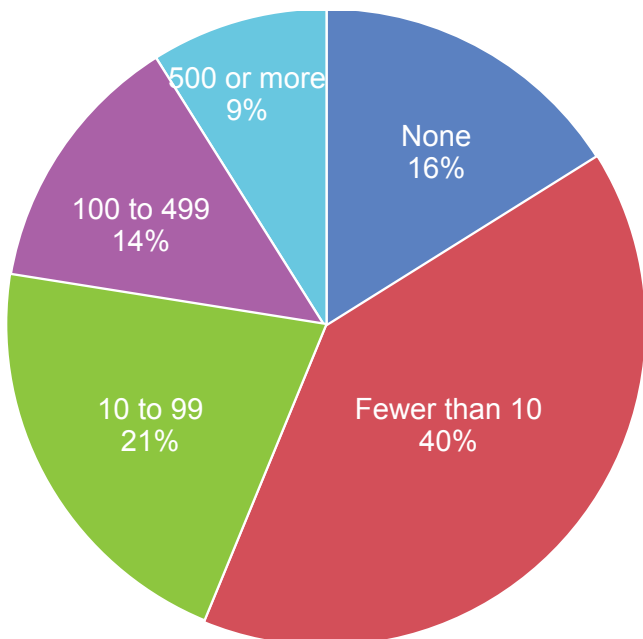
Iowa Meat Processing Characteristics

According to Iowa Department of Agriculture and Land Stewardship (IDALS) compilations, there are 277 meat processing facilities in Iowa (see Table 1). The largest group of processors receives federal U.S. Department of Agriculture inspections, which permit Iowa-processed meats and poultry to be sold in interstate and international trade. The 71 state-inspected facilities allow processors to resell for retail use within Iowa. The 91 custom meat and poultry operations process animals for individual consumption only, not for resale.

TABLE 1
Iowa Meat Processing Facilities, 2010

| | |
|------------------------------|-----|
| Federally Inspected | 115 |
| State-Inspected | 71 |
| Custom Processing/ No Resale | 91 |

FIGURE 7
Iowa Meat Processing Establishments by Paid Employees, 2008



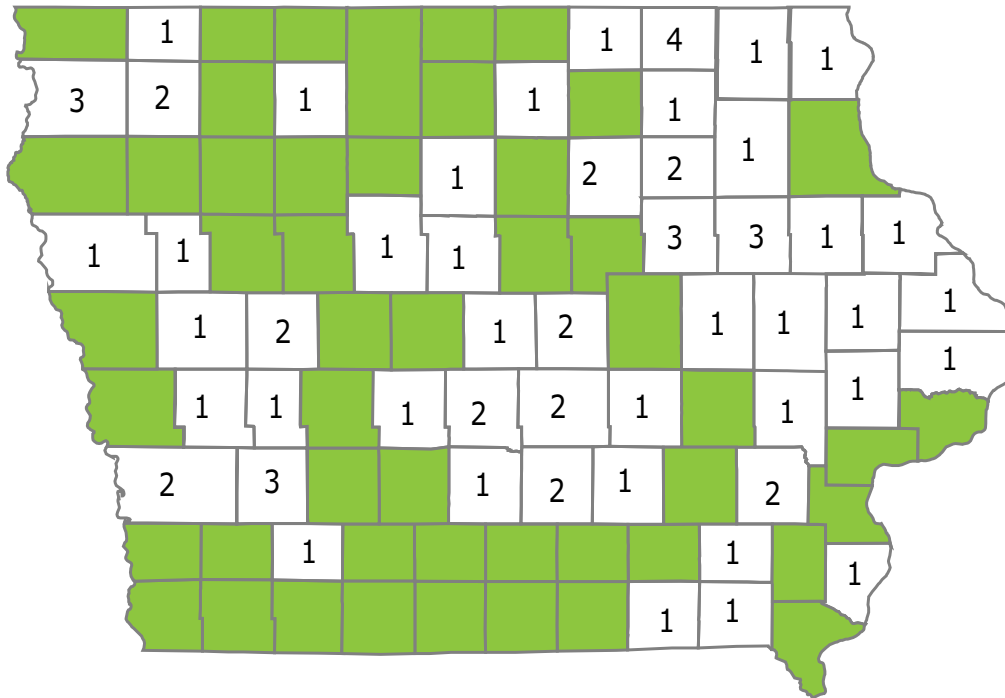
Using establishment data from County Business Patterns for 2008, the distribution of Iowa’s meat processors by the number of paid employees in those firms can be determined. Figure 7 shows that 56 percent of establishments have fewer than 10 employees or no employees. Larger facilities with over 100 employees comprise 23 percent of firms, with the remainder falling between those extremes. As the state and federally inspected operations in Table 1 are processing meat for resale, it is reasonable to assume that all or nearly all of the facilities with 10 employees or more are engaged in processing for resale in one manner or another. Those with fewer than 10 workers would more likely be involved in custom processing for farmers, hunters, or other individuals.

