

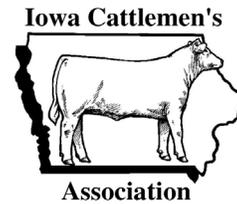


Economic Importance of Iowa's Beef Industry

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IOWA STATE UNIVERSITY
Extension and Outreach
Iowa Beef Center

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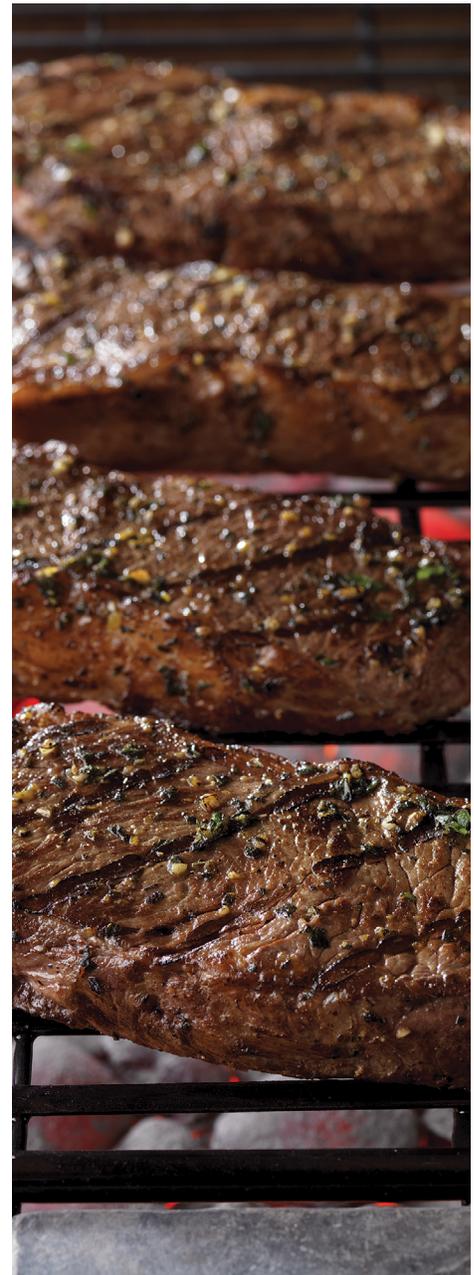
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Courtesy of the Beef Checkoff

Executive Summary

Iowa State University partnered with the Iowa Beef Industry Council to conduct an economic contribution study of the Iowa beef industry. A study of this magnitude is important to the state's beef industry to further understand the economic importance and value added opportunities that exist for the industry. The objectives of this study include four main components:

- Describe the current state of the beef industry in Iowa as it relates to production and marketing trends and economic activity generated through each sector of the industry.
- Provide estimates of the total economic contribution of beef cattle production in Iowa.
- Provide estimates of the total economic contribution of the cattle slaughter and beef processing sector in Iowa.
- Identify opportunities for beef industry growth in Iowa.

The following conclusions were drawn from the study:

Size and Demographics—There are more than 28,000 cattle operations in Iowa, including more than 19,000 farms with beef cows and more than 6,000 feedlots. On January 1, 2017, Iowa was home to 3.85 million cattle and calves. This includes 965,000 beef cows and 1.16 million cattle on feed, in addition to the cattle on Iowa's 1,340 dairy farms. In 2016, Iowa marketed 1.76 million fed cattle. More than 395,000 fed cattle were estimated to be slaughtered and processed in the state.

Production and Income—In 2016, 1.36 million cattle and calves entered the state, and cattle and calf marketings totaled 2.37 million head. The \$3.86 billion in cash receipts for cattle and calves represented 15 percent of all Iowa agricultural cash receipts and 32 percent of all Iowa animal and animal product cash receipts. Cattle and calves were fourth to corn, hogs and pigs, and soybeans in all agricultural cash receipts, and had higher cash receipts than poultry and eggs, milk and dairy products, and all other commodities combined.

Inputs and Expenses—Most cattle production inputs are produced or purchased locally. The largest single category of expenditure, excluding cattle purchases, is feed costs which were valued at \$962.71 million in 2016. More than 9 percent of the Iowa corn acreage contributes to feed for Iowa cattle, not including the contribution of cornstalks for feed uses. In terms of forage usage, 65 percent of Iowa's hay production is fed to cattle, and cow-calf and backgrounding operations utilized 84 percent of the pasture acres in Iowa. Construction of new cattle facilities requires several purchases and once construction is complete, additional inputs and services are required to produce cattle for sale including feed, labor, veterinary services and supplies, machinery and equipment, and marketing services.

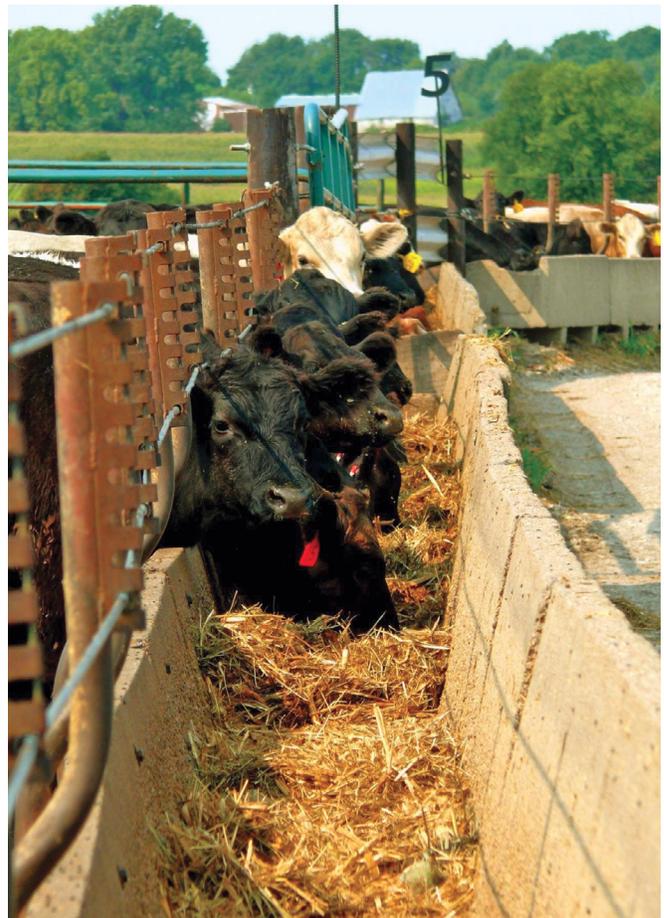
Contribution to the Economy—In 2016, Iowa's beef industry generated an estimated \$6.30 billion of economic activity in the state of which \$4.09 billion was the result of direct spending by the industry. Of this direct effect, cattle production accounted for \$3.86 billion, and cattle slaughtering and beef processing accounted for \$230.56 million. An estimated \$2.21 billion in economic activity comes from indirect and induced effects.

Contribution to Iowa's Employment—Iowa's beef industry supported an estimated 32,317 jobs in 2016. Of this, the industry directly employed 19,528 people. Additionally, the industry supported 12,789 indirect and induced jobs. Jobholders earned \$1.36 billion in labor income.

Fiscal Contribution—Labor incomes generated by cattle production and cattle slaughter and beef processing activities in Iowa are used to pay a wide range of state and local taxes. Based on the average incidence of state and local government tax collections to the state's total personal income, the state of Iowa received \$90.78 million in tax collections and all local governments received \$56.01 million from the \$1.36 billion in labor income generated in 2016.

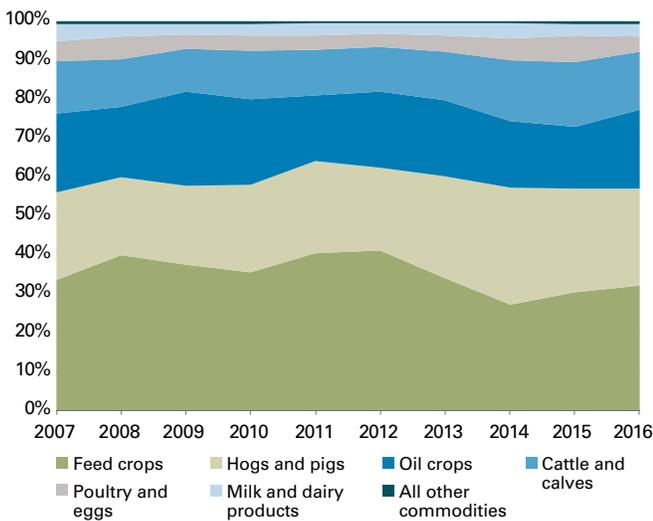
Opportunities for Growth—Iowa's beef industry has ample feed availability and land availability for nutrient application for continued growth and enhanced market share. Currently, pasture availability is a limiting factor for expanding Iowa's cow-calf industry, and thus, expansion will require shifts in land use or improved production efficiency. Iowa is a volume supplier of high quality beef for domestic and international markets, and because of its vibrant cow-calf and feedlot industries, producers are well positioned to respond to traceability demands. However, lack of processing capacity in the state limits the economic contribution of the beef industry to Iowa and limits initiatives to capitalize on Iowa's quality fed beef. Future growth of Iowa's beef industry will require programs that foster transition to a well-trained, new generation and continued adaptation of sustainable efforts to improve land stewardship.

Future Initiatives—This study provides information from which to assess the breadth, depth, and economic contribution of Iowa's beef industry. Conclusions from this study will have much greater leveraged value if they are used as foundational information as initiatives move forward. That is, the information from this study can be used to determine where the most fruitful efforts might be spent in encouraging growth, and where those efforts will be less productive without other external developments to incentivize investment.



Introduction

The Iowa beef industry represents a significant value-added activity in the agricultural economy and a major contributor to the overall Iowa economy. In terms of cash receipts, the \$3.86 billion for cattle and calves in 2016 represented 15 percent of all Iowa agricultural cash receipts and 32 percent of all Iowa animal and animal product cash receipts (Figure 1). These percentages have increased over the past decade. ***In recent years, levels of profitability in the Iowa agricultural economy have been directly related to performance in the cattle production sector.***



Feed crops = corn, hay, oats; Oil crops = soybeans; Poultry and eggs = broilers, chicken eggs, farm chickens, turkeys; All other commodities = miscellaneous animals and animal products, food grains, all other crops.

Source: United States Department of Agriculture Economic Research Service.

