

December 2020



A Comprehensive Review of Iowa's Dairy Industry

IOWA STATE UNIVERSITY
Extension and Outreach

IOWA'S DAIRY INDUSTRY

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Executive Summary

This report details a current analysis of Iowa's dairy industry, as well as national trends. Dairy cows and the economic activity they generate are detailed throughout.

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National Trends

In 2018, Americans consumed 646 lbs. per capita of milk and dairy products, 670 pounds in Iowa, representing more than 211 billion pounds of raw milk.

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Iowa Outlook

Iowa nationally ranks 12th in total milk production and 8th in milk production per cow. Iowa's milk production represents 2.45 percent of the total U.S. milk production.

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Iowa Advantages

The state has a wealth of natural water resources and is the major feed producer of forages, corn, soy and distillers grains from the fuel ethanol industry.

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Economic Development

Funding for this report was made possible by the Iowa State Dairy Association, Iowa Corn Growers Association, Iowa Soybean Association, Iowa Farm Bureau, Iowa American Dairy Association Midwest, Iowa State University Extension and Outreach Dairy Team with assistance from the Iowa State University Extension & Outreach Farm, Food & Enterprise Development Team and Midwest Dairy Support who is committed to showcasing the positive impact dairy has to our local communities and how dairy is good for the people, planet and communities. To succeed it takes a commitment by those who are truly passionate about Iowa's dairy industry and our future. represents approximately 996 dairy farm families to 3,155,009 consumers across the State. Questions related to this document should be directed to the Iowa State University Extension and Outreach Dairy Team.

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Summary

This report demonstrates that the Iowa dairy industry continues to be a strong economic driver in Iowa and the Midwest. The projected national trends for dairy products show increases in profitability and forecasters expect that dairy revenue will continue to rise at 1.15% to \$39.9 billion during 2019-24 (IBIS World Dairy Production 2019).

Iowa continues to be a significant contributor to dairy production based upon several factors that include necessary infrastructure, natural resources, inputs and experience. The state has a unique competitive advantage in these categories and continues to expand on these assets for identified growth opportunities.

The economic impact realized by the state from the dairy industry projects the following: Key metrics include total economic impact of Iowa's dairy industry is \$5.6 billion, supplying 15,587 jobs with a labor income of \$891 million. Annual economic impact of a single dairy cow is \$25,495 per cow.

All Dairy Farming & Manufacturing



Cheese Manufacturing
1,788 jobs
Labor income of \$101,399,283
Value-added \$160,992,715
Output \$744,294,788



Dairy Products Manufacturing
3,757 jobs
Labor income of \$266,510,000
Output \$2,856,640,000



Dairy Farm Cattle and Calf Sales
5,440 jobs
Labor income of \$285,416,574
Value-added \$682,276,988
Output \$1,637,745,435

15,587 jobs
Labor income of \$891,256,190
Output \$5,557,979,243



Iowa Economic Impact of Single Dairy Cow
\$25,495

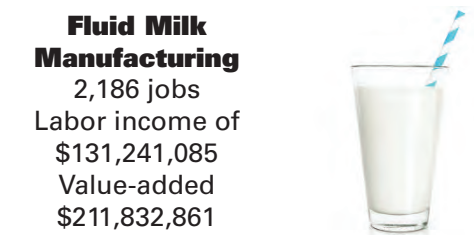
Data Source: USDA Census of Agriculture 2017, NASS 2017-2019



Dairy Farm Milk Sales
4,252 jobs
Labor income of \$248,914,396
Value-added \$602,477,414
Output \$1,395,336,294



Ice Cream Manufacturing
3,296 jobs
Labor income of \$187,381,396
Output \$987,636,459



Fluid Milk Manufacturing
2,186 jobs
Labor income of \$131,241,085
Value-added \$211,832,861
Output \$797,667,485

Source: Pictures from Iowa State University Extension and Outreach - Dairy Team and stock photos



Source: Iowa State University Extension and Outreach - Dairy Team

Decreasing demand for fluid milk continues, while cheese and butter see growth in demand.

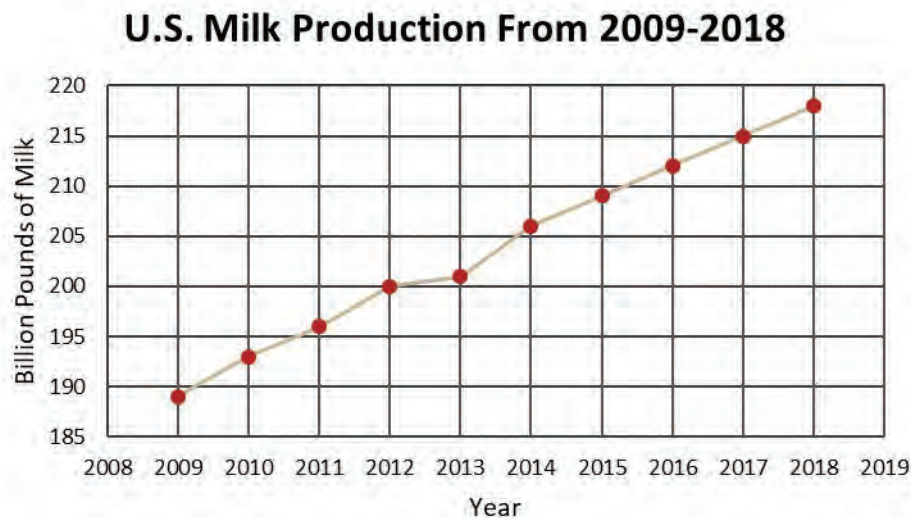
Milk is a staple food, according to the U.S. Department of Agriculture, and it is recommended that Americans consume three cups per day of milk and dairy products. In 2018, Americans consumed 646 lbs. per capita of milk and dairy products, representing more than 211 billion pounds of raw milk. U.S. dairy farms produced 217.6 billion pounds of raw milk in 2018, and Iowa dairies contributed 2.45 percent of that total. Demand for milk is projected to grow with rising demand from processors over the next five years.

Enhanced dairy producer funded, risk management tools and consolidation among farms are expected to continue in order to stabilize profit margins for individual dairy operations.

In recent decades, U.S. consumption of total dairy products has risen faster than the growth in population. However, use of individual products has shown great variation. U.S. per capita consumption of fluid milk has declined because of competition from other beverages and a declining share of children in the population. In contrast, use of cheese has grown exponentially as various types of cheese find their way into recipes, both at home and in restaurants, and in ready-to-eat snack foods.