The evidence shows that Iowa has significant competitive advantages in a wide range of meat production and meat processing operations. Assuming a fully functioning market that responds internally and externally to both the supply and demand of meat products, it is reasonable to assume Iowa’s meat processing system is in equilibrium with local and national demands. Substantial fractions of those demands are met by the state’s federally licensed plants, which include the state’s largest processors. Figure 8 relies on 2010 Iowa Department of Agriculture and Land Stewardship (IDALS) information and demonstrates the distribution of state-inspected and custom processing facilities. These facilities also serve Iowa native demand and fulfill Iowa’s internal demands for meat products and meat processing.

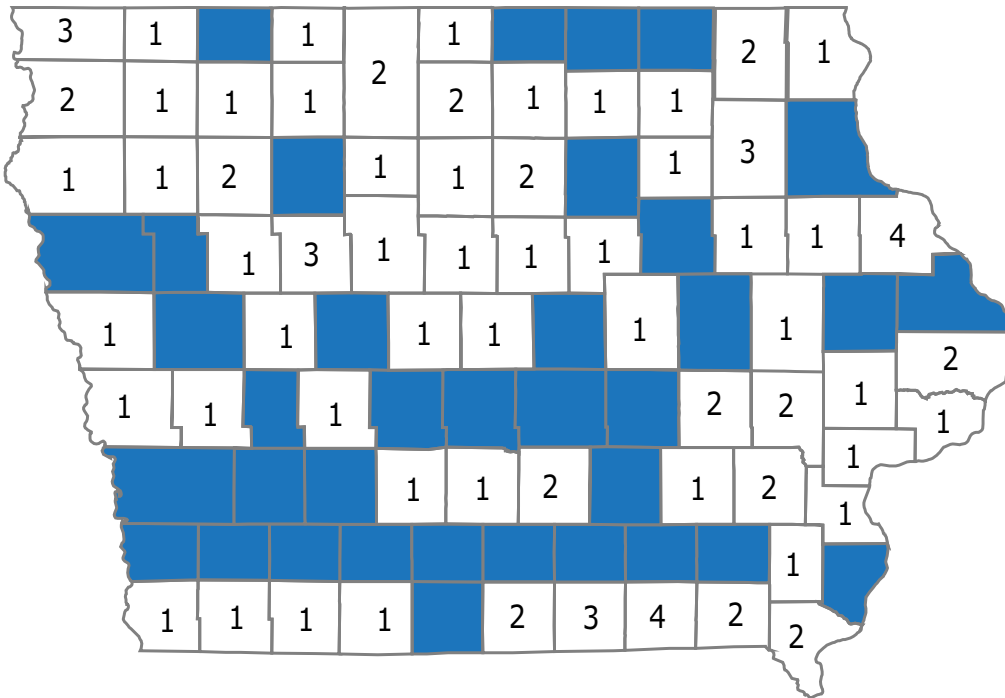


FIGURE 8

Number and Distribution of State-Inspected Meat Plants in Iowa



Number and Distribution of Custom Processing (No Retail Sales) Meat Plants in Iowa



Smaller scale animal processing capacity is widely distributed across the state. There are notable absences of state-inspected operations for in-state resale in the state’s southernmost counties. Noticeable gaps exist in the entire northwest quadrant of the state as well.

Custom processing facilities also are lacking in many Iowa counties, especially in the southern portion of the state. Roughly one-third of Iowa’s counties have no custom processors, and about half of Iowa’s counties have no state-inspected facilities.