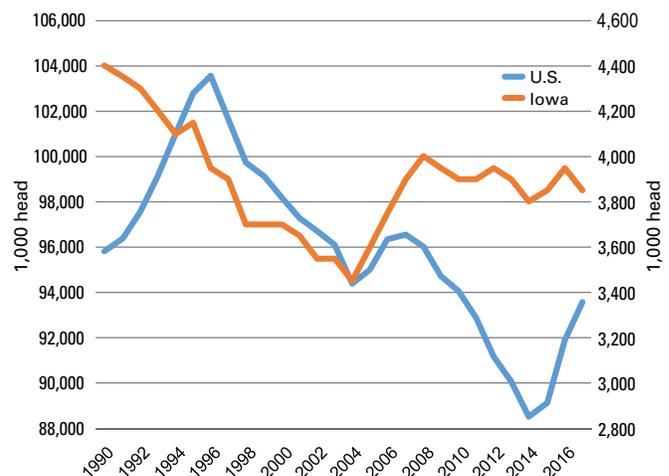
Figure 1. Iowa Cash Receipts by Commodity, Percent of All Commodities, 2007-2016

While these cattle production figures alone represent a sizeable volume of economic activity, they represent only a portion of the total economic activity stimulated by the beef industry. Including the cattle slaughter and beef processing sector, the Iowa beef industry generates an estimated 32,317 jobs, \$1.36 billion in labor income, \$6.30 billion of total output, and \$2.24 billion in value added or gross domestic product.

Following a brief overview of recent inventory and economic trends in the Iowa beef industry, this report describes the estimation of the economic contribution of Iowa's beef industry to the state. Opportunities for beef industry growth in Iowa are then discussed.

Iowa Cattle Inventories and Operations

Iowa has the seventh largest cattle inventory in the U.S. with 4.1 percent of the nation's cattle. Iowa's cattle inventory of 3.85 million head encompasses cattle on feed, beef cows and calves, dairy cows and calves, replacement heifers, stocker or backgrounding cattle awaiting placement in feedlots, bulls, and young calves. The U.S. inventory of all cattle and calves recently peaked in 1996 and by the start of 2014 had declined to near the 1952 level (Figure 2). Current U.S. cattle inventories are back to the level of 2011. Iowa, on the other hand, experienced a general decline in total cattle inventories from 1990 to 2004, down a total of 22 percent. However, by 2008, cattle inventories were up 16 percent, back to 1996-1998 levels, and have remained in that range. Since 2004, the state's increase is due primarily to dairy cows and cattle on feed while the number of beef cows in the state has remained about the same.



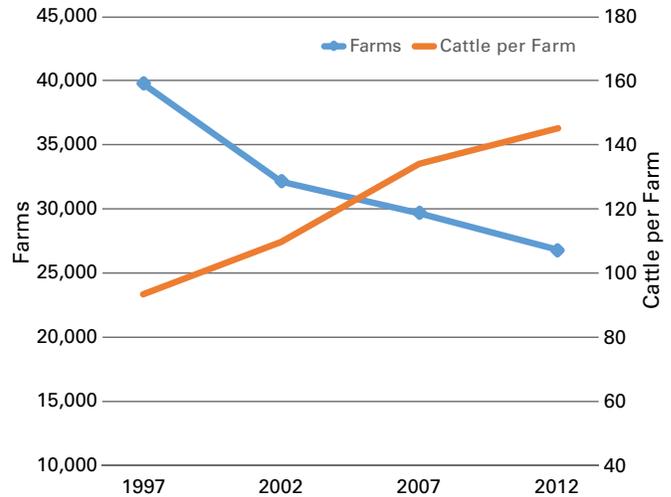
Source: United States Department of Agriculture National Agricultural Statistics Service.

Figure 2. All Cattle and Calves, January 1



Nationally, 2016 cash receipts for cattle and calves totaled \$63.94 billion. Value of cattle and calf production in the U.S. is \$48.63 billion. Value of production removes the value of sales between producers (predominantly calves and feeder cattle) leaving just net value added by cattle producers. Iowa is the number four state for cash receipts (\$3.86 billion) and number five state for value of production (\$2.49 billion). Nebraska (\$10.98 billion), Texas (\$8.47 billion), and Kansas (\$7.86 billion) take the top three spots for total cash receipts. Texas is the number one state for value of production (\$7.24 billion) due to its larger cow-calf sector that represents primary production from breeding cows and birthing calves. Feedlots make up a larger portion of Nebraska's cattle industry. Value of feeder cattle bought by feedlots is deducted from total cash receipts to compute the value of actual production in Nebraska. The same is true for Oklahoma over Iowa with respect to value of production. Nebraska produced \$6.33 billion in value of cattle and calves in 2016, Kansas produced \$4.59 billion, and Oklahoma produced \$2.56 billion.

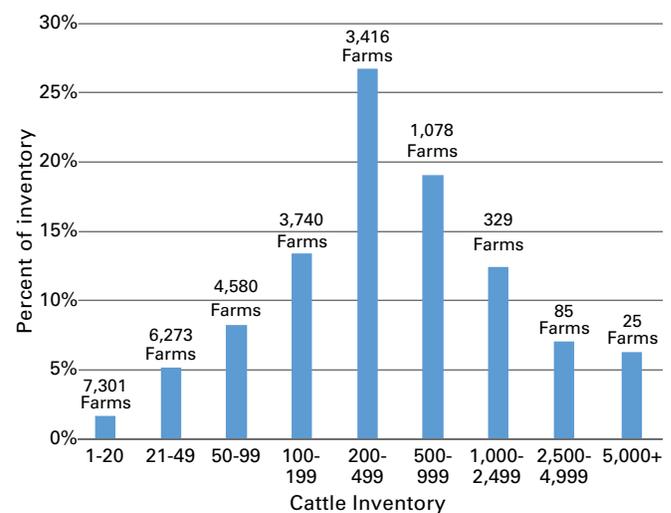
In 2016, 1.36 million cattle and calves entered Iowa, and cattle and calf marketings totaled 2.37 million head. As total cattle and calf marketings in Iowa have increased in recent years, the number of farms raising cattle has continued to decline. Since 1997, the number of farms with cattle decreased from 39,795 to 26,827. (Figure 3). Meanwhile, the average inventory of cattle has increased from 93 to 145 per farm.



Source: United States Department of Agriculture Census of Agriculture.

Figure 3. Iowa Farms with Cattle and Cattle per Farm

Figure 4 illustrates the structure of the Iowa cattle inventory. Two percent of all cattle are on farms with 1 to 20 head inventory. Twenty-seven percent of the inventory is on farms with 20 to 199 head, 46 percent is on farms with 200 to 999 head, and 26 percent is on farms with 1,000 or more cattle.



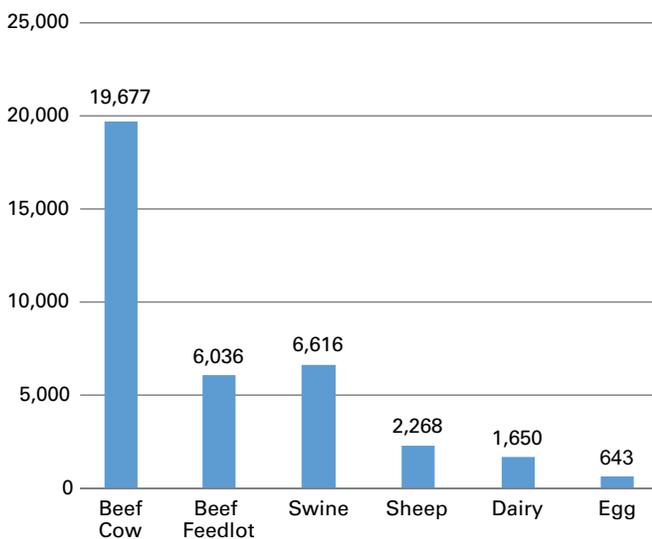
Source: United States Department of Agriculture Census of Agriculture.

Figure 4. Percent of Inventory by Size of Iowa Cattle Farm, 2012

Cow-Calf Sector

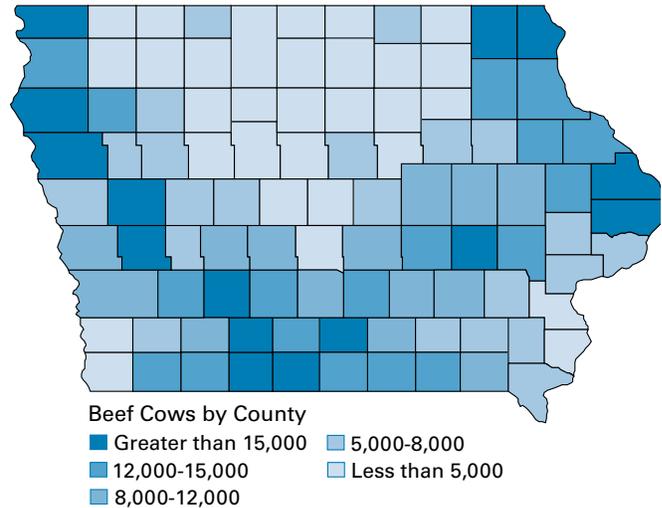
Iowa is the ninth leading beef cow state in the U.S. with 965,000 beef cows as of January 1, 2017. Beef cow-calf production is widely distributed across the state with every county having at least 2,500 beef cows. Beef cow production is the most common livestock enterprise in Iowa with nearly 20,000 producers with sales in 2012 (Figure 5). Nearly one in three farms in Iowa has a beef cow enterprise. The average land base of an Iowa beef cow operation is 167 acres with an average of 45 beef cows. This is less than one-third the U.S. average of 544 acres.

While cow-calf production occurs in every Iowa county, greater numbers of beef cows tend to be concentrated in southern Iowa and along the eastern and western sides of the state where more forage and grassland production occurs. As shown in Figure 6, several counties in Iowa had beef cow inventories greater than 12,000 head in 2012.



Source: United States Department of Agriculture Census of Agriculture.

Figure 5. Number of Iowa Operations with Sales, 2012



Source: United States Department of Agriculture Census of Agriculture.

Figure 6. Iowa Beef Cow Inventory by County, 2012

From 1997 to 2012, the number of Iowa farms with beef cows decreased from 28,385 to 19,677. Beef cow herds in Iowa are relatively small with an average size of approximately 42 cows per herd. The average herd size from 1997 to 2012 ranged from 37 to 45 head, and likely reflected the culling decisions within a herd more than the change in the number of herds.

