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Economic Contribution of Minnesota's Beef Industry

A REPORT OF THE ECONOMIC IMPACT ANALYSIS PROGRAM

Authored by Brigid Tuck with assistance from William Lazarus, Elizabeth Templin, and Ryan Pesch



PROGRAM SPONSOR: MINNESOTA BEEF COUNCIL

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July 2017

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EXECUTIVE SUMMARY: ECONOMIC CONTRIBUTION OF MINNESOTA'S BEEF INDUSTRY

The Minnesota Beef Council contracted with University of Minnesota Extension to conduct an economic contribution study of the Minnesota beef industry. There are more than 16,000 registered beef operations in Minnesota, but little data exists showing the industry's economic impact. **This analysis found the beef industry contributes \$4.9 billion and 47,300 jobs to Minnesota's economy.** Understanding this economic impact is valuable for future planning.

According to its mission, the Minnesota Beef Council is “dedicated to strengthening beef demand by responsibly providing a safe, wholesome, healthy, and delicious eating experience.”

The following conclusions were drawn from Extension's study:

Impact on Minnesota's Economic Output—In 2015, Minnesota's beef industry generated an estimated \$4.9 billion of economic activity in the state. Of this, \$2.3 billion was the result of direct spending by the beef industry (cow-calf operations, feedlots, and beef processors). Of the direct effect, beef production accounted for \$1.2 billion of activity and beef processing \$1.1 billion. Results also revealed an estimated \$2.6 billion in economic activity at non-beef related industries.

Impact on Non-Beef Industries—Given that most of a beef operation's inputs are produced or purchased locally, it is not surprising the industry has strong indirect and induced impacts. The biggest benefits from the beef industry occur in Minnesota's trucking, agricultural feed (hay, alfalfa, and grain), and wholesale trade industries (including agricultural elevators and cooperatives).

Impact on Minnesota's Employment—In 2015, Minnesota's beef industry supported an estimated 47,300 full and part-time jobs in the state. Of this, the industry directly employed an estimated 30,400 people. Additionally, the industry supported 16,900 jobs in non-beef related industries.

Minnesota's Beef Industry—In 2015, cattle and calf production accounted for 27 percent of Minnesota's cash receipts from livestock. In terms of cash receipts in the state, beef cattle were second only to hogs and had higher cash receipts than dairy and poultry.

There are more than 16,000 beef operations in Minnesota. In 2015, Minnesota was home to 350,000 beef cows that had calved. In addition, the state had 385,000 cattle on feed or animals fed for future processing. More than 537,000 cattle were harvested and processed.

In 2015, a major Minnesota beef processing plant closed. As demonstrated from this analysis, beef processing contributes significantly to the economy. A lack of processing for fed cattle represents a lost opportunity in Minnesota's economy.

Notes on the Analysis—To measure contributions, Extension surveyed cow-calf and feedlot operators. Published data were used to measure the contribution of the beef processing industry. Total economic contribution includes direct, indirect, and induced effects. Direct effects result from spending by cow-calf operators, feedlot operators, and beef processors. Indirect and induced effects occur across all industries and were measured using the input-output model IMPLAN. While a part of the total output figures, purchases of cattle by feedlots and processors were not included in the model to avoid double counting.

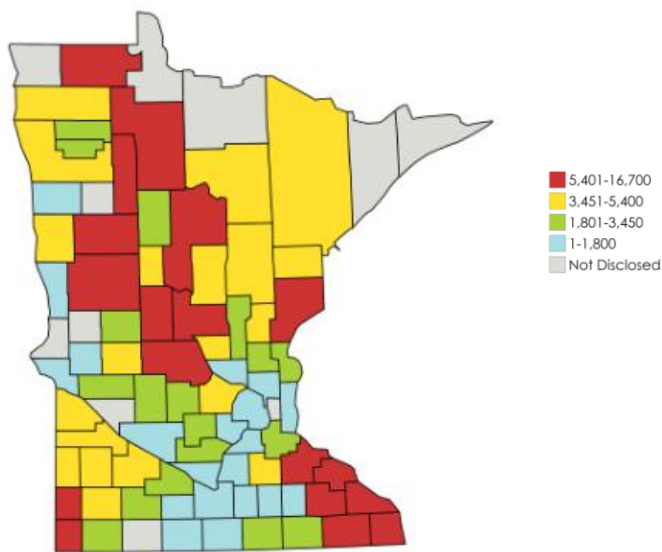


PROJECT BACKGROUND

Minnesota's beef industry is significant in size and scope. There are more than 16,000 beef operations in Minnesota. In 2015, Minnesota was home to 350,000 beef cows that had calved.¹ In addition, the state had 385,000 cattle on feed or animals fed for future processing.² In addition, more than 537,000 cattle were harvested and processed in 2015.³

Every county in the state is affected by the beef industry and nearly every county is home to a cow-calf operation (Map 1). While certain parts of the state have higher concentrations of cow-calf operations, including the Central and Southeast regions, each is home to some form of beef production.

Map 1: Number of Beef Cows that Calved by County, Minnesota, 2015



Source: USDA, NASS

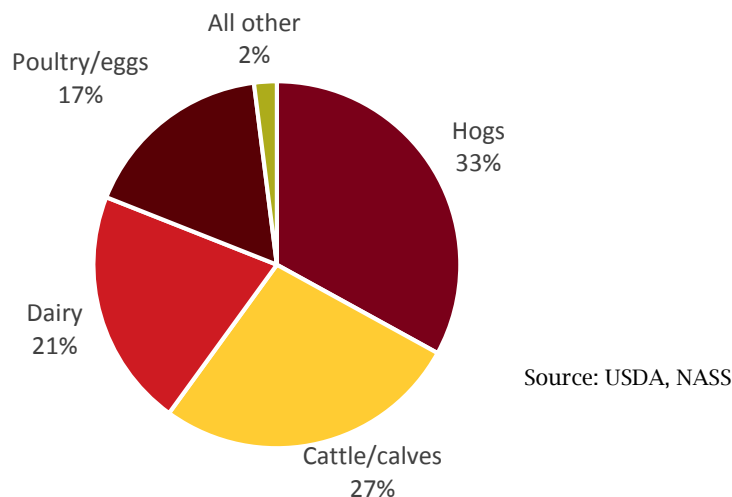
Beef production is also an important component of Minnesota's livestock industry. In 2015, cattle and calf production comprised 27 percent of Minnesota's cash receipts from livestock (Chart 1). In terms of cash receipts in the state, beef cattle were second only to hogs and had higher cash receipts than dairy and poultry.

¹ Minnesota Pollution Control Agency. Personal communication from Lisa Scheirer.

² United States Department of Agriculture, National Agricultural Statistics Service, retrieved from https://www.nass.usda.gov/Statistics_by_State/Minnesota/Publications/Livestock_Press_Releases/2015/MN_cattle01_15.pdf

³ United States Department of Agriculture, National Agricultural Statistics Service, retrieved from https://www.nass.usda.gov/Statistics_by_State/Minnesota/Publications/Annual_Statistical_Bulletin/2016/MN%20Bulletin%202016%2030.pdf

Chart 1: Livestock Cash Receipts by Sector, Minnesota 2015



While available statistics indicate the size of the beef industry in the state, little is known about its total economic contribution to Minnesota's economy. Additionally, current statistics do not adequately represent activities beyond cow-calf production and feedlot operations, such as beef processing. While the value of raising and selling a beef cow may be evident to farmers, no information exists to quantify how this process affects the economy beyond the farm gate. To gain information on the beef industry's impact in Minnesota, the Minnesota Beef Council asked University of Minnesota Extension to measure its economic contribution to the state.

Economic contribution studies measure the direct, indirect, induced, and total effects of an industry. The direct effect is the total output, labor income, and employment by the industry itself. In this study, it includes cow-calf production, feedlot production, and beef processing. Direct effect is typically quantified by conducting a survey to measure the size and scope of the industry.