Iowa's Meat Production and Processing within the Context of Long-Term Change

Iowa is a major exporter of meat products and in economic terms, we are wholly self-sufficient. There is no apparent evidence of market failures in this industry that could be attributed to uneven distribution of society's resources. That capacity, as exhibited in Figure 7, is well distributed by size and, as described earlier, is widely dispersed, although there are gaps. Assuming a market that is responding efficiently to all internal and external demand queues, the evidence clearly demonstrates a mix of meat processing capacities.

The current system of processing is a function of all of the patterns of change in animal production that have occurred over the past 30 years, as well as the structural changes in rural areas. The meatpacking industry in Iowa and the nation underwent widespread and painful reorganization during the early to mid-1980s. Many traditional meat packers were forced out of business in favor of much redesigned and more efficient operations.

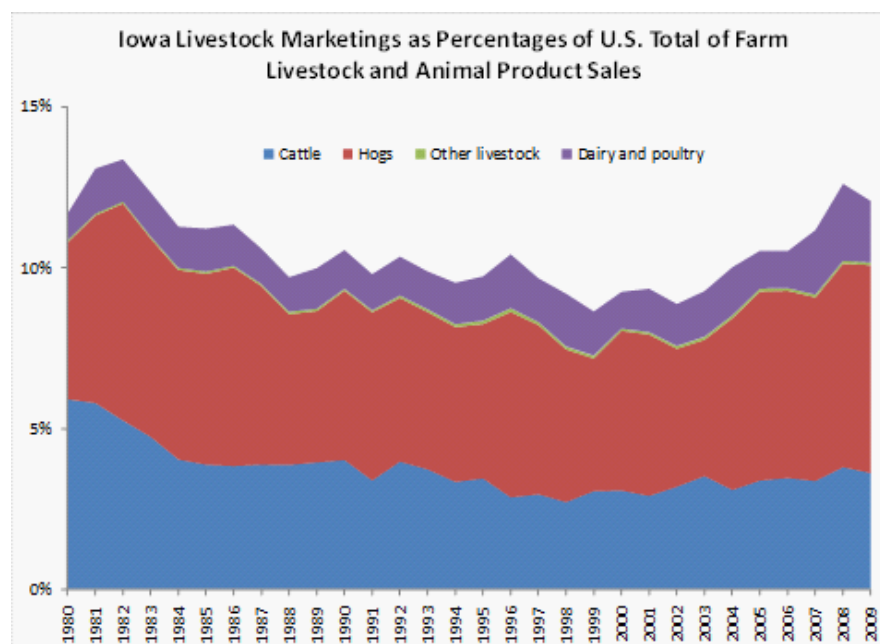
Significant shifts in the amounts and the locations of Iowa's animal production also altered the demand for processing facilities,

both for the large and more modest facilities. The state moved sharply away from cattle in favor of hog production during the 1980s. This is apparent in the Bureau of Economic Analysis data in Figure 9, reflecting a pattern that continues to the present day. Note also the tremendous dominance in hog and cattle marketing relative to dairy and poultry, which have grown slightly in national prominence in recent years, and all other livestock, which are barely in evidence. Finally, the number of farms in Iowa has declined markedly, resulting in 40 percent fewer Iowa farm proprietors in 2009 than there were in 1980.

All of these factors have in part led to widespread decreases in rural populations and shifts in both employment and residency toward Iowa's urban areas. As the state's population has become incrementally and persistently more urban over time, regional demand for many small business services has shifted accordingly. This includes local demand for meat processing services, as well as local or regional population-based demand for locally processed meat products.

There are market signals that have led to increased interest in producing, for example, grass-fed cattle, pasture-raised hogs, and other alternatives to traditional livestock, such as meat goats. If those production goals are to be achieved, producers or purchasing consumers will need access to the type of processing capacities that serve their needs.

FIGURE 9



In the evolving discussion about local foods development, potential producers may decry the absence of adequate intermediate processing or distribution systems as a primary impediment to expanded production. Generally speaking, though, this is an impediment that works itself out over time provided sufficient regional demand exists for the commodity to justify expanded processing activity. Traditional economics suggests that if producers of these products react to legitimate consumer demand, and that demand is generating a price premium, then there will be competition among intermediate firms such as meat processors to accommodate that demand.