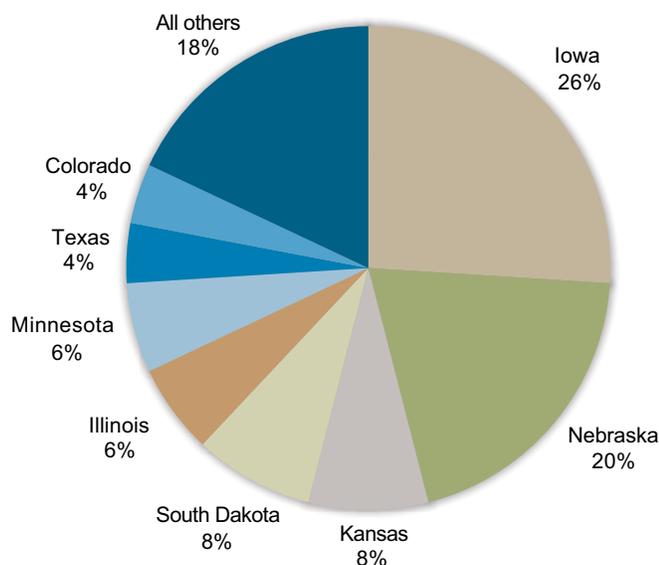
Iowa beef cow herds are also very diverse in size and location. Almost three-quarters of the state's beef cows are in the 14,000+ herds with less than 50 cows. Seventeen percent of Iowa beef cows are in herds of 50-99 head, with 11 percent in herds of 100-499 head. Only 0.2 percent are in herds of at least 500 head.



Feedlot Sector

Iowa is the number four cattle feeding state in the U.S. with an inventory of 1.16 million cattle on feed as of January 1, 2017. Iowa is the only state in the U.S. that reports monthly cattle on feed, placement, and marketing estimates for both 1–999 head capacity and 1,000+ head capacity feedlots. In 2016, feedlots with a capacity of 1–999 marketed 743,000 head while 1,000+ head capacity feedlots marketed 1.015 million head. Iowa fed cattle marketings totaled 1.76 million head in 2016.

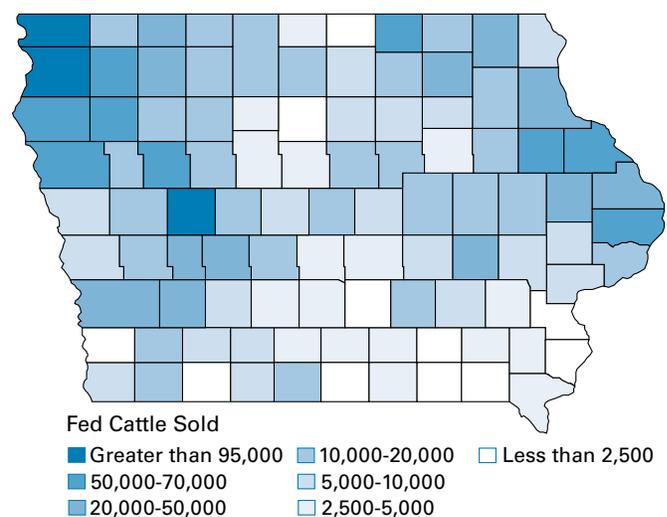
With 6,036 feedlots (operations with sales for slaughter) in the state in 2012, **Iowa has more feedlots than any other state in the U.S.** Nearly half of the cattle are marketed from the 5,674 feedlots with less than 1,000 head capacity. While the size of feedlots tends to be smaller, Iowa also has nearly 900 feedlots that market over 500 head annually (26 percent of the U.S. total, Figure 7).



Source: United States Department of Agriculture Census of Agriculture.

Figure 7. Percent of Feedlots Marketing 500 Head or More by State, 2012

Sioux County has the greatest number of cattle marketings in Iowa with over 350,000 head marketed in 2012. This annual production makes Sioux County one of the top cattle feeding counties in the U.S. Nationally, it was number four in 2012 operations and number fourteen in 2012 sales. Lyon, Carroll, Dubuque, Woodbury, Plymouth, and Delaware counties round out the top seven cattle feeding counties in Iowa as measured by 2012 sales. Sioux, Dubuque, Delaware, Lyon, Winneshiek, Clinton, and Jackson counties have the most feedlots in Iowa and nationally are ranked fourth through tenth for the number of feedlots.



Source: United States Department of Agriculture Census of Agriculture.

Figure 8. Iowa Fed Cattle Marketings by County, 2012

Figure 8 shows Iowa fed cattle marketings by county in 2012. While cattle feeding enterprises are more concentrated than cow-calf operations in Iowa, they are still widely distributed across the state. In addition to the northwest region, large cattle feeding regions in the state include west central, southwest, northeast, and east central counties. The average land base of an Iowa feedlot operation is 439 acres, roughly half that of the U.S. average of 866 acres.

Dairy Cattle Sector

The dairy cattle industry's influence on beef production is significant. CattleFax beef audits for 2012-2016 show cull dairy cows and fed dairy cattle average about 20 percent of total U.S. beef production. About half of the dairy beef came from fed dairy cattle.

Nationally, Iowa ranks twelfth in dairy cow inventory with 215,000 head on January 1, 2017. From 2004 to 2017, nearby state beef cow inventories (Minnesota, South Dakota, and Wisconsin) decreased 1 percent and dairy cow inventories increased 4 percent. Similarly, Iowa beef cow numbers declined 1 percent while dairy cow numbers increased 10 percent over this time period. Declining veal slaughter also meant dairy animals have accounted for an increased share of the calf crop available for feeder cattle supplies.

As the size of the Iowa and nearby beef cow herd declined to 60-year lows with minimal change in total feedlot capacity in the early 2010s, cattle feeders faced increased competition to keep cattle in their feedlots. With dairy animals accounting for a larger percentage of the calf crop and offering a viable option for some cattle feeders to fill excess capacity, more dairy calves have entered feedlots in recent years.

Dairy operations of various sizes and structure are located throughout the state, with the heaviest concentrations of production located in northwestern and northeastern Iowa. Iowa beef feedlots capitalize on this close proximity of available feeder cattle. A 2014 Iowa Beef Center survey of Iowa feedlots indicated that 8 percent of feedlots typically place dairy cattle on feed and an additional 1 percent of feedlots place dairy × beef crossbreds on feed.

Cattle Slaughtering and Beef Processing

While the Iowa cattle production figures by themselves represent sizeable volume of economic activity, they do not represent the total economic activity stimulated by the Iowa beef industry.

Table 1 and Figure 9 provide the current location and approximate slaughter capacity of fed cattle slaughter plants in Iowa and within approximately 500 miles of the Iowa border. According to the 2016 National Beef Quality Audit, fed cattle travel 135 miles on the average to slaughter. The standard deviation is 135 miles so it would not be unusual for fed cattle to be shipped 250 to 350 miles to a slaughter plant in the U.S. Total daily slaughter capacity within 200 miles of the Iowa border is over 27,000 head, several times the number of cattle marketed each day in Iowa (estimated at 6,762 head per day).¹ Extending the range to 500 miles, the daily slaughter capacity exceeds 60,000 head for potential Iowa fed cattle marketings. However, within the borders of the state of Iowa, daily slaughter capacity by larger packing plants is only approximately 1,700 head. It is estimated that daily slaughter capacity is less than 25 percent of the daily fed cattle production in state.

From a historical standpoint, as the cattle industry contracted and shifted regionally in the 1980s and 1990s, beef packing capacity in Iowa was reduced, including loss of packing plants in Fort Dodge, Des Moines, Spencer, Oakland, and more recently, Denison. As fed cattle numbers have recovered in Iowa, the slaughter capacity deficit has increased.

As demonstrated later in this report, cattle slaughter and beef processing contribute significantly to the economy. ***A lack of slaughter and processing facilities for fed cattle represents a lost opportunity in Iowa's economy.***

¹ The fed cattle slaughtering capacity is an estimate for the total head of fed cattle (excluding cull cows or bulls) slaughtered in the respective area. To determine this estimate, the average daily slaughtering capacity of each fed cattle plant was multiplied by 260 operating days per year and then summed together.

Table 1. Iowa and Regional Cattle Slaughter and Beef Processing Plants, 2016

Company Name	City, State	Daily capacity (head)	Distance from Iowa border (miles)
Agri Star	Postville, IA	500	
Iowa Premium	Tama, IA	1,200	
Thunder Ridge Beef Company	Sigourney, IA	50	
Iowa Subtotal		1,750	
Nebraska Beef, Inc.	Omaha, NE	2,200	5
Greater Omaha Packing Company, Inc.	Omaha, NE	2,900	5
Tyson Fresh Meats	Dakota City, NE	6,000	5
Tyson Fresh Meats	Joslin, IL	3,000	15
Cargill Meat Solutions	Schuyler, NE	4,800	80
Aurora Packing Company	Aurora, IL	525	140
JBS Swift and Company	Grand Island, NE	6,000	150
DemKota Ranch Beef	Aberdeen, SD	1,500	220
Tyson Fresh Meats	Lexington, NE	4,800	225
JBS Packerland, Inc.	Green Bay, WI	2,200	230
JBS Packerland, Inc.	Plainwell, MI	1,700	310
Creekstone Farms	Arkansas City, KS	1,300	340
Cargill Meat Solutions	Dodge City, KS	5,000	400
National Beef Packing Company	Dodge City, KS	6,000	400
Tyson Fresh Meats	Holcomb, KS	5,000	450
National Beef Packing Company	Liberal, KS	6,000	490
Regional Subtotal		58,925	

Source: Cattle Buyers Weekly and personal communication.



Figure 9. Fed Cattle Packing Plants within 200 and 500 Miles of an Iowa Border, 2016

Source: Cattle Buyers Weekly and personal communication.

Concentration in fed cattle slaughter remains extremely focused in four states (Table 2). Nebraska continues to rank first, accounting for just under one-quarter of the U.S. market share of fed cattle slaughtered in 2016. Over the past five years, Nebraska has seen a 4 percent increase in fed beef processed. The other top states of Kansas, Texas, and Colorado had percentages remaining relatively steady at about 20 percent, 19 percent, and 7 percent, respectively. Packers within these states have grown to control a market share of 70 percent.

Table 2. Select State Share of U.S. Fed Cattle Slaughter: 2001, 2006, 2011, 2016

State	2001	2006	2011	2016
Nebraska	22.1%	21.2%	20.4%	23.9%
Kansas	20.8%	22.7%	19.0%	20.3%
Texas	18.5%	19.5%	20.3%	17.9%
Colorado	7.5%	6.4%	7.4%	8.1%
Total	68.8%	69.8%	67.1%	70.2%

Source: United States Department of Agriculture National Agricultural Statistics Service.