Indirect and induced effects measure the connections the industry has to others that supply it and its employees. For example, beef cow-calf operations rely on local farmers to produce grain. Thus, economic output generated in the process of producing grain to feed cattle is an indirect effect. An example of an induced effect is when a beef cow-calf operator spends income from the operation to buy groceries in town for his or her family. Indirect and induced effects can be measured with input-output models.

BEEF INDUSTRY DATA COLLECTION METHODS

The first step to measure economic contribution is to determine the direct effect. To measure the direct effect of beef cow-calf operations and feedlots in Minnesota, Extension surveyed operators in the state. To quantify the direct effect of beef processing, Extension used published statistics. This section of the report describes the overall results from the cow-calf and feedlot survey. It also provides an overview of processing in the state.

There are slightly more than 16,000 beef operations (including cow-calf and feedlot) in Minnesota. Using lists provided by the Minnesota Beef Council and Extension's Beef Team, Extension randomly selected 4,000 operations to survey. On January 27, 2017, a postcard invitation was mailed to the selected operations. A reminder postcard was mailed on February 18, 2017. Three hundred eighteen survey invites were sent to wrong or inaccurate addresses, or to operations no longer in business. Thus, the final sample size from the postcard mailing was 3,682.

The Minnesota Cattleman’s Association also provided Extension with a list of email addresses. An email invitation was sent to the list on February 6, 2017 and a reminder was emailed on March 7, 2017. This list contained 876 operations. Of those, 170 had invalid email addresses. The final sample size from the email invitation, then, was 706.

The email and postcard directed respondents to the same online survey instrument. In the first question, survey respondents could self-classify themselves. Options included beef cow-calf operation only, feedlot operation only, joint beef cow-calf and feedlot operation, or other involvement in the beef industry. Cow-calf only respondents were directed to questions on cow-calf operations while feedlot-only respondents received feedlot survey questions. Respondents selecting the joint operation option were given both sets of questions. Those indicating they were involved in another way in the industry were directed to the end of the survey.

In the end, 401 operators participated in the survey. Since operations could self-classify as both cow-calf and feedlot, some operators may have responded to both sets of survey questions.

Table 1: Number of Respondents by Type of Operation

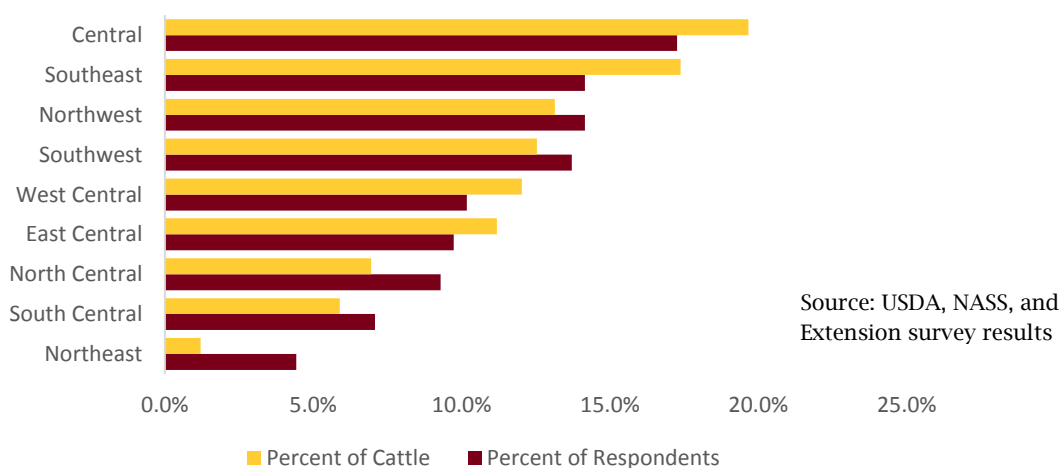
Cow-Calf Operations	Feedlot Operations
258	171

The 401 survey respondents represented a 95 percent confidence interval with a 5 percent margin of error. In other words, we are 95 percent confident that the results presented here are within 5 percent of the true value of the total population.

Cow-Calf Operation Survey Results

Operators across the state responded to the cow-calf survey (Chart 2). The number of respondents roughly mirrors the distribution of cattle by region. According to the USDA, Minnesota’s Central district has 20 percent of all beef cattle in the state. Cow-calf operations from this district provided 17 percent of all survey responses. The Northeast district appears to be slightly overrepresented in the survey results (with a higher percentage of responses compared to the percentage of cattle). A map depicting the counties in each agricultural district is included in Appendix 3.

Chart 2: Regional Breakdown of Cow-Calf Survey Responses Versus USDA Beef Cattle Inventories, by USDA Agricultural Districts



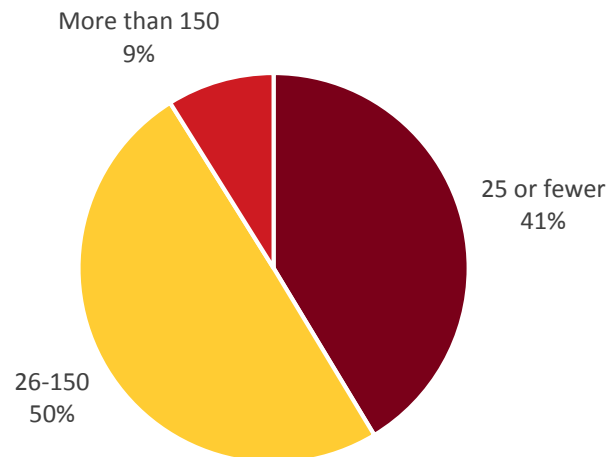
Responding cow-calf operators reported having an average of 62 cows or first calf heifers in their herd in 2015 (Table 2). These operators birthed and marketed an average of 60 calves on 350 acres of land.

Table 2: Herd and Operational Characteristics, 2015

	Average
Cows/first calf heifers	62
Calves born and marketed	60
Culls marketed	10
Other cattle in herd	12
Replacement rate	18
Acreage	350

While the average herd size was 62, operations varied in size. Slightly more than 40 percent of operations reported 25 or fewer cows/first time heifers in their herd (Chart 3). Nine percent reported having more than 150 cows/first time heifers.

Chart 3: Distribution of Cows/First Calf Heifers, Number of Responses = 191



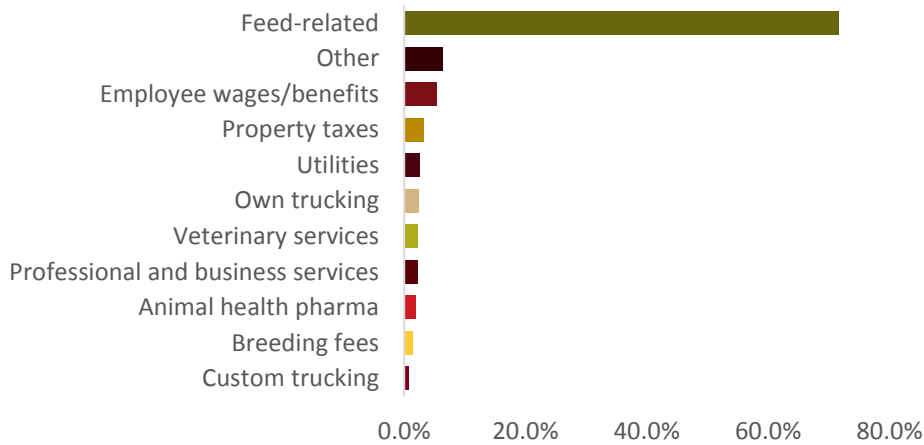
In 2015, beef cow-calf operators reported spending **\$62,600** on average. This equates to \$1,010 per cow. In comparison, the FINBIN farm financial benchmark dataset reported an average of \$849 per cow (not including profit or loss) for Minnesota in 2015.⁴ With a 95 percent confidence interval and

⁴ FINBIN is one of the largest and most accessible sources of farm financial and production benchmark information in the world. The data cited here was pulled for 2015 beef cow-calf operations in Minnesota. Access FINBIN at <https://finbin.umn.edu/>.

5 percent margin of error, that means Extension is 95 percent confident the actual value of spending per operation is between \$58,900 and \$66,400.