If in fact there is sufficient regional capacity to process meat products, animal producers that are closer to those facilities have a competitive advantage over producers located farther away. Producers and processors who are closer to regional centers of dense demand also enjoy production and processing advantages over more remote locations. With regard to meat and poultry processing and livestock farming, much like all other types of agriculture or manufacturing, there are spatial competitive advantages that can work to reinforce both production and processing within that primary region of activity. As in the case of Iowa vis-a-vis the nation in animal or feed grain production and processing, production advantages also will be present for insular sales of meat and poultry products for direct or retail sale to Iowans.

A Discussion of the Potential Economic Impact of Boosting Locally or Regionally Oriented Meat Processing in Iowa

Many people use the term “economic impact” far too liberally. When devising policies or evaluating industrial growth opportunities, impacts occur if an analyst can determine the existence of net gains in regional productivity. Furthermore, if one region of the state gains net new productivity at the expense of

another in-state region, the overall condition of Iowa’s economic welfare often remains unchanged.

These considerations are important to keep in mind when gauging potential economic activity enhancements associated with local foods production. The state of Iowa, on a statistical basis, thoroughly meets its residential demands for meat, poultry, and dairy products via in-state production and processing. If, within the spirit of market competition, one type of Iowa food product slowly gains favor with consumers, the gains accumulating to the producers of that food product (wherever they are generated) must, by definition, come at the expense of other food products. Those competitive shifts result in changes in market share for different types of firms, but they do not necessarily result in gains for the state’s economy.

A state’s economy gains 1) when it is able to rely on local production to offset or substitute for commodities that must be imported or 2) by producing sufficiently more than local demand requires and exporting the surplus. In the absence of these two factors, changes from one kind of in-state activity to another in-state activity do not produce economic impacts in the near term.

On an in-state, interregional basis, however, significant gains may be realized through competitive processes that chip away at production advantages realized in other parts of the state. For example, Iowa hog production is spatially and operationally dominated by a comparatively small number of operations. Similarly, processing capacities are distributed to capture those production concentrations efficiently. If a small number of alternatively-raised hogs in a specific area are able to meet segments of in-state pork demand, and if that demand is facilitated through expanded local meat processing production, then the economic shift to that region may be comparatively substantial. That will not generate net gains to the state’s overall economy as measured by consumption of in-state raised and processed meat products, but gains to the producing region and losses to the yielding region would be tangible.

Consumer behavior, prices, and overall larger market factors will determine whether one form of production is desired over another. All things being equal, consumers are thrifty and make purchases based on a range of comparative values given a range of substitutes that are acceptable to those consumers. Regionally, producers, processors, and retailers respond to those demands.

Consumers respond to other major factors as well, though prices still weigh heavily on their choices. Many express preferences for foods that are produced using certain methods, such as grass-fed beef, or items that are certified as organically produced. Others may prefer locally grown or seasonally available food items over those that are imported. Still others may express regional brand loyalty. In Iowa it might be for Muscatine melons or Grimes sweet corn. Regionally expressed preferences may or may not be priced competitively with alternative products, and the degree to which consumers demonstrate those preferences will be reflected in the marketplace and aggregate demand.

For example, though the number of farms producing vegetables and melons in Muscatine County declined from 17 to 15 between 2002 and 2007, inflation-adjusted sales increased by 48 percent. Slightly fewer farmers were realizing much greater sales per farm. In stark contrast, the number of farms statewide producing vegetables and melons grew by 17 percent over the same period, but their collective sales declined by 27 percent in real terms. Here, significantly more farms were reporting significant declines in real sales per farm.

This example illustrates the ebb and flow of production capacity and realized gains on a regional and state basis. Such variations would be expected if alternatives to conventional systems of meat production and meat processing were to evolve in Iowa. Regional preferences might emerge where such

preferences make significant sense. Grass-fed animal production might thrive in areas with ample pasture, but not in areas where land rents precluded that option. Those production locations might be aided by the presence of reliable local processing capacity that can offset other factors such as higher land prices. Finally, reasonable proximity to substantial nearby demand may allow scale economies that enhance productivity.