Over the past 15 years, Iowa's market share of cattle on feed has increased from 7.3 percent to 8.9 percent (Table 3). Iowa, in combination with Nebraska, South Dakota, Minnesota, Wisconsin, Illinois, and Missouri, accounted for nearly 38 percent of the U.S. cattle on feed as of January 1, 2017, compared to 32 percent 15 years earlier. Iowa and the upper Midwest have quietly been regaining market share in recent years due to many factors including competitively priced corn and corn coproducts, improved production efficiencies compared to other regions, and expanded value-added market opportunities, including a growing share of the industry's slaughter capacity.

Table 3. Select State Share of U.S. Cattle on Feed: January 1, 2002, 2007, 2012, 2017

State	2002	2007	2012	2017
Nebraska	17.1%	18.4%	18.5%	18.9%
Iowa	7.3%	8.5%	9.1%	8.9%
South Dakota	2.6%	2.9%	2.6%	2.9%
Minnesota	2.0%	1.9%	2.4%	2.9%
Wisconsin	1.4%	1.6%	1.9%	2.1%
Illinois	1.6%	1.5%	1.7%	2.0%
Total	32.0%	34.9%	36.1%	37.6%

Source: United States Department of Agriculture National Agricultural Statistics Service.

Cattle Production Inputs and Costs

Total inputs used by the Iowa cattle industry are estimated using a budgeting approach that aggregates average cattle production costs for the total number of cattle marketed in Iowa in 2016. The aggregate costs of inputs used in the cattle industry are based on average live-stock budgets for 2016 representing local costs (Table 4). Individual producer costs and efficiencies may vary.

Figure 10 presents a schematic summary of components and linkages within the cattle production sector. The values summarized in this table represent aggregate input purchases based on budgeted averages calculated on a per calf basis in Table 4. This analysis excludes cattle purchases between cattle production sectors.

The estimated total value of cash inputs, total feed costs and total non-feed variable costs, used in Iowa sum to an estimated \$1.22 billion, or \$1.38 billion if a \$13 per hour average value is assigned to the 12.04 million total hours of labor used in cattle production in Iowa. These hours are based on an estimate of average hours of labor used per calf until marketed by existing producers in Iowa. Total fixed costs including depreciation and interest on assets is \$235.87 million.

Table 4. Cost of Inputs used in Iowa Beef Cattle Industry, 2016

	Units		Cost (\$1,000)
Variable Costs			
Feed Costs			
Corn	79,542,883	Bushels	\$264,963
Dried distillers grains	1,296,085	Tons	\$157,017
Corn silage	2,349,109	Tons	\$78,251
Supplement and minerals	2,560,055	Hundredweight	\$86,402
Alfalfa	317,816	Tons	\$29,557
Other hay	1,778,689	Tons	\$138,738
Cornstalks	265,675	Tons	\$7,080
Pasture	2,357,321	Acres	\$157,940
Other grazing	3,563,826	Acres	\$42,766
Total			\$962,714
Non-feed variable costs			
Veterinary and health			\$85,292
Machinery, equipment, fuel, and repairs			\$79,401
Marketing and miscellaneous			\$76,124
Interest on feed and other costs			\$20,282
Labor	12,040,062	Hours	\$156,792
Total			\$417,891
Fixed Costs			
Machinery, equipment, and fences			\$120,061
Interest and insurance on herd			\$77,513
Bull charge and/or artificial insemination			\$38,311
Total			\$235,886
Total All Costs			\$1,616,490



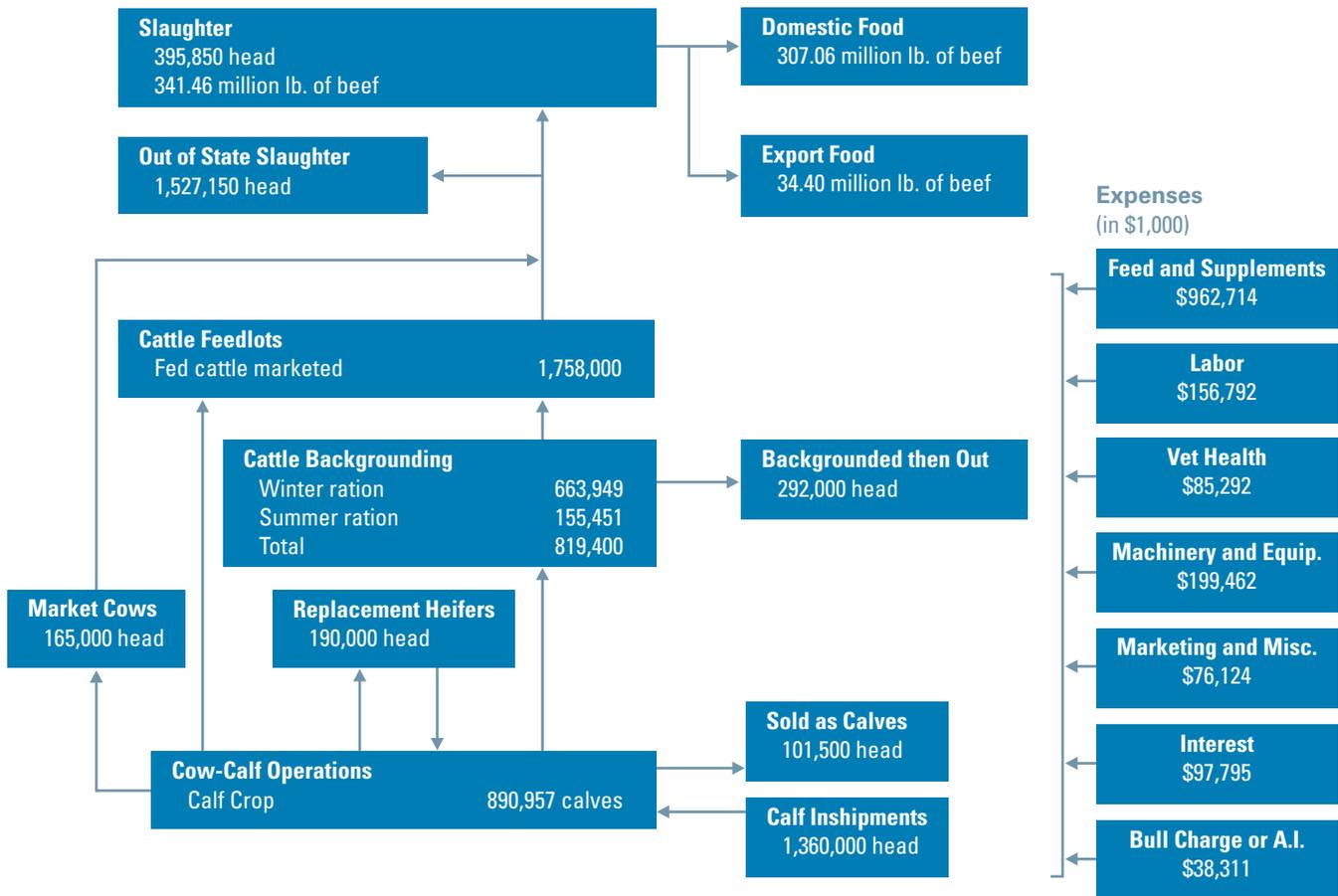


Figure 10. Iowa Beef Production Flowchart

The largest single category of expenditure, excluding cattle purchases, is feed costs, valued at \$962.71 million. The budgeted feed inputs for Iowa cattle production were combined with USDA National Agricultural Statistics Service reported grain and feedstuff production in Iowa to generate estimates of corn, dried distillers grains, corn silage, hay, and pasture use by Iowa cattle.

In 2016, an estimated 79.54 million bushels of corn grain were fed to cattle directly (Table 5). Another 152.48 million bushels of corn grain were processed into ethanol and co-products before being fed to cattle. Actual corn production by the state of Iowa totaled 2.74 billion bushels in 2016 with about 50 percent (1.37 billion bushels) refined into biofuels. Iowa cattle production used 3 percent of the total corn production

and 11 percent of the corn co-products produced. Iowa harvested 7.92 million tons of corn silage in 2016 with cattle consuming an estimated 2.35 million tons or 30 percent of production. Although Iowa cattle consume only 3 percent of Iowa's corn crop directly, over 9 percent of the Iowa corn acreage contributes to feed for Iowa cattle. However, this does not include the contribution of cornstalks as a feed resource for both beef cows and feedlot cattle. Both uses are a growing trend that is not measured accurately. In terms of forage usage, an estimated 2.10 million tons or 65 percent of Iowa's total 3.21 million tons of hay production in 2016 was fed to cattle. Iowa cow-calf and backgrounding operations utilized 84 percent of the pasture acres in Iowa.

Table 5. Share of Iowa Feedstuff Production Fed to Iowa Cattle, 2016

	Iowa Production (USDA)	Cattle Feed Use (Budgeted)	% of Iowa
Corn, bushels	2,740,500,000	79,542,883	3
Corn coproducts, tons	11,631,390	1,296,085	11
Corn silage, tons	7,920,000	2,349,109	30
Hay, tons	3,210,000	2,096,505	65
Pasture, acres	2,791,308	2,357,321	84

The modeled results demonstrate that Iowa produces adequate grain and feedstuffs for current cattle feed use within the state. The use of this scale of feed helps support prices as well as local elevators and transportation services based in rural areas. Further, feeding grain and feedstuffs to cattle is a beneficial strategy for Iowa farmers to add value to their crop.

Contribution to Iowa's Economy

The beef industry generates considerable contributions through its forward and backward linkages in the economy. The backward linkages include purchased inputs, supplies, and services used by cattle producers as shown in Figure 10. The forward linkages include further value-added economic activities occurring beyond the farm gate such as slaughter and processing.

The following analysis is an evaluation of the economic worth of cattle production and cattle slaughtering and beef processing in Iowa. The analysis is conducted with a modified input-output (I-O) model of the Iowa economy that is driven by cattle marketing estimates produced

by the United States Department of Agriculture. The modeling system is called IMPLAN, which has been maintained continuously at Iowa State University since 1985.² This system of analysis accounts for all inter-industrial transactions that industries make in the Iowa economy, and in so doing generates the multiplier effect of a particular type of economic activity.