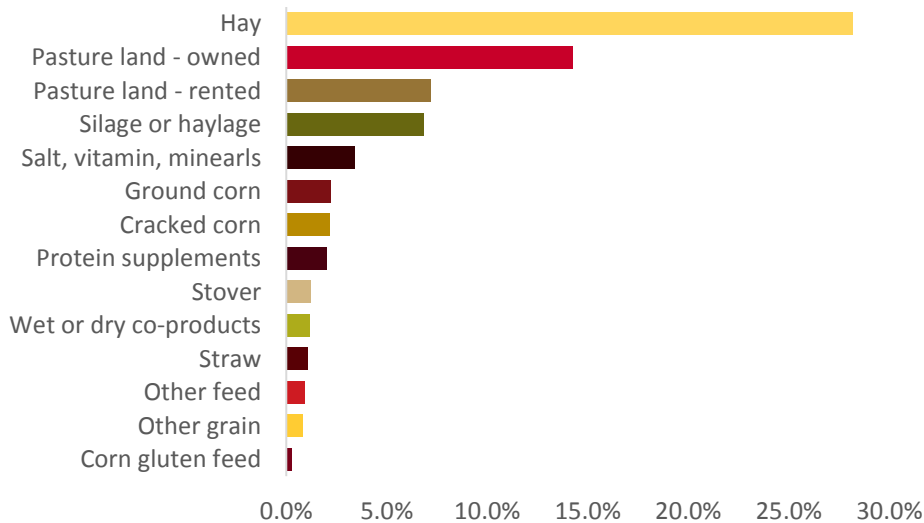
The largest expenditure by cow-calf operators is feed (Chart 4). In total, expenditures for feed, including nutritional supplements, account for 72 percent of beef cow-calf operational expenditures.⁵ On average, each operator spends an estimated \$44,600 on feed.

Chart 4: Operational Expenditures by Category, Percent, 2015



Hay comprises the largest share of expenditures for feed (Chart 5). Pastureland is also a key feed-related expenditure.

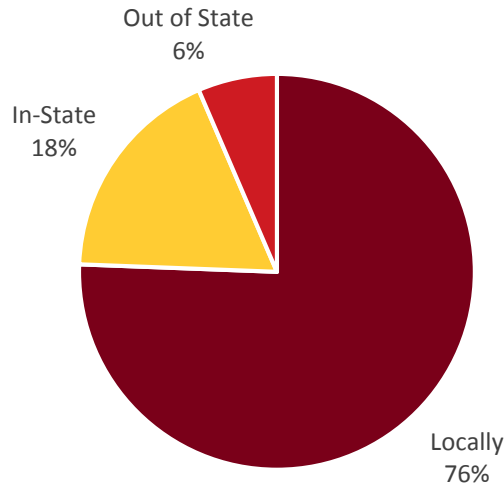
Chart 5: Expenditures by Category, Percent, Feed Only, 2015



⁵ This ratio is higher than for farms in the FINBIN database. The average for feed in that group is 60 percent. The reason for this difference is not clear.

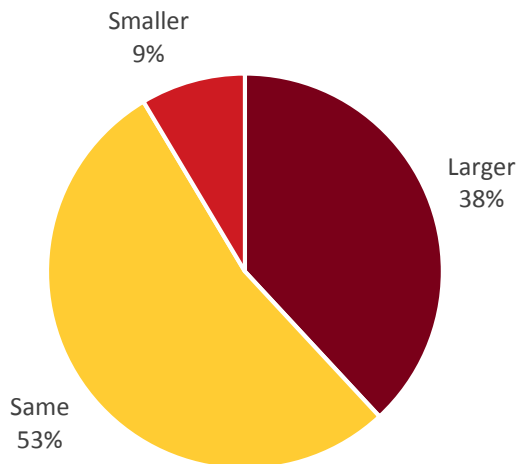
Cow-calf operators reported the majority of expenditures (76 percent) were made locally. 'Locally' was defined as being sourced within 30 miles of the operation (Chart 6). Eighteen percent of expenditures were made in the state but more than 30 miles away. A small portion, 6 percent, was made outside the state.

**Chart 6: Distribution of Expenditures,
Number of Respondents = 175**



A slight majority of cow-calf operations (53 percent) planned to remain at their current size over the next five years (Chart 7). Slightly more than a third (38 percent) planned to grow larger and nearly 10 percent planned on becoming smaller.

Chart 7: Future Plans, Number of Responses = 105

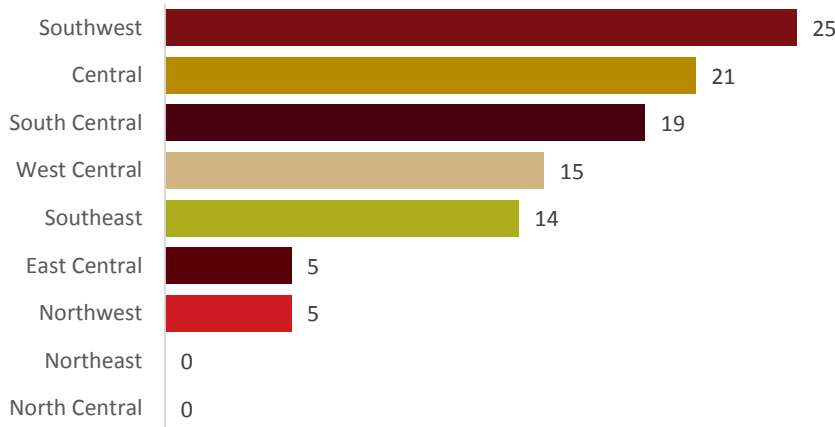


Growth appears to vary with operational size. Fifty-five percent of operations with more than 62 cow/first calf heifers (top half of respondents by size) planned to grow, while only 34 percent of operations with 61 or fewer cow/first calf heifers did.

Feedlot Operation Survey Results

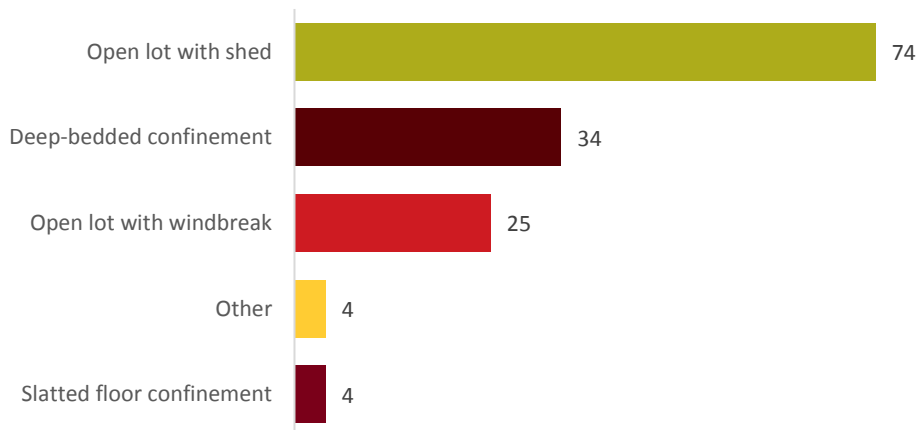
The feedlot survey also yielded responses from across Minnesota (Chart 8). The highest number of responses came from the Southwest and Central agricultural districts. No responses were received from the Northeast or North Central districts.

Chart 8: Regional Breakdown of Feedlot Survey Responses, Number of Responses = 104



The majority of respondents (72 percent) indicated they operated an open lot feedlot with a shed (Chart 9). Other common responses included deep-bedded confinement and an open lot with a windbreak. Respondents could select more than one option (for example, if they operated more than one feedlot).

Chart 9: Type of Facility Operated, Number of Responses = 103, Select All That Apply



On average, each feedlot had 411 head on feed as of January 1, 2015 (Table 3). Number of head on feed ranged from 0 to 4,500. The median value was 204.

The average number of head finished and shipped (sold) to a packer in 2015 was 494. This number ranged from 0 to 6,500 with a midpoint of 161.