No matter what the preferences are, local gains that come at the expense of other Iowa producers must have an overriding social objective that can be clearly articulated and agreed upon widely. For example, if public assistance is geared towards assisting a distressed area of the state, a distressed class of business activities or a distressed group of citizens, then policy makers have an obligation to investigate the nature of those woes, including their causes and consequences, and enact policies that directly address those issues.

Observers should be mindful of the broad market or social factors at work when evaluating long-term changes and suggested policy-driven adjustments to food production and processing in Iowa. Iowa does not have a shortage of animal production for food, but there are gaps in the diversity of animal production and the industry has very strong spatial concentrations. Iowa has adequate meat processing capacities given all manner of market demands, though long-term structural changes in rural areas may slowly undermine the survival prospects of more rural-based businesses.



Evaluating Iowa's Current Meat Processing Sector

Iowa's meat processing industries are extremely efficient and productive when viewed in the aggregate. Table 2 shows nearly 29,000 meat processing jobs in the state, and the average labor income (to include the value of all benefits) for those workers was \$46,757. The industry boasted \$12.826 billion in total output. As the industry produces significant quantities for export sales, a great amount of that production, plus the linkages it has with the rest of the economy, qualify as unarguable economic impacts.

TABLE 2

Iowa Meat and Poultry Processing Production in 2008

| | |
|------------------------------|--------|
| Output \$ Billions | 12.826 |
| Labor income *\$ Billion | 1.349 |
| Jobs | 28,842 |
| Average earnings per job* \$ | 46,757 |

**Includes all payments to proprietors*

TABLE 3

Iowa and U.S. Meat Processing Productivity Comparisons, 2008, Per \$ Million in Output

| | U.S. Industry Average | Iowa Industry Average |
|------------------------------|-----------------------|-----------------------|
| Output \$ | 1,00,000 | 1,000,000 |
| Labor income *\$ | 118,658 | 105,143 |
| Jobs | 2.9 | 2.2 |
| Average earnings per job* \$ | 41,579 | 46,757 |

**Includes all payments to proprietors*

Table 3 compares Iowa and U.S. meat processing per million dollars of output. Iowa processors require 24 percent fewer workers per million dollars in sales than the national norm. That enhanced productivity is rewarded in part through higher earnings. Iowa meat processors earn 12.5 percent more than their national counterparts.



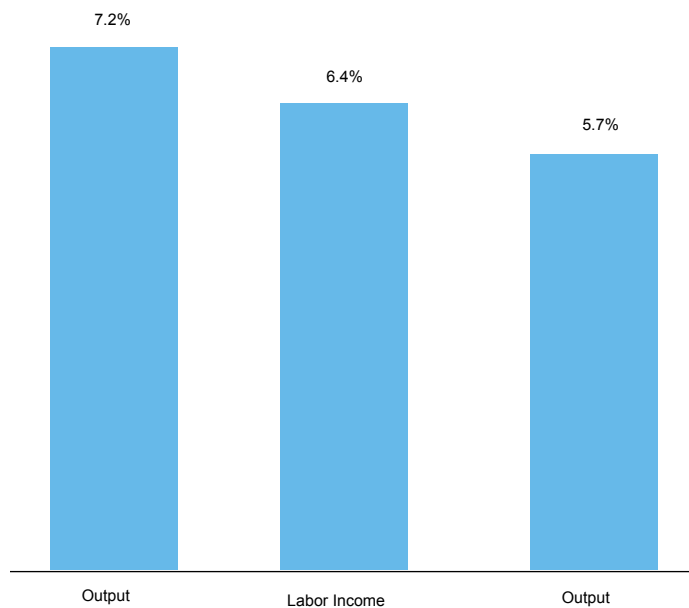
Figure 10 clearly demonstrates Iowa's prominence in this industry. Where the state has 0.9 percent of the nation's population and 1.1 percent of the total jobs, it accounts for 7.2 percent of meat processing output, 6.4 percent of incomes paid to workers in the industry, and 5.7 percent of all meat processing jobs.

Iowa's meat processing characteristics are heavily weighted by its large pork and beef processing facilities; accordingly, those heavily weighted production values are insufficient for adequately evaluating Iowa's smaller operations. As there are no reliable secondary sources of data for smaller operations, estimates of expected output, labor incomes, and jobs for Iowa's small packing operations were made by consulting a 2001 IDALS study of direct meat sales¹, and a recent creative component graduate paper by Nick McCann at ISU².