The I-O model was adjusted to reflect 2016 marketing values for the cattle production sector, and then the model was run to determine the multiplied-through simulative value of beef production in Iowa. Combining information in the modeling system with USDA data on cattle calf sales, the beef production sector in Iowa initially accounted for \$3.86 billion in total sales and 19,075 farm-level jobs.

This analysis also measures the economic value of cattle slaughter and beef processing in Iowa. This sector was measured indirectly by relying on a combination of cattle slaughter and beef processing production data and the values that were contained in the I-O system under that sector. The largest packing plant was found in the Tama County sector of the I-O model. Data on the number of animals slaughtered daily for Iowa's other primary beef processing facilities relative to the daily amounts at the Tama plant were used to infer their respective economic outputs. Total values for this sector were made by summing the estimated employment in the three beef packing facilities in Iowa plus an estimate of employment in small locker plants across the state—those with 10 employees or fewer. For those smaller operations, it was assumed that 50 percent of the locker plant labor was processing beef. In all, the cattle slaughter and beef processing industry was initially assumed to have \$230.56 million in total output in 2016 and 453 jobholders.

² IMPLAN, Inc., is a private company based in North Carolina. This system of analysis was originally developed by the U.S. Department of Interior and then spun off into a private firm originally called the Minnesota IMPLAN Group (MIG), which upon an acquisition in the early 2010s became the present firm. This system of analysis is the most widely used modeling structure used by cooperative extension professionals as well as local, state, and federal government organizations tasked with measuring the regional consequences of economic change. Data for the state of Iowa and its constituent counties are purchased from the company annually so that regional economic estimates reflect the current economy as closely as possible. The core data set used for this assessment was for 2015.

Having arrived at initial values for the two sectors and after adjusting the modeling system to reflect those values, the I-O analysis then calculated the multiplied-through economic worth of these industries individually and jointly to the Iowa economy.

A guide to interpreting the I-O results is provided in Appendix C.

Cattle Production Contribution

The economic contribution of the cattle production sector of the Iowa economy first describes the statewide totals attributable to this industry and then allocates those statewide impacts to the counties.

The initial payments for inputs (feed, labor, rents, veterinary services and supplies, machinery and equipment, marketing services, and other inputs) are known as direct effects. The in-state sources for inputs used by the cattle production sector, as well as their respective input purchases to supply cattle operations, are the indirect effects. Direct sector and indirect sector workers use incomes to make household purchases; these are known as induced effects. Taken together, the sum of direct, indirect, and induced effects is known as total effects.

Direct output is analogous to annual sales. Total output includes the interlinked industry sectors that support these

levels of sales, to include all employee spending. Total value added is generated when incomes to workers and proprietors along with returns on investment are realized from the economic activity. Value added is analogous to gross domestic product (GDP) and is a preferred measure of economic worth of industrial activity.

Table 6 contains the economic contribution of the cattle producing sector of the agriculture economy. That sector had \$3.86 billion in total sales in 2016, and required 19,075 jobholders (including the farmers) earning \$737.90 million in labor income. In producing those sales, the farmers required or otherwise stimulated \$1.34 billion in inputs, which were produced by 6,111 jobholders earning \$333.55 million in labor income. When the direct jobholders (on the farm) and the indirect jobholders (in the supply sectors) converted their labor incomes into household spending, they induced \$780.34 million in additional output in Iowa, of which \$235.48 million was labor income to 6,077 workers. Combined, the cattle production sector of the Iowa economy generated \$5.98 billion in total economic output and \$2.17 billion in value added, of which \$1.31 billion was labor income to 31,264 workers in the Iowa economy created as a result of cattle production.

Table 7 allocates the values in Table 6 down to the county level for select Iowa counties. Complete county results are provided in Appendix D. The apportioning formula

Table 6. Iowa Cattle Production – Farm Level Total Economic Contribution in 2016

	Jobs	Labor Income	Value Added	Output
Direct	19,075	\$737,899,771	\$1,150,512,370	\$3,858,668,800
Indirect	6,111	\$333,545,562	\$574,882,877	\$1,336,999,254
Induced	6,077	\$235,481,595	\$440,698,086	\$780,337,849
Total	31,264	\$1,306,926,928	\$2,166,093,332	\$5,976,005,902

Table 7. Cattle Production by Select Iowa County – Farm Level Total Economic Contribution in 2016

County	Jobs	Labor Income	Value Added	Output
Sioux	3,688	\$154,190,705	\$255,554,806	\$705,046,734
Lyon	1,522	\$63,615,427	\$105,435,851	\$290,885,559
Dubuque	1,063	\$44,424,896	\$73,629,573	\$203,135,642
Carroll	894	\$37,387,574	\$61,965,955	\$170,957,043
Delaware	850	\$35,515,058	\$58,862,456	\$162,394,843

used the average of each county's share of 2016 cattle inventory and the 2012 estimate of cattle sales. Sioux, Lyon, Dubuque, Carroll, and Delaware counties stand out with all five having more than 800 jobs each directly or indirectly (including induced) associated with cattle production. Sioux County accounts for 12 percent of the total economic contribution of cattle production in Iowa.

While there was substantial variance across the counties in terms of cattle production, an average of 316 jobs were linked to this sector with \$13.2 million in labor income per county. Average multiplied-through output per county was \$60.4 million, of which \$21.9 million was payments to value added.

Cattle Slaughtering and Beef Processing Contribution

There are three cattle slaughtering and beef processing plants, plus many small animal slaughter and processing and locker operations in Iowa. An initial estimate was made for the much larger Tama plant by building a Tama County model and determining the size of that sector in that county as we have no information about the economic characteristics of the processors other than the number of head processed per day. For the other two smaller beef processing operations, their outputs were considered fixed percentages of the Tama values given their daily slaughter numbers. Additional estimates were made for the small processing and locker plants in Iowa. One-half of the employment at small locker operation was allocated to beef processing, and their workers were paid approximately 86 percent of the amount received by the larger processors. Data for this component were obtained from County Business Patterns data from the U.S. Commerce Department, and

the pay level differentials were arrived at by comparing average annual pay per job for the smaller operations with the large (more than 250 employees) meat processors. Once the characteristics of production were established for this distinct subset, a separate sector just for cattle slaughter and beef processing was established in the model.

An additional adjustment was made to the model as the I-O system automatically links to the cattle production sector when calculating economic impacts. This study, however, already has compiled the full value of cattle production to the Iowa economy, so an "upstream" linkage to the cattle production sector would result in double-counting of the economic impact. To account for this, the portion of inputs purchased from Iowa cattle producers was set to zero so the cattle slaughter and beef processing values represents only the economic outcomes associated with adding value to cattle and not with stimulating additional cattle production.

Table 8 lists the economic contribution of the cattle slaughter and beef processing sector. In 2016, those operations had \$230.56 million in direct output generated by 453 jobholders making \$22.49 million in labor income. Excluding the cattle purchases, those businesses required or otherwise caused \$72.38 million in inputs, which were produced by 408 workers making \$27.62 million in labor income. When the direct and indirect workers converted their incomes into household spending, they induced \$24.83 million in output that was produced by 193 workers earning \$7.50 million in labor income. Combined, Iowa's cattle slaughter and beef processing sector generated \$327.77 million in output and \$78.19 million in value added, of which \$57.61 million was labor income to 1,054 workers.

Table 8. Cattle Slaughter and Beef Processing Total Economic Contribution in 2016 – Excluding Animal Inputs

	Jobs	Labor Income	Value Added	Output
Direct	453	\$22,494,521	\$29,351,101	\$230,558,823
Indirect	408	\$27,620,665	\$34,832,279	\$72,375,982
Induced	193	\$7,498,225	\$14,009,115	\$24,830,903
Total	1,054	\$57,613,411	\$78,192,495	\$327,765,708

Combined Contribution

Having discretely estimated the multiplied-through size of the cattle production and the cattle slaughter and beef processing sectors, the values in Table 6 and Table 8 can be summed without worry of duplication.

Table 9 combines the cattle production and the cattle slaughter and beef processing contribution values. After all multiplied-through consequences are accounted for, production plus slaughter and processing generated \$6.30 billion in total economic output and \$2.24 billion in value added, of which \$1.36 billion was labor income to 32,317 jobholders.

To put these values into perspective, Table 10 displays the fractions of state totals explained by these two important sectors. Combined, they explained 1.6 percent of state output and state jobs. They explained 1.3 percent of value added as well as its subcomponent, labor income.

Fiscal Contribution

The labor incomes generated by the cattle production and cattle slaughter and beef processing activities in Iowa are used to pay a wide range of state and local taxes. Based on the average incidence of state and local government tax collections to the state's total personal income, the following tables summarize those tax collection estimates by type of tax.

Table 11 provides the tax collections for the cattle production sector. Based on total, multiplied-through labor income of \$1.31 billion, the state of Iowa collected \$86.95 million in taxes from all sources, and all local governments received \$53.64 million in taxes. For the state, 84.2 percent of all collections came from sales taxes and from individual income taxes. For local governments, 86.5 percent of all collections were from property taxes.

Table 9. Combined Cattle Production and Cattle Slaughter and Beef Processing Total Economic Contribution in 2016

	Jobs	Labor Income	Value Added	Output
Direct	19,528	\$760,394,292	\$1,179,863,471	\$4,089,227,623
Indirect	6,519	\$361,166,227	\$609,715,156	\$1,409,375,236
Induced	6,270	\$242,979,820	\$454,707,201	\$805,168,752
Total	32,317	\$1,364,540,339	\$2,244,285,827	\$6,303,771,610

Table 10. Cattle Production and Cattle Slaughter and Beef Processing Share of State of Iowa Totals, 2016

Contribution	% of Iowa
Output	1.6%
Value Added	1.3%
Labor Income	1.3%
Jobs	1.6%



Table 12 lists the tax collections for the cattle slaughter and beef processing sector in the Iowa economy. Based on total, multiplied-through labor income of \$57.61 million, the state of Iowa collected \$3.83 million in total taxes, and local governments received \$2.36 million.

Combining Tables 11 and 12, the state of Iowa received \$90.78 million in tax collections, and all local governments received \$56.01 million from the \$1.36 billion in labor income generated in 2016 from cattle production, slaughter, and beef processing (Table 13).