Growth in demand for cheese has been one of the most important forces shaping the U.S. dairy industry. Rising cheese consumption has been aided

Figure 1. U.S. Milk Production from 2009 - 2018



Source: USDA - NASS, 2019.

by ready availability of a wider variety of cheeses, more away from home eating, and greater popularity of ethnic cuisines that employ cheese as a major ingredient. Mozzarella has been the most popular variety in recent years, followed by cheddar. Consumption of most varieties has grown steadily for many years, as cheese has become a very significant part of the American diet. (USDA-ERS 2019)

Per capita use of butter has increased in recent years. Another notable trend is a substantial increase in yogurt use in the 2000s and early 2010s, with the popularity of Greek yogurt as a contributing factor. Since 2013, per capita yogurt use has decreased, but it has remained at levels substantially higher than in the early 2000s. (USDA-ERS 2019)

At the time the original version of this report was published (2012), milk prices were recovering and the outlook for dairy was improving. During the period 2014-2019, the price of raw milk became increasingly volatile, causing revenue for dairy farms to fall at an annualized rate of 6.8 percent during the five years up to 2019. Yet, dairy farm revenue in 2019 is

expected to rise 5.4 percent to 37.8 billion and the price of milk is projected to rise steadily during the 2019-2024 period. (IBIS World Dairy Production)

Feed prices, which typically represent half of the operational cost of dairy farms, have also experienced significant fluctuations due to high grain prices in 2014 that have since steadily fallen. Climate changes affects crop production, and 2018 and 2019 have seen challenges in many regions around the U.S.; therefore, crop prices are starting to rise which, in turn, are expected to support a rise in feed prices of 2.0 percent over the period 2019-2024. (IBIS World Dairy Production)

Over the next five years to 2024, the U.S. dairy industry will benefit as milk prices stabilize and demand for dairy products grows. In total, forecasters expect that dairy industry revenue will rise at an annualized rate of 1.1 percent to \$39.9 billion over the next five years to 2024. (IBIS World Dairy Production)



Source: Iowa State University Extension and Outreach - Dairy Team

According to IBIS World Dairy Production, dairy farm revenue in 2019 is expected to rise 5.4% to 37.8 billion and the price of milk is projected to rise steadily during the 2019-2024 period.



Source: Iowa State University Extension and Outreach - Dairy Team

Dairy Demand

Although U.S. fluid milk sales have decreased 13.3 percent since 2010, the mix of products comprising the total is changing. Whole milk sales have increased in each of the last four years, whereas lower fat, skim, flavored milk and buttermilk sales decreased. However, per capita consumption of flavored milk and whole milk have increased. (Source: USDA-NASS)

Although fluid milk sales have declined steadily since 1975, a strong positive trend in per capita consumption for dairy products (on milk equivalent milkfat basis) is projected in Figure 2.

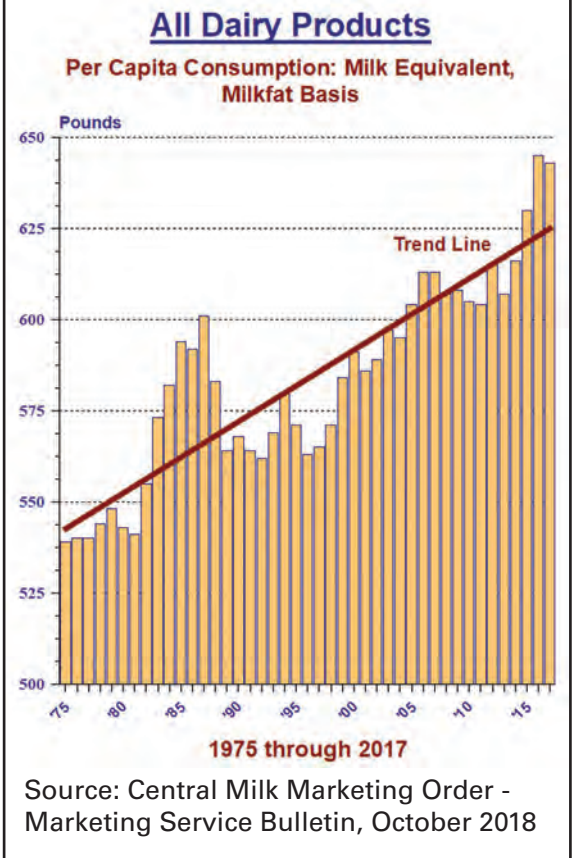
Per capita consumption of all dairy products (on milk equivalent/milkfat basis), has risen 19.8 percent since 1975, with the greatest increase in cheeses.

Per capita consumption has increased in yogurt from 2.0 to 13.4 lbs per person, and in butter from 4.7 to 5.8 lbs per person from 1975 to 2018. Data for the past four years shows a 1 lb per person decrease in yogurt consumption, and

0.2 lb per person increase in butter consumption. Nearly all cheeses have shown increasing consumption patterns, with the greatest being American cheese at 15.4 lbs per person.

The U.S. Dairy Export Council (USDEC) is a non-profit, independent membership organization that represents the global trade interests of U.S. dairy producers, proprietary processors and cooperatives, ingredient suppliers and export traders. Recently, the president and CEO of USDEC cited several reasons for dairy farmers to be optimistic about long-term growth for their industry. Since USDEC was founded in 1996, U.S. dairy exports have increased more than seven-fold to \$5.4 billion annually. In 2018, the U.S. dairy industry exported the equivalent of nearly 16 percent of U.S. milk solids produced in this country.

Figure 2. All Dairy Products.



Exports

For several years, U.S. dairy exports have remained at 15 percent of U.S. milk solids. Despite heavy losses as a result of tariffs and a trade war with China, “The Next 5%” initiative, begun in 2017 and intended to increase exports to 20% of U.S. milk solids, appears to be paying off. Figure 3 shows changes in major export markets and highlights the opportunity in SE Asia. To spur growth in that region, USDEC is making a major investment in the U.S. Center for Dairy Excellence in Singapore. Additionally, the new United States – Mexico – Canada Free Trade Agreement and China 1 Trade agreement should provide stability to the dairy industry.

A recent interim agreement with Japan, the largest importer of cheese, will improve market access there. Through the first six months of 2019, U.S. suppliers exported about \$800 million more in dairy products and ingredients compared to the same period in 2016, creating a value increase of more than 30%. The groundwork being laid by USDEC is a positive force in restoring stability with significant growth opportunities for U.S. dairy farmers and processors.

Figure 3. Dairy Exports.