Iowa's small processor operations are much more labor intensive than larger operations, and returns to labor are much lower. Relying on an additional evaluation of Quarterly

Census of Employment and Wages (CQEW), and County Business Patterns (CBP) data from the Census, insights were gained concerning average labor requirements and the expected labor incomes that would accumulate to those workers, to include the proprietors, by major size categories. Those values were used to estimate the basic production characteristics of small Iowa processors that would be used in an input-output modeling system. The values in Table 4 display the differences in production requirements when comparing very small firms to Iowa's overall average. Note that in this table, the Iowa industry average excludes total livestock purchases so that the two operations are compared on a similar basis. The smaller Iowa meat processors would require 13.3 jobs per million in slaughter and processing output (or total sales) compared to 4.7 jobs statewide. Earnings per worker (to include payments to sole proprietors) are just under \$35,000 for the small processors compared to nearly \$46,800 for the average Iowa meat processing operation. (Earnings include all benefits as well as wages and salaries.)

FIGURE 10
Iowa Meat and Poultry Processing Shares of National Totals



¹Cooperative Development Services, Inc. 2001. Economic Impact of Directly Marketed Livestock in Iowa. Prepared for the Iowa Department of Agriculture and Land Stewardship.

²Nicholas McCann. 2010. Methodology and Computer Application for Scheduling and Product Mix Decisions in Small Iowa Meat Plants. Creative component research in support of a M.S. in Sustainable Agriculture. Iowa State University.

TABLE 4

Iowa Average and Small Meat Processing Productivity Comparisons, 2008

| | Iowa Industry Average** | Small Iowa Meat Processors |
|------------------------------|-------------------------|----------------------------|
| Output \$ | 1,00,000 | 1,000,000 |
| Labor income *\$ | 218,189 | 564,182 |
| Jobs | 4.7 | 13.3 |
| Average earnings per job* \$ | 46,757 | 34,959 |

*Includes all payments to proprietors

**This excludes the cost of livestock

The purpose of distinguishing very small processors from the Iowa average is to estimate the regional job impacts that might accumulate to an area were enhancements in animal production, whether for hogs, cattle or other livestock, intended for direct sale sufficient to warrant increased meat processing capacity in an area. It assumes that much of that expansion will occur among Iowa's small processors. Were significant capacities to be realized among larger operations, say those with from 25 to 100 workers, this research would assume

much greater labor efficiencies (i.e., fewer jobs per \$1 million of output) and use different values for the subsequent analyses. The values in Table 4 represent production averages that might apply to operations ranging from 10 to 20 employees. This table also displays the potential trade-offs at the labor level if productivity were to shift away from Iowa's larger meat packing firms toward its smaller ones and those shifts were sufficient to alter total output in Iowa's larger operations.³

³Please note: It may be tempting to declare that Iowa's economy is better off by supporting small operations over large as the direct job values in the small firms are more than 2.8 times greater than the Iowa meat processing average per million dollars in output. While it may appear that Iowa's economy would be significantly improved by reducing the number of large processing jobs in the state in favor of smaller, more widely distributed operations, it is important to consider that meat processing, like nearly all other industries, operates most efficiently as the size of the operation increases. Generally this means that consumers' welfares are improved as a consequence so long as the industry is considered competitive. Consumer welfares are enhanced because competition-driven efficiencies deliver desired products at the lowest possible price, thereby

making it possible for consumers to consume more of a particular desired good. Arguments that the average consumer is better off purchasing products manufactured by small processors over those from large processors are not supported by the data from this study. This report is a modeling exercise, not an evaluation of overall production efficiency in Iowa considering the consumption of one type of commodity over another. McCann's work suggests that substantial efficiencies can be introduced into Iowa's smaller processors, which will make them more profitable, may work to increase earnings for their workers, and help to insure their stability. In so doing, however, they will put pressure on less efficient processors in their market territories to achieve comparable efficiencies or risk going out of business.