Table 11. State and Local Government Tax Revenues from Cattle Production Economic Contribution in 2016

	State	Local	Total State and Local
Property	\$16,766	\$ 46,366,047	\$46,382,813
Sales and gross receipts	\$40,389,127	\$5,461,712	\$45,850,840
Individual income	\$32,847,927	\$986,228	\$33,834,155
Corporate income	\$4,383,089	-	\$4,383,089
Motor vehicle license	\$5,621,097	-	\$5,621,097
Other taxes	\$3,689,365	\$827,950	\$4,517,315
Total	\$86,947,373	\$53,641,937	\$140,589,310

Table 12. State and Local Government Tax Revenues from Cattle Slaughter and Beef Processing Economic Contribution in 2016

	State	Local	Total State and Local
Property	\$739	\$2,043,960	\$2,044,699
Sales and gross receipts	\$1,780,479	\$240,769	\$2,021,248
Individual income	\$1,448,039	\$43,476	\$1,491,515
Corporate income	\$193,220	-	\$193,220
Motor vehicle license	\$247,795	-	\$247,795
Other taxes	\$162,639	\$36,499	\$199,137
Total	\$3,832,911	\$2,364,704	\$6,197,615

Table 13. State and Local Government Tax Revenues from Cattle Slaughter and Beef Processing Economic Contribution in 2016

	State	Local	Total State and Local
Property	\$17,506	\$48,410,007	\$48,427,512
Sales and gross receipts	\$42,169,606	\$5,702,482	\$47,872,087
Individual income	\$34,295,966	\$1,029,704	\$35,325,670
Corporate income	\$4,576,310	-	\$4,576,310
Motor vehicle license	\$5,868,893	-	\$5,868,893
Other taxes	\$3,852,004	\$864,449	\$4,716,453
Total	\$90,780,284	\$56,006,641	\$146,786,924

Opportunities for Beef Industry Growth in Iowa

Land and Water Stewardship

From 2007 to 2012, Iowa's pastureland acres decreased by 21 percent according to the 2012 Census of Agriculture. This occurred over a period when Iowa beef cow numbers declined by only 2 percent compared to a national decline of more than 13 percent—a testament to improved productivity over that time period. Narrowing margins for crop production and improved profitability of the beef cow-calf enterprise in recent years appears to have reduced this trend of declining pasture acres.

In addition to economics, improved water quality is a front and center issue for agriculture, and cattle can contribute to water quality improvement efforts for the state. The Iowa Nutrient Reduction Strategy has set forth a goal of reducing nitrogen (N) and phosphorus (P) levels in surface water leaving the state by 41 percent and 29 percent, respectively. As part of this strategy, a nonpoint source science assessment estimated that grazed pastureland had an 85 percent reduction in nitrate-N and 59 percent reduction in P leaching compared to an annual corn-soybean rotation. Within traditional corn-soybean rotations, cover crops are an important strategy to retain nutrients as well as improve soil health. Cattle can capitalize on this forage through extended grazing days or as a silage crop, thus further incentivizing the use of cover crops for both crop and livestock producers.

According to the 2014 Iowa Beef Center survey of Iowa feedlot operators, 24 percent indicated they typically grow cover crops on their farms, and the 2017 Iowa Beef Center grazing survey indicated that 65 percent of respondents who have row crop enterprises utilize cover crops, demonstrating that **cattlemen are leaders in adapting this important water quality improvement strategy**. While cattlemen have been



leading the charge for cover crop adoption, results from the 2017 survey indicate that only 78 percent of the row crop acres seeded to cover crops are utilized for grazing purposes or harvested as a feed resource for cattle. Although use of cover crops has grown rapidly in popularity in the past few years, there is still a void in meeting the goal set forth by Iowa Nutrient Reduction Strategy. Thus, **cover crops represent an underutilized opportunity for cattlemen across the state which could increase efficiency of the state's beef industry**. A vibrant cattle industry can contribute to water quality improvement goals for the state through productive use of marginal crop lands converted to forage production and cover crops.

In addition to protecting Iowa's water quality, many management decisions to benefit grazing livestock also positively impact wildlife habitat. The change in Iowa scenery from prairie to row crop production impacted wildlife species and as a result, the remaining forage ground plays a vital role in preserving the wildlife habitat. Although multiple forage systems benefit wildlife species, rotational grazing systems provide the most noted benefit to wildlife habitat. Typically, forage species are more diverse in a paddock system because of the recovery periods and results in a more desirable characteristic for wildlife. Other common practices such as stockpiling forages and introducing warm-season grasses also allow for refuge areas. In an effort to protect surface waters, many producers limit cattle access to streams or ponds by fencing off the water

body and allowing only flash grazing throughout the summer. In turn, this also encourages wildlife habitat. While perhaps not the primary reason, many cattlemen also are habitat managers as several of the management practices implemented to increase productivity of the cow herd also have positive benefits to wildlife.

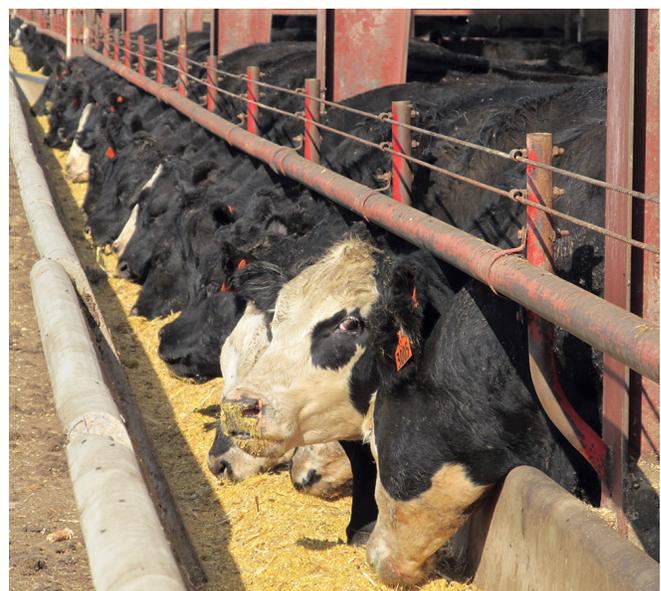
Biorenewable Resources and Crop Residues

The ethanol industry in Iowa has the capacity to produce roughly four billion gallons of ethanol per year, representing more than 25 percent of the total U.S. ethanol production. As a result of ethanol production, the 45 Iowa biorefineries produce a surplus of high quality, cost effective corn coproducts to Iowa's cow-calf and feedlot industries. The majority of Iowa's cattle feeding industry, including all three major cattle feeding counties (Sioux, Lyon, and Carroll) are located within 25 miles of an ethanol plant. Thus, most Iowa feedlots have readily available access to competitively priced distillers grains. Nearly half of the distillers grains produced in the U.S. are consumed by beef cattle according to the 2016 Renewable Fuels Association Annual Industry Outlook. The availability of corn coproducts for cattle feeding has been identified as a major contributor to regional shifts in cattle feeding toward states like Iowa and Nebraska between 2003 and 2013.

Cornstalks represent an almost unlimited and greatly underutilized forage resource in Iowa. Based on University of Nebraska calculations, each acre of cornstalks can provide more than 50 days of grazing for a beef cow and more than 100 days of forage for a 600-pound calf with proper supplementation. With 13 million acres of cornstalks available in the state, this quantity greatly exceeds the number of cattle. Cornstalks are deficient in protein, energy, and certain minerals to meet cattle requirements in many beef production situations; however, these same nutrients are abundant in ethanol coproducts and easily supplemented. Use of cornstalks as a roughage source in feedlots and a low quality, cost effective feed source for beef cows has been increasing. We also estimate that nearly 200,000

tons of cornstalks—or more than 332,000 twelve-hundred pound large round bales—are used for bedding for deep bedded feedlot facilities annually. Similarly, confined cow systems currently are being tested by some producers across the state, especially in areas with limited pasture availability, and are heavily relying on cornstalks for bedding and feed. While it would be extremely difficult to estimate the number of corn acres grazed or used for feed per year, the corn residue utilized for bedding alone accounts for less than 1 percent of the available corn residue in Iowa that could be sustainably removed from the field.

Despite Iowa being in the top 20 percent nationally for cow-calf production and top 10 percent of cattle on feed, ***Iowa is a net exporter of calves and a net importer of yearling cattle.*** The majority of Iowa's calves leave the state post-weaning, and Iowa feedlots tend to purchase yearling cattle from outside the state. While there is not a surplus of underutilized pasture acres across the state, the ***expanded use of cover crops and more efficient use of abundant cornstalk acres may provide an opportunity for producers to background calves on, and ultimately help grow a valuable Iowa stocker industry.***