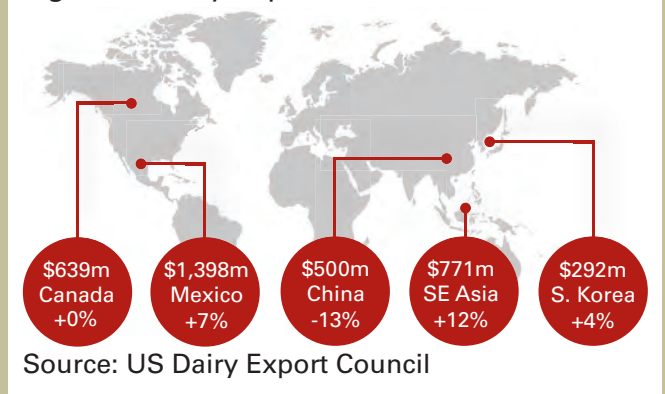
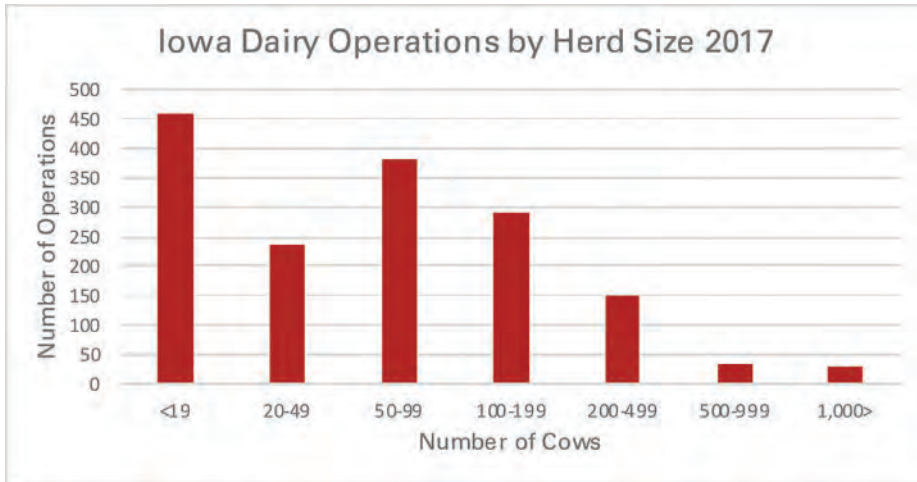
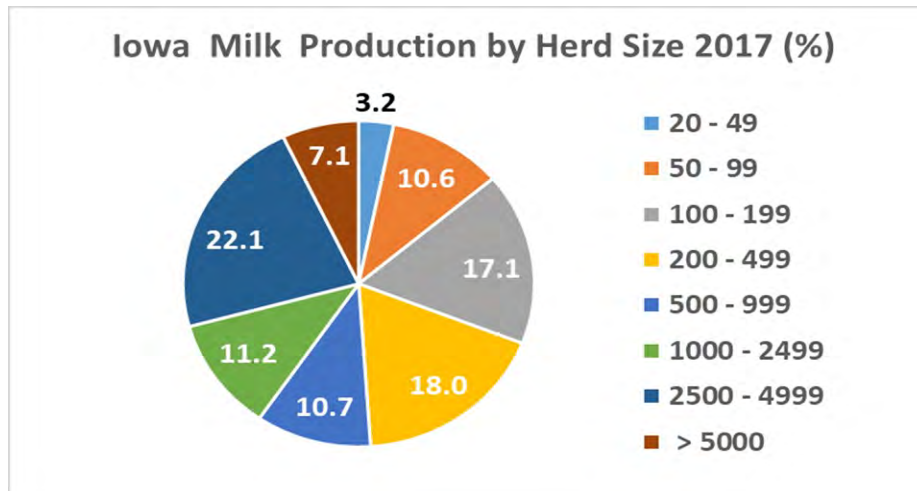


Figure 4. Iowa Dairy Operations by Herd Size.



Source: NASS, 2019.

Figure 5. Iowa Milk Production by Herd Size.



Source: USDA - NASS, 2019.

Note that 463 herds<19 cows not on chart represent .08% of milk sales

Iowa continues its rank of 12th in the nation in milk production, producing 5.27 billion pounds of fluid milk in 2018, up 1.7 percent from 2017. Iowa’s milk production represents 2.45 percent of the total 2018 U.S. milk production of 217.6 billion pounds and it is valued at \$869,220,000. Iowa ranks 8th in the nation for number of dairy cow herds (1,120 herds) and average milk per cow (23,945 lbs). (USDA-NASS) Iowa’s dairy industry is the fifth largest

agricultural sector in the state. In Iowa, the industry began with Dutch immigrants and it has since shaped rural life in many communities, with the heaviest concentration in northeast and northwest Iowa. Current Iowa Dept. of Agriculture and Land Stewardship registration numbers show that there are 996 Grade “A” dairy farms, 14 Grade “B” dairy farms, 217 milk goat dairy farms, and 1 sheep dairy farm.

Although the demographics of herd size and location within the state have shifted over time, the industry size remains stable. Closing and consolidation of farms in the past five years has resulted in fewer farm operations but little reduction in the total number of dairy cows in the state and increased total milk production. Technology has allowed for more efficient milking and larger herd sizes. Also, access to reliable large animal veterinary care supports many livestock operations throughout Iowa, including dairy farms of all sizes.

The Agriculture Improvement Act of 2018 (known as the Farm Bill) authorized the new Dairy Margin Coverage (DMC) program, which is a voluntary risk management program for dairy producers. With this current strategy, risk management programs have changed focus to guarantee the dairy farms’ profit margins instead of providing a support base for milk prices. DMC replaces the Margin Protection Program for Dairy (MPP-Dairy) from the 2014 Farm Bill. DMC continues to offer protection to dairy producers when the difference between the milk price and the average feed price falls below a certain dollar amount selected by the producer.

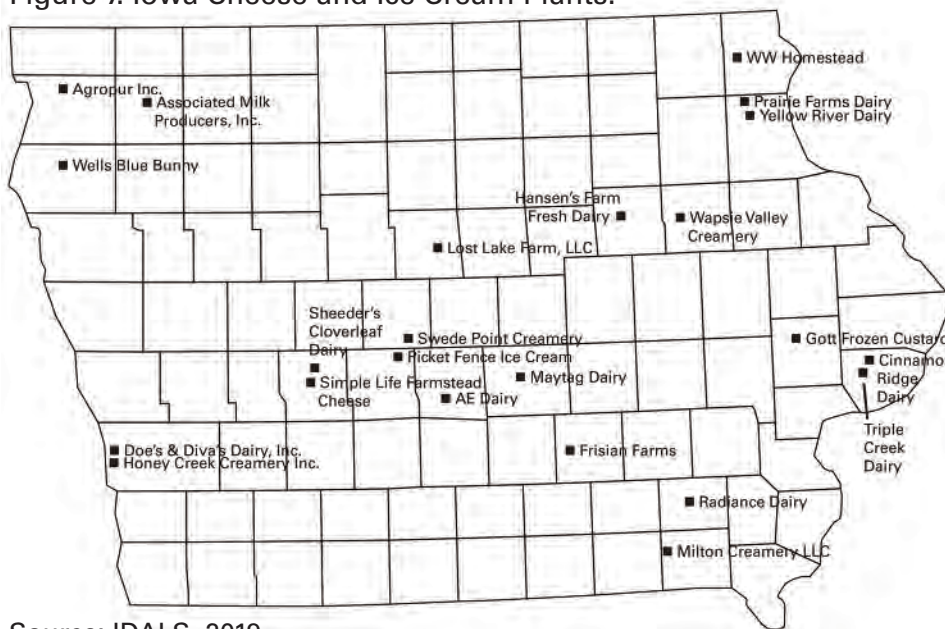
Despite the Margin Protection Program in place until the current Farm Bill was enacted, 80 Iowa dairy farms closed by late 2018. This trend was reflected around the country as licensed dairy farms declined by 2,731 to a new total of 37,468. Wisconsin, the state with the most dairy farms, saw 590 dairy farms close in 2018, representing a 6.5 percent drop. Cow numbers in Wisconsin, however, were down by only 1,000 head from five years ago. Pennsylvania, Michigan, and California all experienced similar declines in farm numbers. However, 12 states saw no change in dairy farm numbers. The severe declines in dairy farm operations were caused primarily by the steady decline in milk prices. Many farmers experienced four years of losses, and the revised DMC could not help them resurrect their

Figure 6. Iowa Grade A and Dry Milk Plants.