On average, each feedlot purchased 565 head in 2015. Of those, approximately half (54 percent) were purchased from Minnesota cow-calf operations.

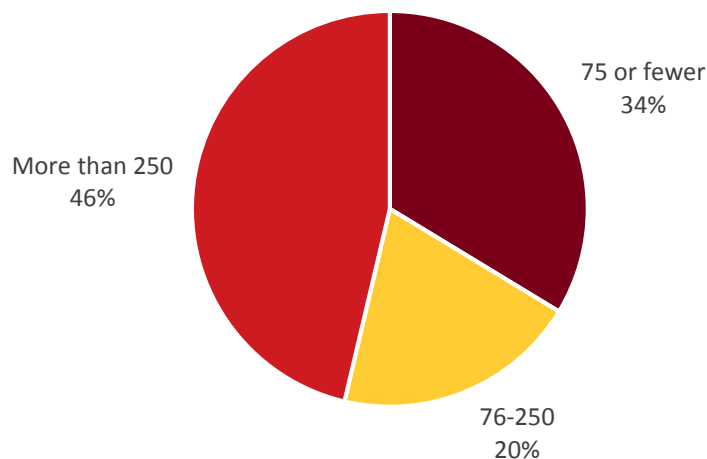
In summary, each feedlot started with 411 head on average in 2015. They sold 494 during the year and purchased 565.

Table 3: Feedlot Inventory and Number Shipped

	Average
Number of head on feed, January 1, 2015	411
Number of head finished and shipped to packer, 2015	494
Number of head purchased, 2015	565
Percent sourced from MN	54%
Feedlot total head days, 2015	142,200

As mentioned, the average number of head on feed on January 1 was 411. Of the survey respondents, 46 percent had more than 250 feed on hand. Roughly one-third of respondents had 75 or fewer head on feed (Chart 10).

Chart 10: Distribution of Number of Head on Feed



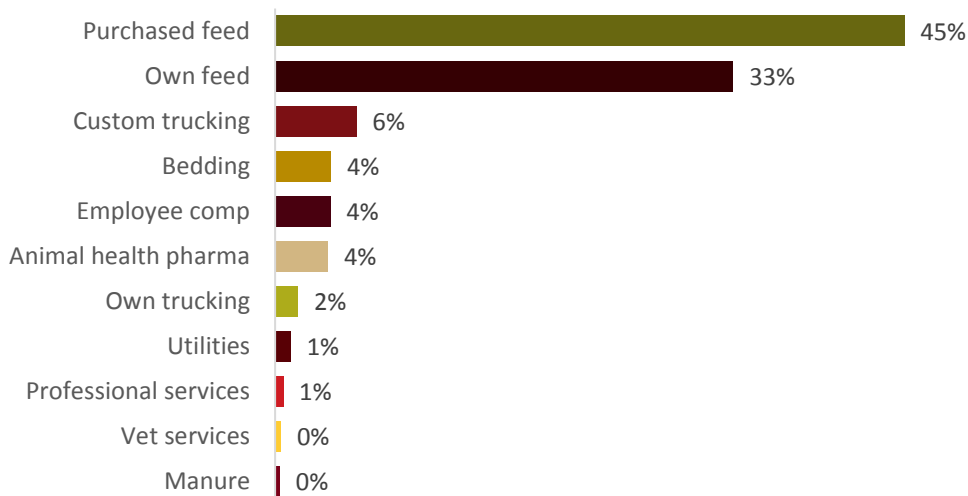
On average, each feedlot operator reported spending **\$271,300**, excluding cattle purchases, to operate in 2015. Based on an average of 411 head on hand, that equates to expenditures of \$660 per

head. FINBIN, the financial benchmark database, reports \$580. Feedlot expenditures are highly dependent on feed prices, which regularly rise and fall.

On average, each feedlot spent \$648,700 on cattle purchases in 2015. Based on an average purchase of 565 head, expenditures were roughly \$1,150 per head. By comparison, the FINBIN financial benchmark database reported spending approximately \$1,340 per head in Minnesota.

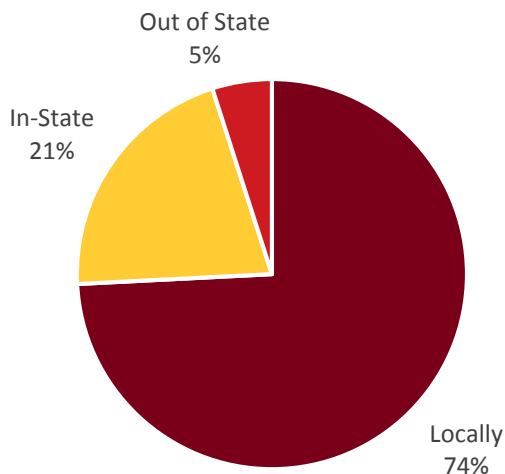
The largest share of feedlot expenditures were for feed, both purchased and grown on site (Chart 11). Feed accounted for 78 percent of feedlot expenditures.

Chart 11: Breakdown of Operational Expenditures by Feedlots, 2015



Feedlot operators reported the majority of their spending occurred within Minnesota (Chart 12). Nearly three-quarters of expenditures were spent locally. ‘Locally’ was defined as sourced within 30 miles of the operation. Twenty-one percent of expenditures were in state but more than 30 miles from the operation.

Chart 12: Distribution of Expenditures, Number of Responses = 88

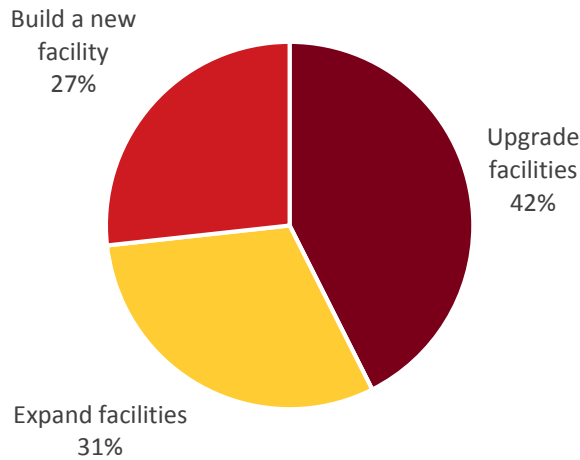


Slightly more than half (57 percent) of feedlot operators expanded their current facility, upgraded their facility, or built a new facility within the last 10 years.

Of those undergoing changes, 42 percent upgraded their facilities, 31 percent expanded their facilities, and 27 percent built a new facility (Chart 13).

On average, each feedlot operator with an upgrade, expansion, or new building invested **\$24,900** in the project. The projects, on average, increased capacity of the feedlot by 33 head.

Chart 13: Upgrade, Expansion, or New Building, Number of Responses = 58, Select All That Apply



Of the respondents, 43 reported having employees (Table 4). On average, each feedlot operator had 0.5 of a full-time, year round employee, 0.3 of a part-time, year round employee, and 0.6 of a seasonal employee.

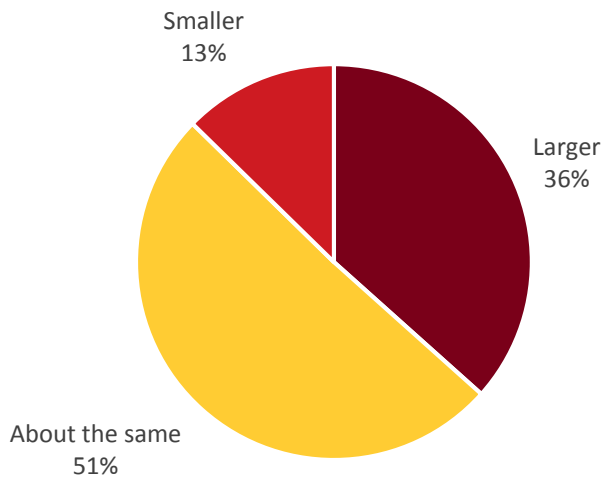
Table 4: Employee Characteristics

	Average	Standard Deviation	Number of Respondents
Full-time, year round	0.5	1.0	43
Part-time, year round	0.3	0.6	39
Seasonal	0.6	1.1	43

Most (51 percent) of feedlot operators planned to remain at their current size over the next five years (Chart 14). Slightly more than a third (36 percent) planned to grow larger.