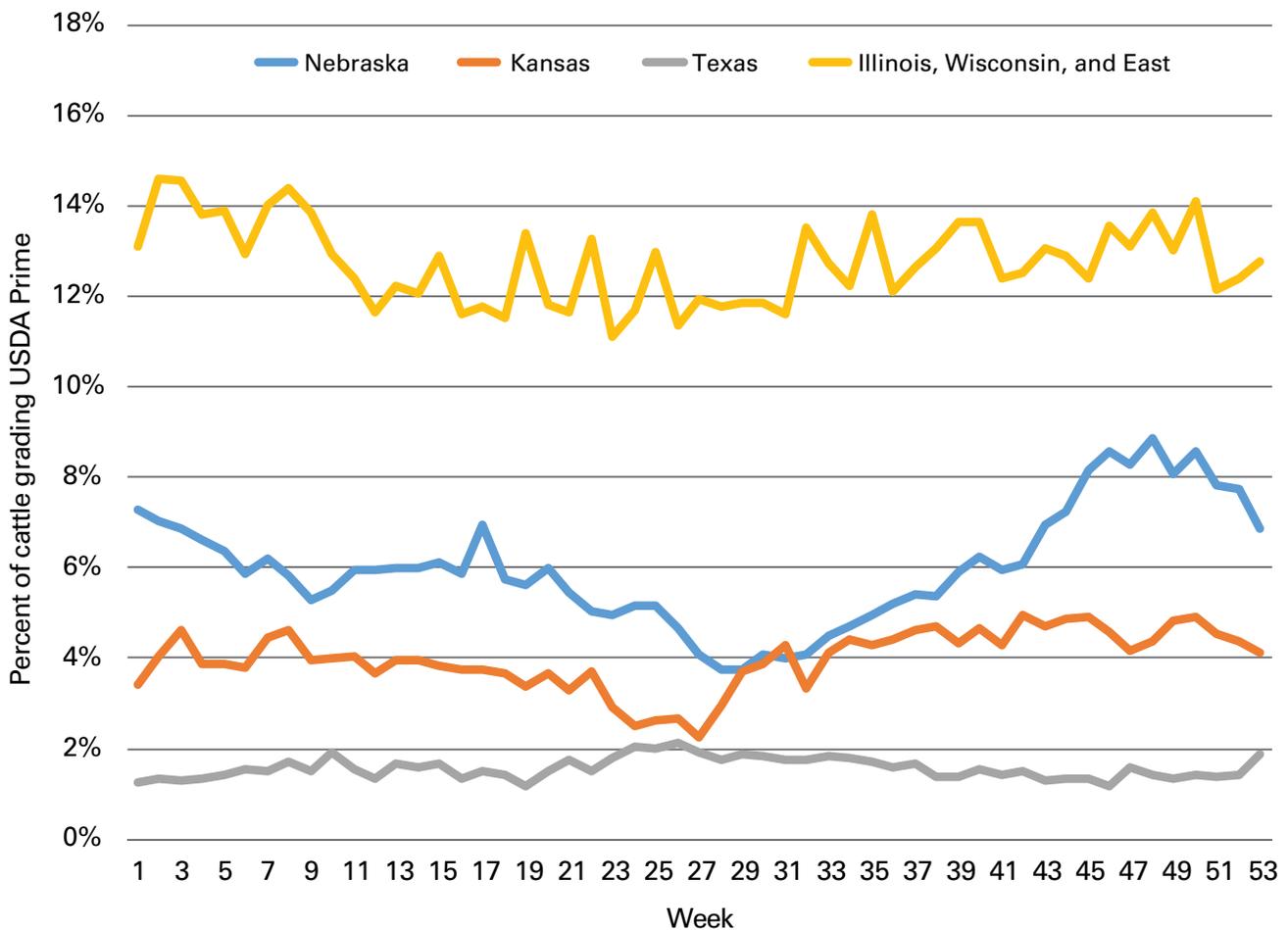


High Quality Beef Production

Iowa is competitive in the commodity beef business, but Iowa's additional strengths lie in quality specification products for the beef market. Iowa has a reputation for producing high quality cattle due to its proximity to an abundant supply of corn and corn coproducts, quality genetics, and excellent stockmanship. Because most fed cattle are marketed and slaughtered outside the state, precise data to document Iowa's advantage in carcass quality is not available. However, steer and heifer estimated grading percent is reported by USDA for the three largest fed cattle slaughter states (Nebraska, Kansas, and Texas) and by region. The majority of Iowa cattle are slaughtered in either Nebraska or east of the Mississippi River.



Courtesy of the Beef Checkoff



Source: United States Department of Agriculture Market News Service.

Figure 11. USDA National Steer and Heifer Estimated Grading Percent Report Weekly Percent Prime Grade by State, 2016

As the percent of cattle grading USDA Choice and higher has continued to increase annually on a national basis (71 percent in the 2016 National Beef Quality Audit), consumer demand for premium cuts has increased simultaneously. Figure 11 shows the percent of cattle grading USDA Prime in Nebraska averaged 6 percent and peaked at 9 percent while cattle slaughtered in plants east of the Mississippi (including Illinois and Wisconsin) ranged from 11 percent to 14 percent in 2016. This is considerably higher than the 4 percent of USDA Prime carcasses noted in the 2016 National Beef Quality Audit. Because Nebraska, Illinois, and to some extent Wisconsin, are where the majority of Iowa cattle are slaughtered, it is reasonable to assume that the portion of Iowa fed cattle grading USDA Prime falls somewhere between 6 percent and 13 percent which ultimately is well above the national average of 4 percent. As demand increases worldwide for high quality, grain fed beef, Iowa is in an excellent position to continue to be a reliable supplier.

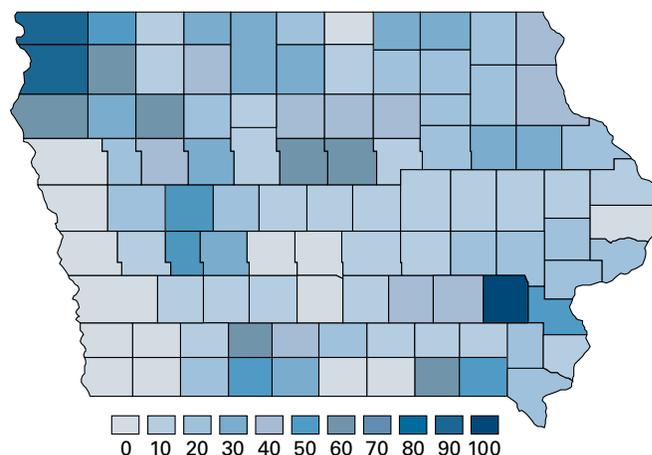
Value Added Opportunities

As consumers ask more questions about where their food comes from, both domestically and internationally, interest has increased in verified programs. For example, while slow to develop, the newly opened Chinese market requires traceability to the farm of birth. ***In Iowa, the proximity of a large beef cow inventory to cattle feeding improves the potential for cooperation and information exchange.*** Iowa pioneered a certified preconditioning program which was one of the first process verified programs.

Based on the 2014 Iowa Beef Center cow-calf producer survey, approximately one-third of Iowa producers participate in a verified health program. Furthermore, 90 percent of respondents tag their calves with individual ear tags, allowing the opportunity to take the first step in source and process verified programs. More than 40 percent of respondents indicated that documentation and sharing of herd records would expand market opportunities. The Iowa cow-calf industry

is well equipped to participate in verified programs as the programs develop. To fully capture this economic value, it is necessary to harvest cattle and process beef in Iowa.

Iowa is a national leader in red meat and egg production and is in the top 25 percent nationally in milk production. As a result, the management of manure nutrients is extremely important. Iowa also leads the nation in acres of corn and soybean production available to utilize the nutrients from livestock production. Figure 12 shows that on a county wide basis, Iowa has a sufficient crop base to utilize manure nutrients. Only a few counties in northwest Iowa approach the balance where manure nutrients would need to be exported to a neighboring county.



Source: Andersen, Iowa State University Animal Industry Report ASL R2904- 2014.

Figure 12. Manure Nitrogen Availability as a Percent of Crop Utilization Capacity

In the 2014 Iowa Beef Center survey of Iowa feedlot operators, 99 percent of respondents indicated that they owned sufficient crop ground to utilize manure nutrients produced. ***This synergy between crop production and cattle feeding is key to economic and environmental sustainability of cattle feeding in Iowa.*** Cattle production adds economic value to Iowa’s corn and forage production while allowing the efficient recycling of manure nutrients to reduce the cost of production for those crops.

To improve manure quality and cattle efficiency, new technologies in cattle housing are being used to grow or expand cattle feeding operations. In fact, according to the 2014 Iowa Beef Center feedlot operator survey, 75 percent of Iowa feedlots are open lots and of those, two-thirds have shelter available. The remaining 25 percent of feedlots are considered confinements. However, half of Iowa's cattle feeding sector expansion over the past five years has occurred in confined housing. Confined housing systems capture more manure value because the manure is contained and protected from environmental elements. This, along with improved feed efficiency, is likely a main driver for the increased popularity of these confine housing systems, despite increased construction costs.

Infrastructure Advantages

Iowa has excellent industry infrastructure and partners. The Iowa Cattlemen's Association is a member-based organization connecting Iowa's beef businesses to operational success through advocacy, leadership, and education. The Iowa Beef Industry Council works for the cattle producers of Iowa in areas of education, promotion, and research. Iowa State University has a strong legacy of providing support to the beef industry through research, extension, and teaching. The Iowa Beef Center is Iowa State University Extension and Outreach's program to cattle producers and delivers the latest research-based information to improve the profitability and vitality of Iowa's beef industry. The Coalition to Support Iowa's Farmers was established to help livestock farmers raise livestock successfully and responsibly manage change in their operations. The state's private and public veterinary and diagnostic services, feed industry, agribusinesses, and other industry stakeholders provide invaluable support to the Iowa Beef Industry.



Farm Succession and Entry into the Industry

The 2012 Census of Agriculture reported that 24 percent of Iowa cow-calf and 17 percent of Iowa cattle feedlot principal operators are over the age of 64. An additional 25 percent of cow-calf principal operators and 26 percent of cattle feedlot principal operators are between 55 and 64 years of age. There are over four times more cow-calf principal operators and over three times more cattle feedlot principal operators over 54 than under 35. Furthermore, these older producers account for nearly half of total Iowa cattle and calf sales, with 15 percent of sales accounted for by principal operators (farming and other occupations) age 65 and over, and an additional 31 percent of sales accounted for by principal operators age 55 to 64. As such, older producers who hold most of the equity will need to be involved in facilitating the transition to the younger generation.

The 2014 Iowa Beef Center cow-calf and feedlot operator surveys indicated 49 percent of cow-calf operators and 52 percent of feedlot operators expect to exit the profession within the next 10 years. Thirty-eight percent of the cow-calf producers and 39 percent of the feedlot operators who expect to be raising cattle for 10 more years or less do not have a succession plan in place. This is particularly concerning, as a realistic time frame for many farm succession situations is 10 to 15 years.

In those same surveys, producers were asked to identify factors perceived as either an obstacle or attraction for future generations entering cattle production. Cow-calf producers said that they view rural lifestyle, self-employment, working with livestock, and working with family as the biggest attractions while the biggest perceived obstacles were environmental regulations, land tax policy, and expansion of corn and soybean acres. Feedlot operators identified the same attractions as the cow-calf group; however, their highest-ranking obstacles were mostly different except for environmental regulations, and included work hours, labor availability, and costs.

With current demographics, including producer age and an equity distribution skewed to older producers, a large share of productive assets in the Iowa beef cattle industry likely will change hands over the next decade. Public policy will influence how and to whom these assets will be transferred, which in turn will help shape beef cattle production for generations to come. This makes it crucial to explore and evaluate alternative policies so policy makers, stakeholder groups, and educators can assess possible pathways of successful farm transition.

Policies that target environmental regulations, competition for land, capital availability and costs, and land tax policy could help facilitate the intergenerational transfer of assets in the beef cattle industry in the coming years. Education and farm linking programs also could be developed to better facilitate transition. New entrants into the cattle business often lack capital but bring labor and education. Custom feeding or backgrounding and cow-share or lease agreements offer an opportunity for the next generation to enter the business while building equity.

Programs and support exist for young and beginning cattle producers. These include the Transition Incentives Program provision in the Conservation Reserve Program, loans from the U.S. Department of Agriculture Farm Service Agency and the Farm Credit System, financial and technical conservation assistance provided by the Natural Resources Conservation Service, the Beginning Farmer Center and the Start-to-Farm program offered by Iowa State University Extension and Outreach, the Young Cattlemen's Leadership Program (YCLP) through the Iowa Cattlemen's Association, the Young Farmer Program of the Iowa Farm Bureau, and programs from the Coalition to Support Iowa's Farmers.