Source: IDALS, 2019.

Figure 7. Iowa Cheese and Ice Cream Plants.



Source: IDALS, 2019.

operations. However, those farmers who were able to weather the drop in milk prices are expected to gain steadily in the next five-year period. (IBIS World Dairy Farm Production report)

The fundamental change to producer funded risk management tools (DMC, DRP, LGM) is expected to help dairy farm revenue to improve and stabilize. Economic recovery, farm consolidation and automation, and a steadily

increasing demand for dairy products, both nationally and internationally, is expected to contribute to farm profitability. In addition, the growing popularity of organic milk is expected to benefit the industry through specialty regional markets.

Iowa dairies are complemented by an equally diverse group of processors strategically located throughout the

state to serve both in-state and out-of-state markets. This variety of processors also strengthens Iowa's ability to deal with seasonal peaks and valleys in milk production. Twenty-two processors are located in Iowa with some manufacturing more than one product, including; 12 processors of fluid milk, 2 dry milk plants, 17 cheese processors, and 7 ice cream processors. Other direct support companies include 10 dairy container manufacturers, 5 receiving and transfer stations, and 7 truck washing facilities. (Iowa Dept. of Agriculture and Land Stewardship). Across Iowa's borders, there are a total of 289 dairy processors in Minnesota, Wisconsin, Illinois, and Missouri, and 17 more to the west/northwest in Nebraska and South Dakota.

This diversified production, processing, and support system helps create stable and attractive regional price trends, and it provides opportunities for individual dairy farms to grow to meet changes in national and international demand. Iowa is within the Central and Upper Midwest regions of the Federal Milk Marketing Order (FMMO) program. The FMMO establishes provisions under which dairy processors buy fresh milk from dairy farms in a marketing region. The program was established to stabilize market conditions across the country so that consumers would be assured of adequate supplies of pure and wholesome milk at all times. Within the Central and Upper Midwest regions, Iowa's milk has consistently ranked highly in terms of low somatic cell counts, a measure of milk quality and udder health. The Central FMMO is one of four FMMO's that utilizes incentive payments for somatic cell counts below 350,000 cells/ml of milk and a price reduction for somatic cell counts above 350,000. Under the provisions of the program, milk quality has improved overall and Iowa's continues to be among the best. (Council on Dairy Cattle Breeding Somatic Cell Counts of Milk from Dairy Herd Improvement Herds in 2018, February 2019)

Proximity to grocery retail markets in large population centers (Minneapolis, Omaha, Chicago, Des Moines, Kansas

Iowa Advantages



Source: Iowa State University Extension and Outreach - Dairy Team

City) for milk and dairy products is an added benefit of Iowa's location, along with the well-developed interstate and state highway system that serves both large and small markets.

Additionally, whey and other processing co-products are used in both human and animal foods. Iowa and its Midwestern neighbors have high concentrations of food and feed manufacturers. Iowa has 1,200 food manufacturers that together generate \$36 billion in revenue annually (Dunn & Bradstreet 2019, US Census 2013). It is home to 36 of the top 100 food processors. (Food Processing Magazine) Iowa produces 9 percent of the nation's food supply. (Iowa Area Development Group, 2019).

Location can be a deciding factor when expanding or locating a dairy business. Livestock businesses all require three critical elements and they include water, feed and a feasible way to manage manure. Iowa has an advantage with all three of these aspects because of a diversified agriculture sector, supportive public policy, and vast natural resources. The heritage of livestock in this state has been balanced by the natural environment and the determination by Iowans to maintain this valuable asset. The state has a wealth of natural water resources and is

the major feed producer of corn, soy and distillers grains from the fuel ethanol industry.

Water Advantages

Favorable rainfall patterns over nearly all of Iowa have historically supported the highest yields, making Iowa a leading producer of corn. This climate creates the basis for consistent feedstuff availability including hay and oilseeds. Stewardship of the land and water are goals common to all Iowans. All around Iowa are established wetlands, buffer strips, in riparian areas, and other efforts intended to manage water quality. The Iowa Rural Water Association (www.iowaruralwater.org), a progressive organization dedicated to enhancing Iowa's water and wastewater industries, offers professional training and technical assistance. The association regularly takes a role in rural economic development and enterprise financing. Iowa is served by a very modern, comprehensive rural water system and as such water quality regulation has been consistently strengthened at the state level over the past 20 years. During this time frame livestock production restructured and environmental goals became a public focus. The U.S. Geo-

logical Surveys (USGS), in cooperation with the Iowa Department of Natural Resources (DNR), collects and compiles water level data from a statewide network of 150 observation wells. This policy approach to resource conservation requires environmental stewardship from all livestock operations. The guidance applied by Iowa Regulatory agencies has been developed and strengthened with strong, continuous involvement from state commodity organizations and general farm organizations working collaboratively for the best outcomes.

Feedstuff Advantages

The Iowa land resource was leveled by glaciers and built on the tall grass prairie. Iowans are historically early adopters of technology. So, even as the state has seen huge growth in the pork, poultry, dairy, and biofuels, feedstuff production has been in excess of local demand. Varying geography allows for abundant production of hay and haylage, pasture, intensive grazing, corn and soybeans. Iowa is the U.S. center of corn ethanol production with 38 dry-grind plants and 5 wet mill plants producing approximately 4.35 billion gallons of ethanol and over 13 million tons of distillers grains and other feed co-products in 2018. (Iowa Renewable Fuels Association). Research, experience, and new technology in distillers grains production has allowed the industry to provide products that are uniform in nutrient content and quality and can be adapted to specific markets. Iowa's fertile lands allow the production of high-quality feed grains and quality grass and hay, and its central location in the Midwest also makes easy to access other feedstuffs and ingredients essential to maintaining high-quality low-cost rations. According to the National Agricultural Statistics Service (NASS), Iowa is highly competitive in the costs of purchased and total feed costs per hundredweight (CWT) sold. The ability to grow a variety of high-quality feedstock on-farms adds to the profitability and less dependence on fluctuating feed prices.

Manure Storage



Source: Iowa State University Extension and Outreach - Dairy Team

Manure Injection Application



Source: Iowa State University Extension and Outreach - Dairy Team

Manure Advantages

In Iowa, the annual grain production requires replenishment of the fertility of the soil. Deep soils and high yields are a perfect solution for recovering value from manure. Technologies for better application and more efficient handling are applied throughout Iowa. The livestock industry is fully supported within the state with technology and

service providers abound. Iowa State University offers research-based information.

Studies demonstrate that Iowa has more than enough land and more than enough fertilization need to handle the growth in the livestock sector. While many areas of the country cannot handle such growth due to the manure, Iowa has systems in place to utilize

waste.