Size of operation did not appear to factor into whether or not to expand. Thirty-eight percent of operators with less than 411 head planned to expand in the next five years. Meanwhile, 33 percent of those with 411 or more head planned to expand.

Chart 14: Future Plans, Number of Responses = 71



Beef Processing Summary

Some cattle raised by Minnesota farmers are also processed in the state. There are two primary types of processing. Cattle can be processed in large-scale commercial factories, primarily packaged under a brand label, and sold across the nation. Cattle can also be processed in commercial meat lockers. Meat lockers tend to process smaller, custom orders for farmers or for local meat retailers.

In 2015, 537,000 head of cattle were processed in the state.⁶ In Minnesota, several major commercial processing plants operated in 2015. Among those were PM Beef Holdings, which at its peak processed 900 head of cattle per day, or approximately 300,000 head annually. In 2013, PM Beef Holdings was the 17th largest beef processor in the United States.⁷ However, since 2013, PM Beef Holdings slowed and eventually ceased production at its facility in Windom, Minnesota. PM Beef Holdings closed its plant in October of 2015. State processing totals for 2015 reflect the lower levels at the plant. PM Beef Holdings was the only major commercial plant in Minnesota that processed fed cattle.⁸

A second major processing facility is Long Prairie Packing in Long Prairie, Minnesota. Long Prairie Packing processes cull cattle.⁹ Cull cattle processed in the facility include both dairy and beef cattle.

⁶ United States Department of Agriculture, National Agricultural Statistics Service, retrieved from https://www.nass.usda.gov/Statistics_by_State/Minnesota/Publications/Annual_Statistical_Bulletin/2016/MN%20Bulletin%202016%2030.pdf.

⁷ Cattle Buyer's Weekly, retrieved from <http://www.themarketworks.org/sites/default/files/uploads/charts/Top-30-Beef-Packers-2013.pdf>.

⁸ Fed cattle are those raised specifically for harvesting and processing.

⁹ Beef and dairy producers are selective in the cattle kept in the herd. Cull cattle are the animals not selected to remain in the herd for breeding or other specific purposes.

ECONOMIC CONTRIBUTION

Economic contribution is the total of direct, indirect, and induced effects. This section of the report details how Extension measured the direct effect of the beef industry in Minnesota.

Direct Effects

Direct effects in this study were measured for beef cow-calf operations, feedlots, and beef processing. Direct effect metrics include output, labor income, and employment. Appendix 1 contains definitions and details for each metric. The following section details the total direct effect of the beef industry and each of its components.

In total, the Minnesota beef industry generated an estimated \$2.3 billion of direct economic activity in 2015 (Table 5). Nearly 50 percent of its direct effect comes from the processing sector. The figures for cow-calf and feedlot operations are based on survey responses.¹⁰

**Table 5: Total Direct Effect, Beef Industry
Minnesota, 2015 (millions)**

Statistic	Value
Beef cow-calf operations	\$480.9
Beef feedlots	\$721.7
Beef processing	\$1,122.0
Total direct effect	\$2,324.6

Estimates by University of Minnesota Extension

Cow-Calf Operations

In 2015, Minnesota cow-calf operators directly spent an estimated \$528.5 million to operate (Table 6). This includes expenditures for cow/calf pairs in the herd, along with spending for any additional beef animals in the herd. Of this amount, 91 percent was spent in the state.

The direct output effect of cow-calf operations in Minnesota was an estimated \$480.9 million. Included in this figure is \$127.5 million in labor income expenditures (including wages paid to employees, a labor management charge for the operator, and profit).

Beef cow-calf operations provided employment for an estimated 16,900 people. This includes both hired labor and owner-operators. Each job (regardless of its status as part-time, full-time, or seasonal) is counted as one job.

¹⁰ Using the survey, we calculated the average expenditure per cow and then added a labor and management charge and profit margin from FINBIN to arrive at total spending per cow. We then multiplied by the total number of cattle to determine the total direct effect.

Table 6: Cow-Calf Production Value Estimates, 2015

Statistic	Value
Number of head (pairs), January 1 ¹¹	350,000
Expenditures per head ¹²	\$1,265
Total expenditures for cow/calf pairs	\$442.8 million
Total expenditures for cow- calf operations ¹³	\$528.5 million
Total expenditures in Minnesota (91 percent)	\$480.9 million
Labor income expenditures	\$127.5 million
Employment	16,900

Estimates by University of Minnesota Extension

Feedlot Operations

In 2015, Minnesota feedlots spent an estimated \$759.7 million to operate (Table 7). This includes expenditures for operations, capital improvements, and upgrades. Ninety-five percent of these expenditures were spent in the state.

The direct effect of feedlot operations in Minnesota in 2015 was an estimated \$721.7 million. This includes \$39.6 million in labor income and encompasses employee wages, a labor management charge, and profits.

Feedlots employed an estimated 12,000 people (including owner-operators and hired labor) in 2015.

¹¹United States Department of Agriculture, National Agricultural Statistics Service, retrieved from https://www.nass.usda.gov/Statistics_by_State/Minnesota/Publications/Livestock_Press_Releases/2015/MN_cattle01_15.pdf

¹²Note: this includes the \$1,010 in expenditures from the survey, plus the addition of a labor and management charge and profit taken from FINBIN. Data was drawn from FINBIN, as these questions were not asked on the survey to respect privacy.

¹³Includes expenditures for additional cattle in a herd (e.g., bulls)

**Table 7: Beef Feedlot Production Value
Estimates, 2015**

Statistic	Value
Number of head, January 1 ¹⁴	385,000
Expenditures per head	\$1,913
Expenditures per head, without cattle purchases	\$762
Total operating expenditures	\$736.4 million
Capital improvements per head	\$61
Total capital improvement expenditures	\$23.3 million
Total expenditures	\$759.7 million
Total expenditures in Minnesota (95 percent)	\$721.7 million
Labor income expenditures	\$39.6 million
Employment	12,000

Estimates by University of Minnesota Extension

Beef Processing

The direct effect of beef processing can be estimated using published statistics on the commercial slaughter sector in the state. In 2015, Minnesota companies processed 537,000 head of cattle. This translates into a total estimated processing value of \$1.1 billion (Table 8).

According to the USDA, Minnesota's average live processing weight was 1,489 pounds in 2015.¹⁵ Given this, the estimated total weight of cattle processed in the state was 7,996,000 hundredweight (cwt). Processed cattle are divided into two classes—meat for consumption and byproducts. The ratio of meat to byproducts is the dressing weight. The industry standard dressing weight in the United States is 62 percent.

In this study, meat processed for consumption was valued using the published boxed cut-out value, which follows methodology established in a 2015 Washington state study.¹⁶ In 2015, the averaged

¹⁴United States Department of Agriculture, National Agricultural Statistics Service, retrieved from https://www.nass.usda.gov/Statistics_by_State/Minnesota/Publications/Livestock_Press_Releases/2015/MN_cattle01_15.pdf

¹⁵United States Department of Agriculture, National Agricultural Statistics Service, retrieved from https://www.nass.usda.gov/Statistics_by_State/Minnesota/Publications/Annual_Statistical_Bulletin/2016/MN%20Bulletin%202016%2030.pdf

¹⁶ <http://ses.wsu.edu/wp-content/uploads/2014/12/2014-Economic-Contribution-of-Washington-Beef-Industry1.pdf>

boxed cut out value nationally was \$229.30 per cwt for select cuts.¹⁷ Byproducts were valued by the drop credit value of \$12.87 per cwt.

Table 8: Beef Processing Production Value Estimates, 2015

Statistic	Value
Number cattle processed	537,000
Average processing weight	1,489
Total weight processed, cwt	7,996,000
Dressing weight	62%
Boxed cut out value, cwt	\$229.30
Drop credit value, cwt	\$12.87
Total processing value	\$1,122.0 million

Estimates by University of Minnesota Extension

Indirect and Induced Effects

Input-output models trace the flow of dollars throughout a local economy and capture the indirect and induced, or secondary, effects of an economic activity. To quantify the indirect and induced effects of the beef industry for this analysis, the direct effects were entered into the input-output model, IMPLAN. This analysis used IMPLAN version 3.0 with SAM multipliers¹⁸.