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Appendix C. Interpretation of Input-Output Tables

To aid in interpretation, a short primer on the information produced in an input-output modeling system follows. I-O models generate a vast array of information for analysts. For purposes of this study, however, a typical I-O results table comprises four types of data and four levels of data.

The types of economic outcomes data are:

- **Output.** This is the value of industrial production over the course of a year. It represents the worth of what was produced whether it was sold or not. For public institutions, output usually is represented by annual expenditures. In this instance we are using total marketings to measure the output value of cattle production for 2016. Estimated jobs in cattle slaughter and beef processing was used to determine the output based on that overall sector's average output per worker.
- **Labor income.** These are wage and salary payments to workers, including employer-provided benefits. Salary-like payments to proprietors, like farmers, for their management of businesses are also counted as labor income payments.
- **Value added.** Value added includes all labor income (mentioned above) plus payments to investors (dividends, interests, and rents), and indirect tax payments to governments. Value added is the equivalent of gross domestic product (GDP), which is the standard measure of economic activity across the states and for the nation.
- **Jobs.** There are many kinds of jobs. I-O models measure the annualized job value in different industries. Many industries have mostly full-time jobs, but many others have part-time and seasonal jobs, as is the case in this study. I-O models do not convert jobs into full-time equivalencies, but they do convert them into annualized equivalencies.

The levels of economic outcomes data are:

- **Direct values.** In this study, the direct values will be those made by cattle producers or by the beef packing operations.
- **Indirect values.** All direct firms require intermediate inputs into production. They must buy supplies, utilities, other agricultural or manufactured inputs, transportation, and services, just to name a few.
- **Induced values.** When the workers in the direct industries, and those in the indirect industries (the supplying sectors) convert their labor incomes into household spending they induce a third round of economic activity. Induced values are sometimes called the household values.
- **Total values.** The sum of direct, indirect, and induced activity constitutes the total economic contribution that is being measured. In short it gives the economic sums of the studied industry, its suppliers, and all affected households.

Appendix D. Cattle Production Total Economic Impacts by County

County	Jobs	Labor Income	Value Added	Output
Adair	279	\$11,667,950	\$19,338,394	\$53,352,436
Adams	177	\$7,405,334	\$12,273,559	\$33,861,358
Allamakee	419	\$17,516,664	\$29,032,020	\$80,096,052
Appanoose	159	\$6,627,145	\$10,983,792	\$30,303,037
Audubon	312	\$13,040,316	\$21,612,947	\$59,627,670
Benton	322	\$13,474,181	\$22,332,031	\$61,611,541
Black Hawk	177	\$7,397,155	\$12,260,003	\$33,823,957
Boone	135	\$5,636,735	\$9,342,293	\$25,774,328
Bremer	203	\$8,492,231	\$14,074,976	\$38,831,262
Buchanan	214	\$8,942,766	\$14,821,691	\$40,891,364
Buena Vista	261	\$10,909,368	\$18,081,125	\$49,883,773
Butler	154	\$6,458,569	\$10,704,396	\$29,532,216
Calhoun	175	\$7,324,713	\$12,139,938	\$33,492,714
Carroll	894	\$37,387,574	\$61,965,955	\$170,957,043
Cass	370	\$15,448,234	\$25,603,816	\$70,638,025
Cedar	170	\$7,093,808	\$11,757,238	\$32,436,886
Cerro Gordo	71	\$2,961,803	\$4,908,875	\$13,543,029
Cherokee	450	\$18,810,214	\$31,175,943	\$86,010,891
Chickasaw	349	\$14,605,342	\$24,206,811	\$66,783,847
Clarke	163	\$6,804,402	\$11,277,577	\$31,113,556
Clay	262	\$10,951,367	\$18,150,734	\$50,075,816

Appendix D. Cattle Production Total Economic Impacts by County

County	Jobs	Labor Income	Value Added	Output
Clayton	503	\$21,027,683	\$34,851,163	\$96,150,407
Clinton	556	\$23,252,536	\$38,538,622	\$106,323,689
Crawford	367	\$15,326,783	\$25,402,523	\$70,082,681
Dallas	167	\$6,971,527	\$11,554,569	\$31,877,745
Davis	175	\$7,306,894	\$12,110,405	\$33,411,234
Decatur	348	\$14,556,419	\$24,125,726	\$66,560,144
Delaware	850	\$35,515,058	\$58,862,456	\$162,394,843
Des Moines	44	\$1,837,699	\$3,045,791	\$8,402,993
Dickinson	216	\$9,016,130	\$14,943,283	\$41,226,823
Dubuque	1,063	\$44,424,896	\$73,629,573	\$203,135,642
Emmet	187	\$7,812,061	\$12,947,666	\$35,721,143
Fayette	478	\$19,999,784	\$33,147,530	\$91,450,277
Floyd	190	\$7,945,464	\$13,168,767	\$36,331,136
Franklin	92	\$3,854,397	\$6,388,255	\$17,624,472
Fremont	100	\$4,191,840	\$6,947,531	\$19,167,451
Greene	169	\$7,057,426	\$11,696,938	\$32,270,526
Grundy	159	\$6,656,388	\$11,032,259	\$30,436,753
Guthrie	279	\$11,653,261	\$19,314,049	\$53,285,272
Hamilton	64	\$2,689,196	\$4,457,058	\$12,296,516
Hancock	131	\$5,480,270	\$9,082,969	\$25,058,881

Appendix D. Cattle Production Total Economic Impacts by County

County	Jobs	Labor Income	Value Added	Output
Hardin	189	\$7,899,519	\$13,092,618	\$36,121,048
Harrison	209	\$8,723,802	\$14,458,781	\$39,890,137
Henry	105	\$4,405,920	\$7,302,346	\$20,146,345
Howard	276	\$11,532,297	\$19,113,564	\$52,732,155
Humboldt	92	\$3,851,742	\$6,383,855	\$17,612,333
Ida	238	\$9,960,179	\$16,507,944	\$45,543,547
Iowa	354	\$14,809,910	\$24,545,861	\$67,719,248
Jackson	747	\$31,217,127	\$51,739,090	\$142,742,282
Jasper	138	\$5,751,448	\$9,532,417	\$26,298,857
Jefferson	107	\$4,464,508	\$7,399,451	\$20,414,245
Johnson	248	\$10,379,468	\$17,202,871	\$47,460,771
Jones	524	\$21,886,672	\$36,274,847	\$100,078,190
Keokuk	186	\$7,756,912	\$12,856,262	\$35,468,969
Kossuth	236	\$9,857,956	\$16,338,521	\$45,076,128
Lee	139	\$5,821,880	\$9,649,151	\$26,620,913
Linn	224	\$9,381,284	\$15,548,487	\$42,896,512
Louisa	49	\$2,046,997	\$3,392,681	\$9,360,023
Lucas	201	\$8,411,441	\$13,941,075	\$38,461,846
Lyon	1,522	\$63,615,427	\$105,435,851	\$290,885,559
Madison	197	\$8,226,881	\$13,635,186	\$37,617,933

Appendix D. Cattle Production Total Economic Impacts by County

County	Jobs	Labor Income	Value Added	Output
Mahaska	247	\$10,326,029	\$17,114,303	\$47,216,421
Marion	180	\$7,514,655	\$12,454,747	\$34,361,234
Marshall	190	\$7,933,707	\$13,149,282	\$36,277,378
Mills	46	\$1,935,170	\$3,207,340	\$8,848,688
Mitchell	566	\$23,678,425	\$39,244,488	\$108,271,094
Monona	147	\$6,157,590	\$10,205,556	\$28,155,971
Monroe	199	\$8,334,628	\$13,813,766	\$38,110,614
Montgomery	193	\$8,051,448	\$13,344,425	\$36,815,755
Muscatine	127	\$5,295,582	\$8,776,868	\$24,214,384
O Brien	613	\$25,631,692	\$42,481,822	\$117,202,529
Osceola	426	\$17,811,702	\$29,521,014	\$81,445,132
Page	237	\$9,908,519	\$16,422,324	\$45,307,330
Palo Alto	262	\$10,931,646	\$18,118,048	\$49,985,641
Plymouth	791	\$33,066,330	\$54,803,949	\$151,197,882
Pocahontas	162	\$6,780,104	\$11,237,306	\$31,002,453
Polk	56	\$2,321,239	\$3,847,208	\$10,614,010
Pottawattamie	594	\$24,823,828	\$41,142,873	\$113,508,521
Poweshiek	237	\$9,887,189	\$16,386,972	\$45,209,797
Ringgold	361	\$15,094,458	\$25,017,470	\$69,020,363
Sac	393	\$16,428,383	\$27,228,309	\$75,119,816

Appendix D. Cattle Production Total Economic Impacts by County

County	Jobs	Labor Income	Value Added	Output
Scott	140	\$5,863,679	\$9,718,429	\$26,812,042
Shelby	345	\$14,442,809	\$23,937,430	\$66,040,655
Sioux	3,688	\$154,190,705	\$255,554,806	\$705,046,734
Story	175	\$7,325,544	\$12,141,315	\$33,496,511
Tama	267	\$11,157,247	\$18,491,958	\$51,017,216
Taylor	207	\$8,661,729	\$14,355,901	\$39,606,302
Union	281	\$11,727,220	\$19,436,628	\$53,623,453
Van Buren	138	\$5,749,592	\$9,529,342	\$26,290,374
Wapello	100	\$4,197,226	\$6,956,459	\$19,192,081
Warren	156	\$6,513,832	\$10,795,988	\$29,784,907
Washington	133	\$5,569,096	\$9,230,189	\$25,465,044
Wayne	226	\$9,466,671	\$15,690,007	\$43,286,950
Webster	64	\$2,666,610	\$4,419,624	\$12,193,242
Winnebago	70	\$2,925,672	\$4,848,992	\$13,377,818
Winneshiek	586	\$24,503,468	\$40,611,910	\$112,043,654
Woodbury	746	\$31,186,883	\$51,688,965	\$142,603,994
Worth	37	\$1,556,594	\$2,579,891	\$7,117,626
Wright	43	\$1,777,081	\$2,945,323	\$8,125,813
State of Iowa	31,264	\$1,306,926,928	\$2,166,093,332	\$5,976,005,902



Economic Importance of Iowa's Beef Industry

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