It has been established for decades that fed cattle finished in feed lots produce approximately one dry ton of collectible manure per animal. (An Economic Analysis of Waste Management for Texas Cattle Feed-lots: An analysis of System Alternative and Policy Implications, Glover, 1994 <http://esr.lib.ttu.edu/handle/2346/1832>). This equals about two dry tons of collectible manure per year per head of feedlot capacity. Given the amount of cropland in the Midwest crop production, there is a constant high demand for manure. Land application of cattle and dairy manure has been determined to be an optimal approach to nutrient management. Manure application leads to lower supplemental nitrogen requirements for corn production. The demand for manure and commercial fertilizer increases in areas with high availability. These factors synergistically result in increased corn production, which in turn increases demand for both manure and commercial fertilizer.

Dairy manure values, according to Iowa State University specialists, are such that a corn producer can easily have more than enough fertility brought onto his farm to fully fertilize the following year's crop and more. This means a dairy producer could contract with a farmer for their corn crop as silage. The farmer can save nearly \$40 per acre in harvest and handling costs since the dairy operation would pay for harvest of silage. If the contract barter the manure value for the corn stalk removal, the farmer will see fertility increase over time. This is a highly significant "win-win" that is being conducted. This means that the dairy operation can focus its capital on the milk enterprise while finding feed plus land resources to utilize manure value.

To put manure values into perspective, the following calculations were compiled. Assuming nitrogen is \$.38 per unit; phosphate is \$.42 per unit and potash at \$.31 per unit, and assuming a 15-ton application rate, the total value delivered to the field is \$162. (Estimated Costs of Crops Production – 2019, Ag Decision Maker, File A1-20, Plastina, Alejandro)



Source: Iowa State University Extension and Outreach - Dairy Team

With higher yields and increased corn production in Iowa, the value and marketing opportunities are here.

Regional Processing Advantages

Iowa has a robust and growing dairy industry and currently ranks highly as a processing state, with processing capacity a short distance across neighboring state lines.

The output side of the value chain has a well-established transportation, processing, distribution, and market infrastructure for primary product and co-product utilization. With respect to processing and distribution, some of the largest processors have Iowa or Midwest connections as well as many state and regional players. Iowa has 22 dairy processing facilities producing dairy products for consumers or high-value specialty ingredients for other industries. State, national and international distribution chains are well established. Iowa and adjoining states have distribution hubs for the major supermarket chains that constitute 49% of the national dairy market, major food service suppliers, and major suppliers for international

fast food restaurant chains. (Center on Globalization, Governance & Competitiveness (CGGC)).

Infrastructure Advantages

With respect to dairy production, Iowa has an educational infrastructure to train operators and update informational resources. Outstanding regional education and information and outreach sources include various farm and industry organizations, but also public institutions in Iowa and neighboring states.

The state's private and public veterinary services infrastructure and state and regional breeding (genetics), veterinary service and associated ongoing veterinary continuing education and information support resources is outstanding. Centrally located in Ames, are the Iowa State University Dairy Sciences Program, Iowa State University School of Veterinary Medicine and the USDA National Animal Disease Laboratory, all considered national leaders in dairy science, large animal veterinary training and support, and dairy enterprise risk management planning.

Several marketing and producer cooperatives (Land O' Lakes, Dairy Farmers of America, AMPI, Prairie Farms Dairy and others) are already established in Iowa. Additionally, strong policy influencing state dairy and agriculture associations (Iowa State Dairy Association, and the Iowa Farm Bureau Federation) and their associations with major production marketing cooperatives are ready and willing to work on the producer's behalf.

Based on fuel volatility, all operating expenses related to transportation can fluctuate. For this reason, it is advantageous to co-locate production facilities close to major transportation routes to processors and major transportation routes from feed producers.

Iowa is crisscrossed and bordered by major transportation corridors constantly increasing in regional impact. Bisected north-south by I-35 and east-west by I-80, these

Figure 8. Iowa Interstate and Highway Map.



Source: iStock Photo, 2019.

two interstates intersect in Des Moines, the location of several large dairy processors, and link Iowa to neighboring states.

The east west north-south I-29 corridor in the west and Hwy. 61/52 corridor in the east are ready transportation routes upon which major processors are located and are routes that lead to others in neighboring states. I-29 is an important highway of commerce linking Sioux City and Council Bluffs, IA; Omaha, NE; and Rapid City, SD. The north-south Hwy.-61/52 corridor in the east is an important highway of commerce linking Dubuque, Burlington and the Quad Cities, IA/IL areas. Additionally, I-380 is an important north-south highway of commerce linking Waterloo/Cedar Falls, Cedar Rapids and Iowa City with connections to east-west routes I-20, I-80 and Hwy.-30.

Resources

In Iowa, the Iowa State University (ISU) Department of Animal Science's Dairy Program, ISU Dairy Farm; ISU College of Veterinary Medicine's FSVM Veterinary Extension Program for Dairy Cattle; and ISU Extension dairy team; and associated manure-management programs in association with ISU Department of Agricultural and Bio-systems Engineering faculty and extension technicians support Iowa's dairy farms. The ISU dairy extension group pro-

vides information and assistance with business and financial management, production records, employee management and training including Latino resources, milk marketing and pricing, facility construction with robotic milking systems and related system support, and various livestock and environmental resources.

The ISU Veterinary Medicine Diagnostics Laboratory (VDL) Veterinary Pathology and Microbiology (VDPAM) group provides testing for milk quality and pathogens, important to Iowa dairy producers. Milk quality specialists at ISU VDPAM help troubleshoot milking equipment and cleaning problems. The ISU VDL Bacteriology Lab processes over 5,000 samples per year.

Iowa has long been noted for the competitive advantage of its workforce. The high quality workforce is reinforced by Iowa's community college system with programs for continuing education and farm management and operator training, such as the Northeast Iowa Community College Dairy Center, Calmar, IA.

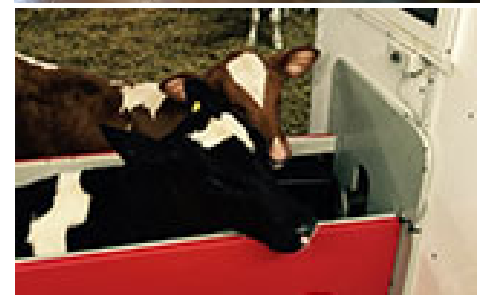
State service providers and extension outreach professionals have pioneered low cost parlors and parlor efficiency renovation support systems, as well as economic budget tools and models for all types of dairy operations (different breeds and systems of production).

Robotic milking works for all segments of the industry from small to large and from

grazing to confinement operations. Major manufacturers, including Westfalia, Lely, Boumatic, and DeLaval, offer systems in the Midwest. There are more than 35,000 robotic systems worldwide. To help producers and lenders make informed decisions on the economic variables associated with robotic systems, ISU Extension Dairy Team, has developed online resources at <https://www.extension.iastate.edu/dairyteam/milking-systems>.

Like the previously mentioned Rural Water Association, other groups contribute to sustainable rural development by providing valuable support services to Iowa's agribusiness community. The Coalition to Support Iowa's Farmers (CSIF), established in 2004 by farmers for farmers, helps livestock producers successfully and responsibly navigate the ever-changing livestock farming landscape. Working closely with the Midwest Dairy Association and other commodity groups, CSIF helps farmers understand and comply with state and federal regulations, provides building-site analysis, and consults on environment safeguards and enhanced neighbor relations.