Indirect effects are those associated with a change in economic activity due to spending for goods and services directly tied to the industry. In this case, these are the changes in the local economy occurring because those involved in Minnesota’s beef industry purchase goods (e.g., grain, hay, veterinary supplies, and electricity) and related services (e.g., veterinary services, accounting, and tax preparation). As members of the beef industry make purchases, this creates an increase in purchases across the supply chain. Indirect effects are the summary of these changes across an economy.

Induced effects are those associated with a change in economic activity due to spending by the employees of businesses (labor) and by households. These are economic changes related to spending by people directly employed in Minnesota’s beef industry. Those who work for beef producers and beef processors are also included. Spending by beef producers includes the spending of wages by hired labor but also spending of profits by owner/operators. Induced effects also include household spending related to indirect effects.

The following discussion of total economic contribution details the indirect and induced effects of Minnesota’s beef industry.

¹⁷ United States Department of Agriculture, Agricultural Marketing Service, retrieved from <https://www.ams.usda.gov/sites/default/files/media/AMTR2015.pdf>

¹⁸ www.implan.com

Total Effects

Total effects are the sum of direct, indirect, and induced effects. This section of the report highlights the total effects of Minnesota's beef industry.

In 2015, Minnesota's beef industry supported an estimated \$4.9 billion in economic activity in the state (Table 9). This includes \$1.1 billion in labor income. The industry supported employment for an estimated 47,300 people.

Note that total expenditures for cow-calf operations, feedlots, and processing facilities are included in the output figure. In this analysis, however, purchases of cattle by both feedlot and processing plant operators were removed before running the model. This is to avoid double counting. Indirect effects, as explained previously, include the backward linkages (or the purchases made) of an industry. Counting feedlot cattle purchases as an expenditure for feedlots and cow-calf operations would measure the effects twice.

Table 9: Total Economic Contribution of Minnesota's Beef Industry

	Direct	Indirect	Induced	Total
Output (millions)	\$2,324.6	\$2,049.9	\$571.4	\$4,945.9
Employment	30,400	13,100	3,800	47,300
Labor Income (millions)	\$250.5	\$645.3	\$187.0	\$1,082.8

Estimates by University of Minnesota Extension

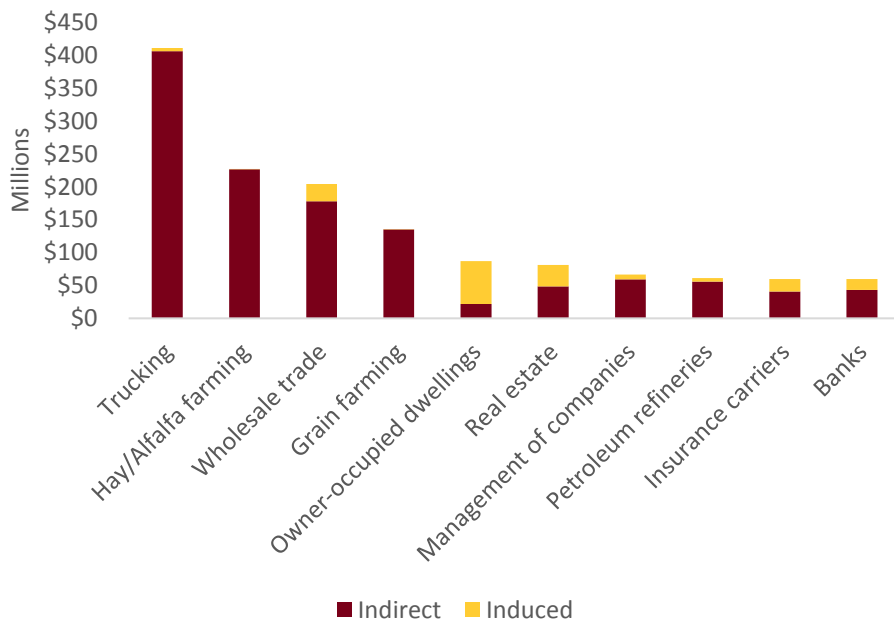
Top Industries Impacted

Minnesota's beef industry supports an estimated \$4.9 billion of output in the state. Of that output, \$2.3 billion is from cow-calf operations, feedlots, and beef processors. This means the Minnesota beef industry supports \$2.6 billion in other businesses in the state. Chart 15 illustrates the top 10 industries supported by Minnesota's beef industry.

The industry has relatively high indirect effects, as many inputs into beef production and processing are available and purchased in the state. Both cow-calf and feedlot operators reported purchasing more than 90 percent of their inputs in Minnesota.

The beef industry's highest impacts are in the trucking, hay and alfalfa production, and wholesale trade industries. Included in wholesale trade operations are grain elevator and farming cooperatives, which produce and sell feed and supplements.

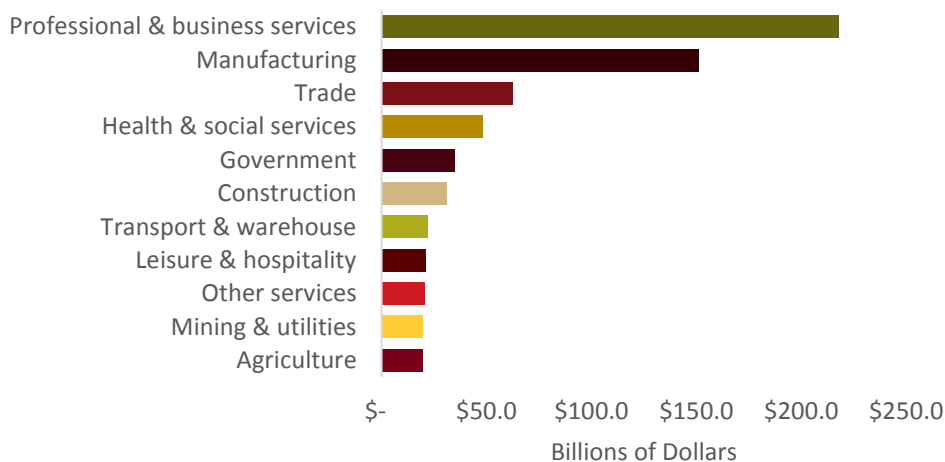
Chart 15: Top Industries Impacted by Minnesota's Beef Industry, Sorted by Output



BEEF INDUSTRY IN THE CONTEXT OF MINNESOTA'S ECONOMY

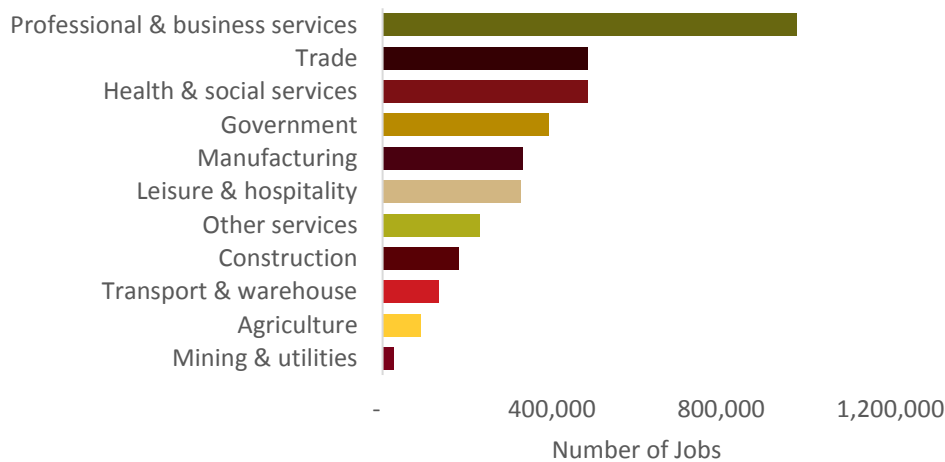
In 2015, businesses and enterprises in Minnesota created \$649.3 billion of output. The professional and business services industry, the largest industry, generated \$218.0 billion of total output (Chart 16). Minnesota's agriculture industry, which includes the beef industry, produced \$19.5 billion of output.