Small Meat Processor

Economic Impact

The foregoing adjustments were used to fine-tune a state of Iowa input-output model to estimate localized employment and labor income gains to processors and regional economies as a consequence of increased productivity driven by increased local or regional sales of locally produced and locally consumed animal products.

Based on the McCann research and an earlier study by IDALS on direct meat marketing, the assumptions in Table 5 are incorporated into the modeling process and into the interpretation of the findings. Given a configuration where 55 percent of output is derived from beef processing, 30 percent from hogs, and 15 percent from goats or lambs, this amount of processing activity would require 5,119 animals.

Understanding Impact Model Terminology

The expected regional economic impact is measured using an input-output (IO) model of the area of scrutiny. For this study, an Iowa-based set of industrial accounts was utilized so that the results reflected Iowa's existing economic structure as closely as possible. The tables that are produced in IO models display the amount and the types of economic activities that are generated when fruits and vegetable production increase in Iowa.

There are four categories of economic information displayed in subsequent tables:

- **Total industrial output.** This is the value of what is produced in the industries that we are evaluating.
- **Total value added.** Value added is composed of wages and salaries to workers, returns to management to sole proprietors, incomes from properties and other investments and indirect tax payments that are part of the industrial production processes. Value added is the same thing as Gross Regional Product, and it is the standard manner in which we gauge the extent of an economic activity, especially on a comparative basis.

TABLE 5

Characteristics of Production Per \$1 Million of Processing Output

| | |
|---|-----------|
| Jobs (including proprietor) | 13.3 |
| Labor income | \$464,182 |
| Percent of total processing charges from: | |
| Beef | 55% |
| Hogs | 30% |
| Goats/lamb | 15% |
| Total Animals | |
| Beef | 1,310 |
| Hogs | 1,667 |
| Goat/lamb | 2,143 |



- **Labor income.** Labor income is a subset of value added. It is composed of the payments to workers and the proprietors' incomes. Labor incomes are useful for regional analysis because very large fractions of them accumulate to resident workers, whereas incomes from investments, for example, may accumulate out of the region being studied.
- **Jobs.** Jobs are not equivalent to employed persons. Many people have more than one job, so an economy has more jobs than employed persons. In addition, jobs are not created equal. Some are seasonal, others are part-time. The modeling system provides an annualized value of the jobs associated with some level of industrial output even if the jobs occur only during a short period of time. This would be the case for fruit and vegetable production jobs or many other crop production jobs.

Three levels of economic activity are summarized.

- **Direct activity.** This refers to all of the economic values listed above for the industry that we are assessing. In subsequent analyses, for example, all small meat processing is the direct activity.
- **Indirect activity.** All firms require inputs into production such as supplies, services, wholesale goods, transportation, banking services, and utilities. When levels increase or decrease in the direct sector, that influences the demand for inputs.

- **Induced activity.** This occurs when workers in the direct firm and workers in the indirect or supplying sectors convert their labor incomes to household consumption. This sparks another round of regional economic activity that, in turn, stimulates jobs and pays incomes.

We can add together these values to arrive at an estimate of the total economic value of a particular kind of industrial production. The degree to which an economic activity produces incremental export or import substituting gains, as discussed above, constitutes the regional economic impact. This study only assumes localized economic impact gains. Without further research, those localized gains are likely to come at the expense of existing processing activity elsewhere in the state.

Meat Processing Findings

Table 6 displays the findings of the modeling exercise. For each million dollars of output, the modeled small meat processing plant would require 13.3 jobs earning \$464,870 in labor income. At that level of production, it would require \$118,286 in production inputs, which would sustain 8/10th of a job and \$37,629 in labor income. When the direct workers and the indirect worker convert their incomes into household spending, they help induce \$364,473 in output and \$110,619 in labor income to 3.5 more jobs. These combined activities would account for \$1.48 million in regional output, \$613,117 in labor incomes, and 17.6 total jobs.