Since its beginning in 1985, Iowa Area Development Group (IADG) has assisted over 1,700 successful new-business and business-expansion development projects representing a capital investment of more than \$6 billion and creation of over 40,000 retained and new jobs. (Iowa Area Development Group, <http://www.iadg.com/default.aspx>).



Source: Iowa State University Extension and Outreach - Dairy Team

Economic Impact

This evaluation estimates the multiplied through worth of dairy farming in Iowa as well as the value-added manufacturing activity that is linked directly to dairy farm output. This evaluation relies on an input output (I-O) model of the Iowa economy and dairy farm sector sales information from the USDA. Iowa State University has continuously maintained an IMPLAN input-output modeling system since the mid-1980s. IMPLAN provides annual state and county level estimates of inter-industrial transactions that are then used to estimate likely economic outcomes from industrial production changes. The IO model was specifically modified to align with dairy sector sales in 2017, the year of analysis, as reported by USDA.

There are two basic evaluations: first, the economic worth of dairy farming is estimated; next, an estimate is made of the statewide economic worth of dairy product processing. As the latter analysis contains linkages to the former, the I-O model was modified to sever those links so that there is no double counting. This allows the two basic estimates, dairy farming and manufacturing, to be added together to arrive at an estimate of the importance of both dairy production and manufacturing without duplication. In so doing, we arrive at a defensible estimate of the importance of that industry to the state's total economy.

Iowa's Dairy Industry

There are two aspects of Iowa's dairy industrial prominence profiled in this report. First, look at dairy production on the farm. Next, look at the processing of milk into other products for consumers or as other inputs into food manufacturing.

Key information about Iowa's dairy industry was obtained from the 2017 Census of Agriculture. According to that count, Iowa had 1,592 dairy farmers in

2017 that had \$1.025 billion in total sales, 84 percent of which were milk sales (Table 1).

Further analysis of the source data for Table 1 revealed that Iowa's dairy farmers were 6.3 percent of all farmers with cattle and calves, they possessed 11.5 percent of the state's cattle and calf inventory, and they accounted for 18.2 percent of total sales (cattle and milk) of farms with cattle and calves.

Data from the I-O model indicate that there were four major dairy products manufacturing sectors in Iowa in 2017. Although, there is no specific industry manufacturing butter exclusively in Iowa, butter is manufactured in the state and is listed in the model as a separate dairy products manufacturing sector. That sector produced \$2.86 billion in output (which is generally analogous to gross sales), and employed 3,457 job holders earning a total of \$266.51 million in labor income. The largest

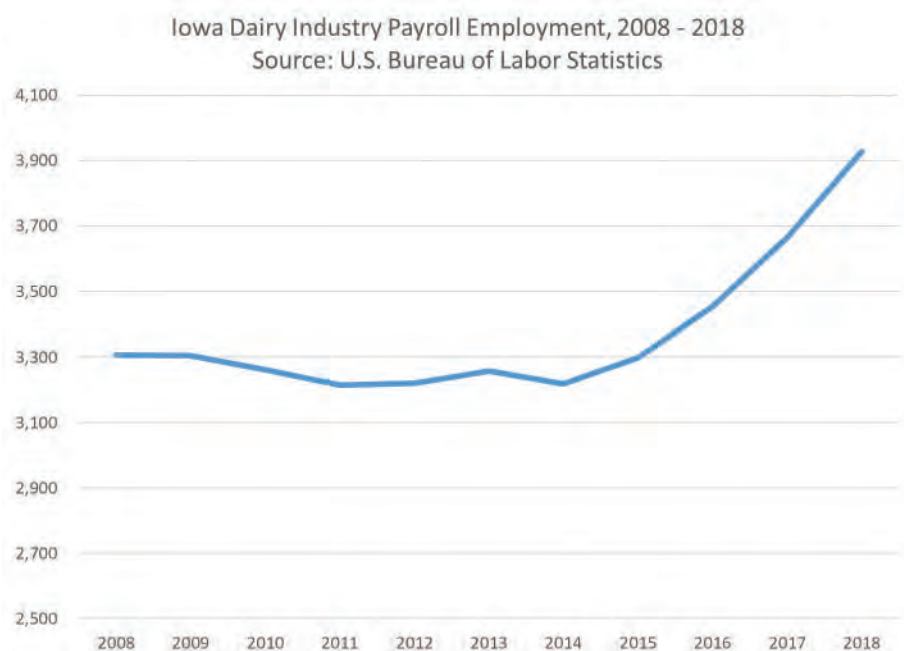
Table 1. Iowa's Dairy Farms, 2017

Farms with milk cows	1,592
Milk cows	218,000
Other cattle	212,349
Milk sales (\$000)	\$864,781
Other cattle sales (\$000)	\$159,977
Total sales (\$000)	\$1,024,758
Source: Table 17, Milk Cow Herd Size by Inventory and Sales. 2017 Census of Agriculture, USDA and NASS Figures 2017-2018	

Table 2. Iowa Dairy Products Manufacturing, 2017

	Industrial Output (\$ Million)	Jobs	Total Labor Income (\$ Million)
Fluid Milk	587.94	801	59.33
Cheese	557.92	620	38.29
Dry, condensed and evaporated dairy product	1,013.08	727	68.41
Ice cream and frozen dessert	697.7	1,609	100.48
Total	2,856.64	3,757	266.51
Source: 2017 IMPLAN model of the Iowa economy, Iowa State University			

Figure 9. Dairy Industry Payroll Employment



sector was ice cream and other frozen dessert manufacturing, and firms manufacturing cheese were the smallest.

Dairy manufacturing employment was quite stable in Iowa over the first half of the last 10 years, but has grown considerably since, as illustrated in Figure 9. Total employment grew by 22 percent between 2014 and 2018.

Data from the preceding two tables were used to modify the I-O modeling system. In addition, the production characteristics of the I-O model were also scrutinized to assure that they made sense and that they aligned broadly with dairy cost of production budgets that are produced by Iowa State University. (The Iowa State University Extension and Outreach Dairy Team produces a range of estimates of costs and returns to different dairy configurations. See, generally, <https://www.extension.iastate.edu/dairyteam/business-and-financial-management>.)

Modifying the Modeling System

Inter-industrial models track the buying

and selling relationships that exist among all firms. Because, for example, one sector of agriculture buys from another or food manufacturing firms buy from Iowa farmers, analysts have to take special care to eliminate double counting when piecing together a cogent picture of broad sectors of the economy. Because the dairy manufacturing industry buys milk products, any assessment of the economic contribution of dairy manufacturing automatically assumes an increase in dairy production at the farm level. But if we are measuring both the unique contribution of dairy farming and the unique contribution of dairy products processing, we have to eliminate these linkages in the model to not count the dairy farmers twice. In so doing, we measure dairy farming as a unique sector that buys no products as inputs from dairy manufacturing, and we measure dairy products manufacturing as a sector that has no dairy purchases in the estimate. Accordingly, we get a clean measure of the worth of dairy farming and we then get a separate estimate of the manufacturing value added that results from processing dairy farm inputs.