Chart 16: Output by Industry, Minnesota, 2015



In 2015, there were 3.7 million jobs at Minnesota businesses and enterprises. Nearly 1 million of these jobs were in the professional and business services industry (Chart 17). Agriculture employed 91,000 people.

Chart 17: Employment by Industry, Minnesota, 2015



NOTES ON THE ANALYSIS

This analysis focused on beef production and processing. For the purposes of this report, Extension classified beef production as cow-calf operations and feedlots. FINBIN, for comparison, has 10 options for beef operations—cow-calf, finishing, bulls, background bulls, backgrounding, finish cull, finish yearlings, grazing, replacement heifers, and finishing-contractor. The level of detail needed in a survey to gather data for each of these operations would have been insurmountable. Therefore, the additional cattle in a herd (e.g., bulls, replacements, culls, backgrounded) were not included in the cow-calf data.

As explained earlier, double counting was avoided by removing cattle purchases from the expenditures by feedlots and processors.

This analysis only covers 2015. There are two reasons for this—timing and data availability. The cow-calf and feedlot surveys were distributed in early 2016. Given this, we did not expect producers to have their records for 2016 finalized and asked only for 2015 data. Additionally, certain statistics for the beef industry are only current through 2015. Moreover, as mentioned previously, beef processing capacity decreased in Minnesota after the closure of a major processing plant. All beef cattle fed for processing are now exported out of the state for processing. This represents a lost opportunity for economic activity in the state.

Finally, the analysis presented here is based on expenditures by beef producers and did not measure profitability.

APPENDIX 1: DEFINITIONS AND TERMS

Special models, called input-output models, exist to conduct economic impact analysis. There are several input-output models available. IMPLAN (Impact Analysis for PLANning, Minnesota IMPLAN Group) is one such model. Many economists use IMPLAN for economic impact analysis because it can measure output and employment impacts, is available on a county-by-county basis, and is flexible for the user. IMPLAN has some limitations and qualifications, but it is one of the best tools available for input-output modeling. Understanding the IMPLAN tool, its capabilities, and its limitations will help ensure the best results.

One of the most critical aspects of understanding economic impact analysis is the distinction between the 'local' and 'non-local' economy. The local economy is identified as part of the model-building process. Either the group requesting the study or the analyst defines the local area. Typically, the study area (the local economy) is a county or a group of counties that share economic linkages. In this analysis, the study area is Minnesota.

To properly read the results of an IMPLAN analysis, a few definitions are essential. These terms and their definitions are provided below.

Output

Output is measured in dollars and is equivalent to total sales. It includes significant "double counting." Think of corn, for example. The value of the corn is counted when it is sold to the mill and then again when it is sold to the cow-calf operator as feed. The value of the corn is built into the price of each of these items, and then the sale of each item is added to get total sales (or output).

Employment

Employment includes full- and part-time workers and is measured in annual average jobs, not full-time equivalents (FTEs). IMPLAN includes total wage and salaried employees, as well as the self-employed, in employment estimates. Because employment is measured in jobs and not in dollar values, it tends to be a very stable metric.

Labor Income

Labor income measures the value added to the product by the labor component. So, in the corn example, when the corn is sold to the mill, a certain percentage of the sale goes to the farmer for his/her labor. Then when the mill sells the corn as feed to a cow-calf operator, it includes some markup in the price for its labor costs. These individual value increments for labor can be measured, which amounts to labor income. Labor income does *not* include double counting.

Direct Impact

Direct impact is equivalent to the initial activity in the economy. In this study, it is spending by the beef industry, as detailed in this report.

Indirect Impact

The indirect impact is the summation of changes in the local economy that occurs due to **spending for inputs** (goods and services) by the industry or industries directly impacted. For instance, if employment at a beef processing plant increases by 100 jobs, this implies a corresponding increase in plant sales. As the plant increases sales, it must also purchase more inputs, such as electricity and



equipment. As the plant increases the purchase of these items, its suppliers must also increase production, and so forth. As these ripples move through the economy, they can be captured and measured. Ripples related to the purchase of goods and services are indirect impacts. In this study, indirect impacts are those associated with spending by the beef industry for operating items.

Induced Impact

The induced impact is the summation of changes in the local economy that occurs due to **spending by labor**. For instance, if employment at a beef processing plant increases by 100 jobs, the new employees will have more money to spend to purchase housing, buy groceries, and go out to dinner. As they spend their new income, more activity occurs in the local economy. Induced impacts also include spending by labor generated by indirect impacts. So, if a cow-calf operator purchases services from a local tax preparer, spending of the tax preparer's wages would also create induced impacts. Primarily, in this study, the induced impacts are the economic changes related to spending by the beef industry's employees.

Total Impact

The total impact is the summation of the direct, indirect, and induced impacts.

Input-Output, Supply and Demand, and Size of Market

Care must be taken when using regional input-output models to ensure they are being used in the appropriate type of analysis. If input-output models are used to examine the impact of an industry so large that its expansion or contraction results in major supply and demand shifts—causing the prices of inputs and labor to change—they can overstate the impacts. It is not likely Minnesota's beef industry has an impact on national input prices. Hence, the model should reliably estimate the impacts.

APPENDIX 2: BEEF COW-CALF AND FEEDLOT SURVEY INSTRUMENTS

Beef Cow-Calf Survey Instrument

PART 1 – Your Role in Minnesota’s Beef Industry

In what region of the state are you located? (circle on map)

Did you market beef cattle for sale in 2015? Yes No

Are your cattle primarily grazing _____ primarily on feed _____? Other _____(please describe)?

What percentage of your calf crop do you sell as weaned calves ____% keep for your own finishing operation ____% keep for your own backgrounding ____% keep as replacements ____% other ____% (should add to 100%)

What percent of your herd is.....spring calving _____% fall calving _____% other _____% (should add to 100%)

How many cows/first calf heifers calved in 2015?

How many of the calves born in 2015 did you market in 2015? _____

How many culls did you market in 2015? _____

Other cattle in your cow-calf herd (bulls, heifers that didn’t calve, etc.)? _____

What was your replacement rate percentage in 2015? _____

PART 2 – Your Farming Operation

Please do your best to answer the following questions. We realize this will take time to complete. **These answers are critical to measuring the economic value of the industry.**

For the following questions, please think about your operation for the 2015 calendar year (January 1 to December 31, 2015)

How much did you **spend in total** on your beef cow-calf operation in 2015? _____

What percent of the total was spent (use your best estimation)

Locally (within 30 miles and in Minnesota) _____%

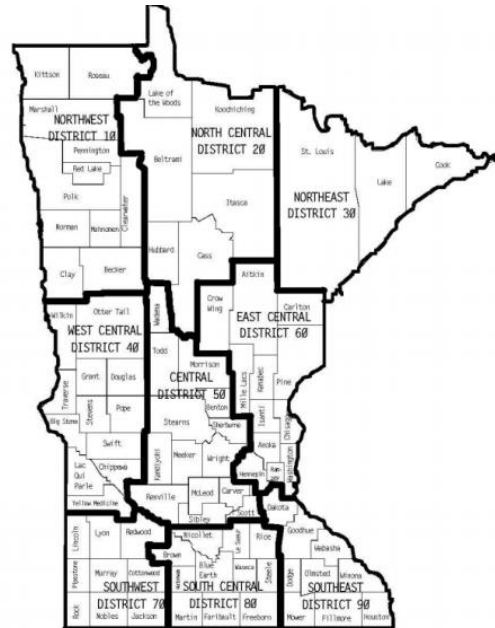
Regionally (more than 30 miles but in Minnesota) _____%

Out of state _____% (should add to 100%)

PART 3 – Feed and Your Farming Operation

Did your cows spend time on pasture in 2015? Yes No

How many head were on pasture? _____



How many acres of pasture did you own in 2015? _____

How many acres of pasture did you rent in 2015? _____

How much did you spend to maintain pasture and grazing land in 2015? _____

Did you rent pasture land in 2015? Yes No

If yes, what was the total lease cost? _____

Did your cows graze corn stalks after harvest? Yes No

What was your average stocking rate when grazing stalks? _____

What were your cattle-related feed expenses for 2015?