TABLE 6

Regional Economic Impacts of Small Meat Processors

| | Direct | Indirect | Induced | Total | Multiplier |
|----------------------|----------|-----------|---------|-----------|------------|
| Industrial Output \$ | 1,00,000 | 1,000,000 | 364,473 | 1,482,760 | 1.48 |
| Value Added \$ | 218,189 | 564,182 | 205,598 | 738,777 | 1.56 |
| Labor Income \$ | 464,870 | 37,629 | 110,619 | 613,117 | 1.32 |
| Jobs | 13.3 | 0.8 | 3.5 | 17.6 | 1.32 |

Table 6 also lists multipliers, or the total value divided by the direct value. They tell us how much the total region is linked to a unit change in the direct value. The output multiplier of 1.48 means that for every \$1 in direct meat processing activity, there is \$.48 in activity supported in the remainder of the economy. The multiplier of 1.32 for labor income means that for every \$1 in labor income generated in the direct sector, \$.32 in labor income is supported in the rest of the economy. The job multiplier of 1.32 means that for every job in the meat processing firm, 32/100th of a job is supported in the rest of the economy.

Table 7 allows for the indexing of the preceding values per 1,000 animals processed,

and can be used to estimate regional meat processing needs given animal production objectives. The differences are considerable, given the average processing costs of the different animals. In total, 1,000 processed cattle would need 5.6 direct processing jobs, and would ultimately link to \$622,759 in total regional output and \$257,509 in labor income going to 7.4 jobs. Processing 1,000 hogs would require only 2.4 jobs at the processor and would support \$266,897 in total regional output, \$132,980 in total labor income, and 3.2 jobs. Processing 1,000 goats or lambs calls for 9/10th of a job at the plant, but supports \$103,793 in total regional output, \$42,918 in total labor incomes, and 1.2 total regional jobs.

TABLE 7

Regional Economic Impacts of Small Meat Processors Per 1,000 Cattle Processed

| | Direct | Indirect | Induced | Total | Multiplier |
|----------------------|---------|----------|---------|---------|------------|
| Industrial Output \$ | 420,000 | 49,680 | 153,079 | 622,759 | 1.48 |
| Value Added \$ | 198,746 | 25,190 | 86,351 | 310,286 | 1.56 |
| Labor Income \$ | 195,245 | 15,804 | 46,460 | 257,509 | 1.32 |
| Jobs | 5.6 | 0.3 | 1.5 | 7.4 | 1.32 |

Regional Economic Impacts of Small Meat Processors Per 1,000 Hogs Processed

| | Direct | Indirect | Induced | Total | Multiplier |
|----------------------|---------|----------|---------|---------|------------|
| Industrial Output \$ | 180,000 | 21,291 | 65,605 | 266,897 | 1.48 |
| Value Added \$ | 85,177 | 10,796 | 37,008 | 132,980 | 1.56 |
| Labor Income \$ | 83,677 | 6,773 | 19,911 | 110,361 | 1.32 |
| Jobs | 2.4 | 0.1 | 0.6 | 3.2 | 1.32 |

Regional Economic Impacts of Small Meat Processors Per 1,000 Goats/ Lambs Processed

| | Direct | Indirect | Induced | Total | Multiplier |
|----------------------|--------|----------|---------|---------|------------|
| Industrial Output \$ | 70,000 | 8,280 | 25,513 | 103,793 | 1.48 |
| Value Added \$ | 33,124 | 4,198 | 14,392 | 51,714 | 1.56 |
| Labor Income \$ | 32,541 | 2,634 | 7,743 | 42,918 | 1.32 |
| Jobs | 0.9 | 0.1 | 0.2 | 1.2 | 1.32 |

Discussion

This analysis is designed to help planners, policy makers, and local food system advocates understand the economic growth potential and the limits to growth that can be assumed given the state's meat production capacity. The assessment focuses entirely on the meat processing capacities of the state, and does not address the desirability of alternate systems of livestock production and distribution in so far as they influence producers' incomes or consumers' welfares.

Iowa is a major producer of meat animals and nationally prominent in meat product exports. This makes the state statistically self-sufficient in nearly all forms of traditional meat products. The substitution of one form

of production, say local sales-oriented animal production, may not result in net gains to statewide production, though there may be advantages that accumulate regionally. If one region can enhance its economic activity at the expense of another in the state, it counts as a localized economic impact even though the state may not register a net gain. Such shifting ought to be based on the sum of consumer demand and regional production capacity. If that occurs, it is due to the spirit of traditional market competition. The role of public resources or policies in promoting one form of production over another, however, is not validated in this research.