This is done in the model by adjusting the regional purchasing percentages of specific industries. Not only do we not want dairy industries buying from farmers in the model (again, as we have already measured their value), we also do not want the four different dairy manufacturing sectors buying and selling to one another, which they do to a substantial degree.

The IO modeling, once properly modified, then allows the analyst to properly piece together the unique and independent contributions each industry makes towards the total economic contribution of Iowa's dairy industry.

Understanding Economic Impact Terminology

Tables in the next section will outline the economic contributions of Iowa's dairy producers and dairy products manufacturers. Understanding the tables takes some preparation. I-O models produce an array of information for analysts. For our purposes, however, there are four types of data and four levels of data comprising a typical I-O results table.

The types of economic data are:

- **Output.** This is the value an industry's productivity over the course of a year. It represents the worth of what was produced whether it was sold or not. For many industries, total income represents output. That is especially true for food products manufacturing.
- **Labor income.** These are wage and salary payments to workers, including employer-provided benefits. Payments that farm and nonfarm proprietors make to themselves for their labor and management 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. I-O models do not convert jobs into full-time equivalencies, but they do express them as annualized equivalencies. As many people have more than one job, there are always more jobs in an economy than there are employed persons.

The levels of economic impact data are:

- **Direct values** These are the just-mentioned data types for the industry we are evaluating. In this study, the direct data will refer to activity unique to the ag sectors analyzed and that of the manufacturing firm that were included.
- **Indirect Values.** All direct firms require intermediate manufactured and service inputs into production. They may buy supplies, utilities, wholesale goods, transportation, and services, just to name a few. Many people like to call this the supply chain.
- **Induced values.** When the workers in the direct activity along with those in all of the indirect industries (the supplying sectors) convert

their labor incomes into household spending they induce a third round of economic activity. Induced values are also called the household values.

- **Total values.** The sum of direct, indirect, and induced activity constitutes the total economic effect that is being measured. In short it gives us the economic sums of the studied industries, their suppliers, and all affected households within the study region.

The following tables summarize the separate contributions of each level of economic activity that is included in the definition of dairy farming and in dairy products manufacturing. This study uses the phrase “economic contribution” because we are measuring the total multiplied-through value of these activities as they contributed to Iowa’s total economy in 2017. Economists reserve the term “economic impact” to denote a discernible change in economic activity due to demand changes. For example, trade actions that limit agricultural exports have an economic impact on those agricultural producers and on the state’s economy.

The Economic Contributions of Iowa’s Dairy Production and Processing Sectors

The sales or the output data that are listed in Table 1 and Table 2 were en-

tered into the I-O models as “shocks” to the model to produce the multiplied through consequences. In the next table, a complete description of the elements of the table will be given to assist the reader in understanding how to read and understand the information presented. In the subsequent tables to that one, only a description of the total results will be discussed.

Milk Production

Table 1 on page 13 breaks out dairy farm activity into milk sales and cattle and calves sales. This first economic contribution summary explains the components of the multiplied-through consequences of the production and sale of milk by farmers. Table 3 indicates that the \$864.32 million in dairy sales in Iowa in 2017 required, at the farm (or the direct) level, 1,612 workers (including the farmer) making \$116.3 million in labor income. Those farmers required \$385.16 million in inputs from state industries, which in turn required 1,509 workers earning \$87.21 million in labor income. When the farm workers and the supply sector workers converted their labor incomes into household spending, they induced \$145.85 million in output in Iowa, which required 1,132 persons to produce earning \$45.41 million. Sum-med, Iowa’s dairy farmers contributed \$1.36 billion in total output to the state’s

Table 3. The Economic Contribution of Iowa Dairy Farm Milk Sales, 2017

	Jobs	Labor Income	Value Added	Output
Direct	1,612	\$116,299,396	\$361,761,757	\$864,320,000
Indirect	1,509	\$87,206,230	\$157,607,335	\$385,162,055
Induced	1,132	\$45,408,770	\$83,108,322	\$145,854,209
Total	4,252	\$248,914,396	\$602,477,414	\$1,395,336,264

Table 4. The Economic Contribution of Dairy Farm Cattle and Calf Sales, 2017

	Jobs	Labor Income	Value Added	Output
Direct	745	\$14,462,104	\$40,834,216	\$159,977,000
Indirect	276	\$15,381,684	\$26,778,921	\$61,045,323
Induced	166	\$6,658,390	\$12,186,437	\$21,386,848
Total	1,187	\$36,502,178	\$479,799,574	\$242,409,171



Source: Iowa State University Extension and Outreach - Dairy Team

Table 5. The Economic Contribution of Dairy Farm Milk, Cattle, and Calf Sales, 2017

	Jobs	Labor Income	Value Added	Output
Direct	2,357	\$130,761,500	\$402,595,973	\$1,024,297,000
Indirect	1,785	\$102,587,914	\$184,386,256	\$446,207,378
Induced	1,298	\$52,067,160	\$95,294,759	\$167,241,057
Total	5,440	\$285,416,574	\$682,276,988	\$1,637,745,435



Source: Iowa State University Extension and Outreach - Dairy Team

economy, of which \$602.48 million was value added, and of that value added, \$248.91 million was labor income that went to 4,252 Iowa jobholders.

Iowa's dairy farms also had sales of cattle and calves. Those sales were modeled separately using the cattle and calves production component of the model, and the results of which are in Table 4. There were \$159.98 million of these sales, and farm labor associated with the production of those animals numbered 745 jobs making \$14.46 million in labor income. After all inter-industrial relationships were accounted for, that component of dairy farms produced \$242.41 million in total output, of which \$79.8 million was value added, and of that value added, \$36.5 million was labor income to a total of 1,187 jobholders statewide.

Table 5 combines the previous two

tables for a summary of the value of dairy farming in Iowa. All told, Iowa's dairy farmers produced \$1.64 billion in total industrial output. Of that output, \$682.28 million was value added. Of that value added, \$285.42 million was labor income that went to 5,440 Iowa jobholders

Milk Products Manufacturing

Iowa's dairy farmers sell primarily to Iowa manufacturers who make dairy products as inputs into other food production or for household consumption. This next subsection lists the separate economic contributions those sectors of Iowa's economy make. Again, it is important to remember that in this section, the supply linkages have been modified in order to present non-duplicative values that do not include any farm level values summarized in the previous three tables as well as sales

that occur across dairy manufacturing industries. By doing so, this allows for a complete and incremental summation of the unique contributions of each type of manufacturing sector to the state's economy. Table 6 totals indicate that Iowa's fluid milk manufacturers generated \$797.67 million in total economic output in 2017, and \$211.83 million in value added. Of that value added, \$131.24 million was labor income to 2,186 Iowa workers.

Iowa's cheese products manufacturers (Table 7) accounted for \$744.29 million in total industrial output in 2017 and \$160.99 million in total value added. Of the value added, \$101.4 million was labor income accruing to 1,788 Iowa jobholders.