	Purchased (dollars)	Produced Own (dollars)
Hay (grass and alfalfa)		
Stover		
Straw		
Silage or haylage		
Ground corn		
Cracked corn		
Other grain		
Wet or dry co-products		
Protein supplements		
Salt, vitamins, minerals		
Corn gluten meal		
Corn gluten feed		
Corn oil		
Other (describe)		
Other (describe)		

For those backgrounding, did you raise your own hay/haylage/straw/silage for winter feed? Yes

No

	Tons Produced	Describe (if necessary)
Grass hay		
Alfalfa hay		
Mixed grass/alfalfa		
Haylage		



Straw		
Silage (describe)		
Other hay (describe)		

PART 4 - Veterinary and Your Farming Operation

How much did you spend in 2015 on animal health pharmaceuticals? _____

How much did you spend on veterinary services? _____

How much did you spend on breeding fees? _____

PART 5 - Operating Expenses and Your Farming Operation

How much did you spend on your own trucking (include fuel, insurance, rig costs, etc.) ? _____

How much did you spend to custom hire your trucking needs? _____

How much did you spend on utilities for your cattle operation? _____

PART 6 - Labor and Your Farming Operation

Did you hire employees for your cattle operation in 2015? Yes (see below) No (go on to final question in this section)

YES (if you answered yes to the above question)

What was your estimated total annual hired labor expense for your cattle operation in 2015 (include benefits)? \$_____

How many full-time, year-round employees did you have in 2015? _____

How many part-time, year-round employees did you have in 2015? _____

How many seasonal employees did you have in 2015 (include both full and part-time)? _____

NO (if you answered no to the question on hiring labor)

How many hours per month on average did **you (the owner)** invest in your cattle operation in 2015?

PART 7 - Property and Your Farming Operation

How many acres do you utilize in your beef cow-calf operation? _____

What is your annual property tax expense? _____

PART 8 - Other Costs

Did your operation have any other major costs in 2015 not included above? Yes No

If yes, please describe? _____ How much did you spend? _____

PART 9 - Future Plans

In the next five years, do you anticipate your operation to be Larger? Smaller? About the same?

PART 10 - Land Utilization

Do you use any cover crops on land harvested for corn silage? Yes No

If yes, what percent is planted to cover crops? _____

What cover crops are you planting? _____

Do you harvest stover?

If yes, how many acres are harvested for feed _____? Bedding _____?

Do you have any concerns regarding harvesting stover? _____

PART 11 – Final Comments

Do you have anything you wish to share with the researcher?

THANK YOU!

Feedlot Survey Instrument

PART 1 – Your Role in Minnesota’s Beef Industry

Did you operate a Minnesota-based feedlot in 2015? Yes No

In what region of the state are you located? (circle on map)

How many feedlots sites did you operate in Minnesota in 2015?

PART 2 – Your Facilities

What type of facility or facilities do you operate (check all that apply)? Open lot with windbreak _____ Open lot with shed _____ Deep-bedded confinement _____ Slatted floor confinement _____ Other _____ (please describe)

Did you expand, upgrade, or build a new facility in the last ten years? Yes No (if no, move to next section)

If yes, did you upgrade your facilities? _____ expand your facilities? _____ or build a new facility? _____ (check all that apply)

What type of facility did you invest in? Open lot with windbreak _____ Open lot with shed _____ Deep-bedded confinement _____ Slatted floor confinement _____ Other _____ (please describe)

What year did you complete your most recent change? _____

PART 3 – Inventory and Number Shipped

What was the number of head on feed on January 1, 2015? _____

What was the number of head finished and shipped to the packer in 2015? _____

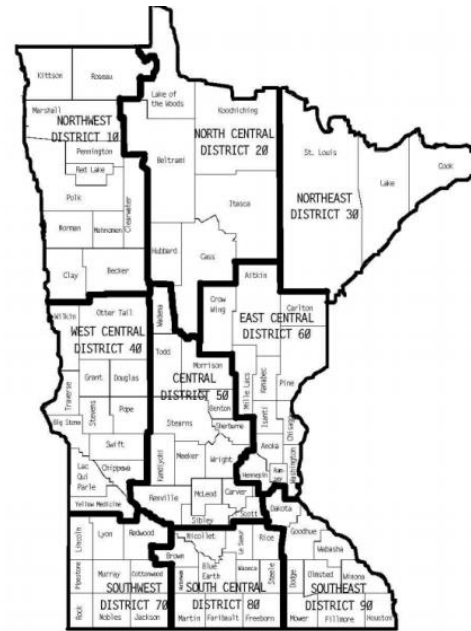
What percent were marketed to Minnesota processors? _____%

What was the number of head purchased in 2015? _____

For the head purchased and the placements, please estimate the percent sourced from Minnesota? _____%

What percent of cattle purchased/placed were owned in partnership with other cattlemen? _____%

What percent of cattle purchased/placed were owned in partnership with a packer? _____%



What percent of cattle purchased/placed were owned in some other arrangement? ___%

What was your feedlots total head days in 2015? _____

PART 4 - Feedlot Expenditures

What were your total feedlot expenditures in 2015? _____

Of these expenditures, what percent were

Local (within 30 miles and in Minnesota) _____%

Regional (more than 30 miles, but in Minnesota) _____%

Out of state _____%

How much did you spend on cattle purchases in 2015? _____

PART 5 - Trucking Expenditures

Did you truck your own _____ or hire out for trucking _____ (both for trucking cattle and for trucking feed).

How much did you spend on your own trucking (include fuel, insurance, rig costs, etc.) ? _____

How much did you spend to custom hire your trucking needs? _____

PART 6 - Feed Expenditures

How much did you spend to purchase feed in 2015? _____

Roughly what percent of those expenditures were from producers in Minnesota? _____%

Please estimate the percent spent on

	Percent of Total Spending
Roughage (hay, straw, silage, etc.)	
Grains (corn, etc.)	
By-products (distiller's grain)	
Vitamins/Minerals	
Feed additives	
Others	

Did you grow your own feed in 2015? Yes No

If yes, what was the market value of total feed produced?

What was the market value of each of the following?

	Market Value	If market value not available, production used in feedlot

		(tons, etc)
Roughage, hay		
Roughage, straw		
Roughage, silage		
Grains (corn, etc.)		
Others		

PART 7 – Bedding Expenditures

Was the majority of your bedding ____purchased or ____raised on your farm?

What was the value of your bedding in 2015? _____

How many tons of bedding did you use in 2015?

PART 8 – Labor Costs

What was your estimated total annual hired labor expense for the feedlot in 2015 (include benefits)?
\$ _____

How many full-time, year-round employees did you have in 2015? _____

How many part-time, year-round employees did you have in 2015? _____

How many seasonal employees did you have in 2015 (include both full and part-time)? _____

PART 9 –Manure Costs

Did you apply manure from your feedlot to your own acreage in 2015? Yes No

If yes, what was the estimated market value of that manure? _____\$/ton

Did you sell manure from your feedlot in 2015? Yes No

If yes, how much did you receive for your manure? _____\$/ton

PART 10 –Other Costs

How much did you spend on vaccines, veterinary, and animal health pharmaceuticals? _____

How much did you spend on veterinary services? _____

What were your expenses for other professional services (attorneys, accountants, etc.)

How much did you spend on utilities? _____

PART 11 – Infrastructure Upgrades

If you upgraded, expanded, or built a new facility in 2015, what were your total investments?

How much additional capacity did your expansion/upgrade/new facility add? _____Number of head

PART 12 - Future Plans

In the next five years, do you anticipate your operation(s) to be larger? Smaller? About the same?

PART 13 - Final Comments

Do you have anything you wish to share with the researcher?