Source: Iowa State University Extension and Outreach - Dairy Team



Source: Iowa State University Extension and Outreach - Dairy Team



Table 6. The Economic Contribution of Fluid Milk Manufacturing, 2017

	Jobs	Labor Income	Value Added	Output
Direct	801	\$59,326,375	\$92,009,022	\$578,942,592
Indirect	783	\$47,712,713	\$75,562,283	\$140,951,518
Induced	602	\$24,201,997	\$44,261,556	\$77,773,375
Total	2,186	\$131,241,085	\$211,832,861	\$797,667,485

Table 7. The Economic Contribution of Cheese Manufacturing, 2017

	Jobs	Labor Income	Value Added	Output
Direct	620	\$38,283,612	\$55,470,586	\$557,889,904
Indirect	704	\$44,421,881	\$71,333,540	\$126,332,886
Induced	465	\$18,693,790	\$34,188,589	\$60,071,988
Total	1,788	\$101,399,283	\$160,992,715	\$744,294,778

Manufacturers of dry, condensed, and evaporated dairy products in Iowa generated \$1.39 billion in total output in 2017 and \$323.09 million in value added (Table 8) after all effects were multiplied through the model. Of the value added, \$185.82 million was labor income to 2,878 Iowa workers.

Table 9 isolates the contribution of ice cream and frozen dairy products manufacturing in Iowa. Total output in 2017 was \$987.64 million, of which \$346.10 million was value added. Of the value added, \$187.38 million was labor income to 3,296 workers.

Table 8. The Economic Contribution of Dry, Condensed and Evaporated Dairy Product Manufacturing, 2017				
	Jobs	Labor Income	Value Added	Output
Direct	727	\$68,411,585	\$123,648,002	\$1,013,116,096
Indirect	1,300	\$83,150,671	\$136,794,284	\$267,439,852
Induced	852	\$34,255,595	\$62,649,428	\$110,079,138
Total	2,878	\$185,817,852	\$323,091,714	\$1,390,635,086

Table 9. The Economic Contribution of Ice Cream and Frozen Dairy Product Manufacturing, 2017				
	Jobs	Labor Income	Value Added	Output
Direct	1,609	\$100,480,607	\$196,944,178	\$697,684,096
Indirect	1,828	\$52,330,528	\$85,929,840	\$178,858,357
Induced	859	\$34,570,261	\$63,221,470	\$111,094,006
Total	3,296	\$187,381,396	\$346,095,488	\$987,636,459

Table 10. The Economic Contribution of All Dairy Products Manufacturing, 2017				
	Jobs	Labor Income	Value Added	Output
Direct	3,757	\$266,502,179	\$468,071,788	\$2,847,632,688
Indirect	3,614	\$227,615,793	\$369,619,947	\$713,582,613
Induced	2,777	\$111,721,643	\$204,321,043	\$359,018,507
Total	10,148	\$605,839,616	\$1,042,012,778	\$3,920,233,808

Table 11. The Economic Contribution of All Dairy Farming and Dairy Products Manufacturing, 2017				
	Jobs	Labor Income	Value Added	Output
Direct	6,114	\$397,263,679	\$870,667,761	\$3,871,929,688
Indirect	5,399	\$330,203,707	\$554,006,203	\$1,159,789,991
Induced	4,074	\$163,788,803	\$299,615,802	\$526,259,564
Total	15,587	\$891,256,190	\$1,724,289,766	\$5,557,979,243

Table 10 is the sum of the previous four tables and represents the unique contributions of each of those sectors to the Iowa economy. Dairy products manufacturers in Iowa generated \$3.92 billion in total economic output, of which \$1.04 billion were payments to value added. Of the value added produced in 2017, \$605.84 million were labor income payments to 10,148 Iowa jobholders.

Combined Dairy Farming and Dairy Products Manufacturing Contributions

Now that the individual sector or activity values have been compiled without any double counting, a grand total can be generated that combines dairy farming and dairy products manufacturing economic contributions.

Iowa farm through manufacturing dairy industries accounted for \$5.56 billion in total industrial output in 2017 and made \$1.72 billion in payments to value added. Of that value added \$891.26 million was in the form of labor income that supported 15,587 Iowa jobs.

Table 12 illustrates the distribution of jobs by different industries. It lists the top 20 industries in terms of job production in the sectors analyzed above as well in the supplying sectors and sectors that service households. As would be expected, the largest job impacts are in the sectors explicitly measured in this report, but there are strong job effects in wholesale trade, truck transportation, real estate (both land rental and to households), dining and drinking services, health care, banking, and in retail trade.

Table 12. Top 20 Combined Dairy Production and Dairy Products Manufacturing Job Creation by Industry

Dairy cattle and milk production (milk only)	1,612
Ice cream and frozen dessert manufacturing	1,609
Wholesale trade	1,393
Truck transportation	814
Fluid milk manufacturing	801
Beef cattle ranching and farming, including feedlots and dual-purpose ranching and farming	745
Dry, condensed and evaporated dairy product manufacturing	727
Cheese manufacturing	620
Real estate	347
Support activities for agriculture and forestry	316
Limited-service restaurants	265
Full-service restaurants	256
Management of companies and enterprises	220
Hospitals	192
Services to buildings	179
Monetary authorities and depository credit intermediation	175
Employment services	168
Retail - food and beverage stores	165
Retail - general merchandise stores	159
Maintenance and repair construction of nonresidential structures	148
Total	15,587

All Dairy Farming & Manufacturing

15,587 jobs

**Labor income of
\$891,256,190**

Output \$5,557,979,243



Dairy Products Manufacturing
3,757 jobs
Labor income of \$266,510,000
Output \$2,856,640,000

Ice Cream Manufacturing
3,296 jobs
Labor income of \$187,381,396
Output \$987,636,459

Iowa Economic Impact of Single Dairy Cow

\$25,495



Dairy Farm Cattle and Calf Sales 5,440 jobs
Labor income of \$285,416,574
Value-added \$682,276,988
Output \$1,637,745,435

Fluid Milk Manufacturing 2,186 jobs
Labor income of \$131,241,085
Value-added \$211,832,861
Output \$797,667,485



Data Source: USDA Census of Agriculture 2017, NASS 2017-2019

Source: Pictures from Iowa State University Extension and Outreach - Dairy Team and stock photos

Resources:

Iowa State Dairy Association	https://www.iowadairy.org/
Midwest Dairy Association	https://www.midwestdairy.com/
Iowa State University Extension and Outreach	https://www.extension.iastate.edu/aq/dairy
Iowa State University Extension and Outreach Farm, Food and Enterprise Development	https://www.extension.iastate.edu/ffed/
Iowa Department of Agriculture and Land Stewardship	https://iowaagriculture.gov/dairy-products-control-bureau
USDA Agriculture Marketing Service	https://www.ams.usda.gov/market-news/dairy
United States Department of Agriculture National Agricultural Statistics Service	https://www.nass.usda.gov/Publications/AqCensus/2017/index.php
US Dairy	https://www.usdairy.com/
US Dairy Export Council	https://www.usdec.org/
IBIS World	https://www.ibisworld.com/

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