IOWA STATE UNIVERSITY
Extension and Outreach
Value Added Agriculture Program

Iowa's Dairy Industry

An Economic Review

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Table of Contents

Executive Summary 3

Industry Situation and Outlook 4

- Industry Size and Location 4
- Prices and Profits 5

Competitiveness of the Iowa Dairy Industry 6

- Water Advantages 6
- Feedstuffs Advantages 7
- Manuare Advantages 8
- Regional Processing Advantages 9
- Infrastructure Advantages 10

Economic Impacts 13

- Economic Importance of the Dairy Industry in Iowa 15
- Impact on Dairy Processing Employment 16

Executive Summary

This report shows the Iowa dairy industry is already a strong economic driver in Iowa and the Midwest. What is the trend in demand for dairy products? Up. And dairy businesses are responding. Iowa among all Midwest states is the only one to grow for two decades and counting; and it is poised for continual growth.

Why Iowa? Iowa has tremendous water resources, people resources, feed resources, transportation infrastructure, dairy heritage and consistent top markets; describing a place with competitive advantage in all the main categories. Iowa is a place with always competitive costs and high prices for milk as shown in the graphs within this report. Iowa has all the comparative advantages which drive naturally to competitive business advantages for dairy industry stakeholders operating here.

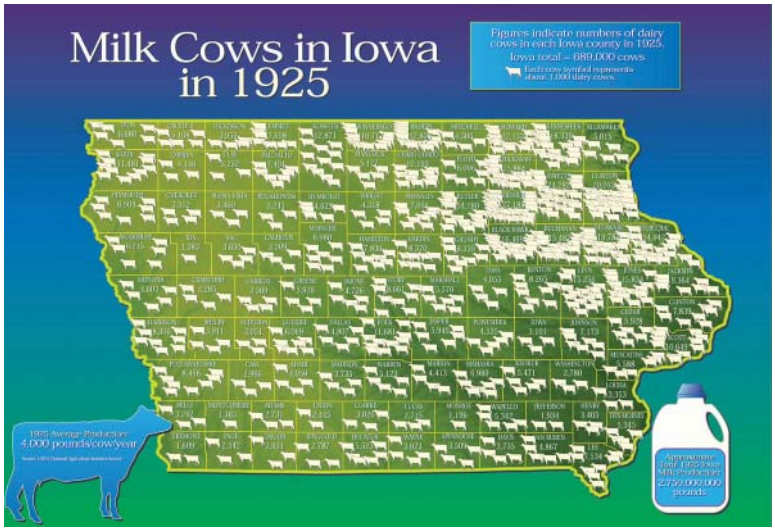
Dairy cows and the economic activity that they generate in the local economy have always and continue to be one of the most robust economic stimuli that exist. The most recent IMPLAN model (2011) quantifies that fact with the following statistics.

- $23,445 is the total economic impact per cow through direct/indirect and induced commerce.
- Each cow generates the equivalent of .1 full time job created throughout the entire dairy and processing sectors.
- Over 22,000 jobs are supported by the activities directly, indirectly and induced by a strong dairy presence.

Dairy Industry Situation and Outlook

The Iowa dairy industry has historically been important in Iowa and remains so yet today as the fifth largest sector of Iowa agriculture. Rooted in Iowa by Dutch immigrants, the industry has helped shape the fabric of many rural communities. Although the demographics of herd size and location within the state have shifted with time, the positive economic impact of the dairy industry has remained solid. Competitive advantages that Iowa offers to the dairy industry have resulted in Iowa being the only Midwestern state that has experienced an increase in milk production, estimated at 19 percent over the past two decades. With ample quality feed, stable prices, access to markets and a strong support system for production agriculture, the potential for growth will likely continue.

Figures 1 and 2.



Industry Size and Location

Nationally, Iowa ranks 12th in total pounds of milk produced, representing 2.25 percent of the 192.8 billion pounds in total U.S. milk production. *(Source: NASS)* Iowa has 209,000 milk cows in production on over 1,700 farms, producing 4.34 billion pounds of milk. *(Source: NASS)* In addition, there are more than 600 dairy goat operations and 15 licensed processing facilities. *(Source: 2007 Census of Agriculture)* Consistent with national trends, the total number of dairy farms has declined, yet the production per cow and total production both continue to increase with averages of 20,751 pounds of milk produced per cow. *(Source: NASS)* Increases in production are a result of dedicated producers and support industries utilizing or providing access to new technologies, improved feed efficiencies and operation management.

Dairy operations of various sizes and structure are located throughout the state, but the heaviest concentration of production is located in northwestern and northeastern Iowa. Iowa operations of all sizes are complemented by an equally diverse selection of processors strategically located throughout the state to services both in-state and out of state markets.

Iowa's processing capabilities rank it among the top 10 states in fluid milk bottling (9th), total dairy products processed (8th), cheese production (7th), cottage cheese production (6th), American cheese production (6th) and ice cream production (4th). Iowa has 11 milk bottling plants processing fluid milk, ten processing dry milk products, 11 processing cheese and seven processing ice cream. Iowa has more than 12 receiving and transfer stations to facilitate sales and transportation of milk. *(Source: Iowa State Dairy Association)* This highly diverse production and processing model helps create stable and attractive regional price trends, provides opportunities for growth, and places Iowa in a strong position to meet changes in national and international consumption trends.

Nationally, fluid milk consumption has declined since 1975, but cheese consumption has increased more than 100 percent, creating an overall increase in consumption of milk products from 539 pounds per person to 616 pounds per person in 2010. *(Source: Marketing Service Bulletin, Federal Milk Market Administrator, USDA)* American per capita cheese consumption was 33.3 pounds in 2010. *(Source: Wisconsin Milk Marketing Board)* Yogurt and cream products also posted significant per capita consumption gains during this time frame. Americans eat an average of 13.5 pounds of yogurt per person every year, more than double the 6.5 pounds per person Americans consumed just ten years ago. *(Source: Wisconsin Milk Marketing Board)*

Another important factor driving milk production is demand for whey, the fluid co-product of cheese production. Exported whey products provide high quality protein to countries where milk and meat are less available. Recently, domestic demand for whey proteins has risen with their use in weight management diets, also known as functional beverages. The market for functional beverages grew by more than 30 percent over the past five years, according to a Mintel report. *(Source: Whey Protein Sees Demand from Functional Drinks, www.Nutraingredients-usa.com)* Whey is also an appropriate protein source for gluten-free diets and lacto-vegetarian diets.

Prices and Profits

In 2010, the national fluid grade milk price was $16.28/cwt. During the same period in Iowa, the average price was $16.55/cwt. *(Source: NASS)*

Iowa is part of the Central and Upper Midwest Federal Milk Marketing Orders, a program that helps stabilize market conditions. The Market Order benefits producers and consumers alike by establishing and maintaining consistent market conditions and assuring consumers of adequate supplies of pure and wholesome milk at all times.

Iowa's milk has consistently ranked highly in the Central order in terms of somatic cell counts, a measure of milk quality and udder health. Low somatic cell counts mean better quality. The quality of milk from all states has improved; Iowa's milk continues to be the best.

Iowa's dairy farms come in all shapes and sizes. Nearly all of them are family-owned and herd sizes range from 10 cows to 6,000 cows. Systems include pasture, intensive grazing, and conventional barns that incorporate tie stalls, free stalls and compost barns. Milking parlors may be low-cost conventional styles or state-of-the-art robotic systems. In Iowa, there is opportunity for dairy herdsmen to develop the style that works best for them.

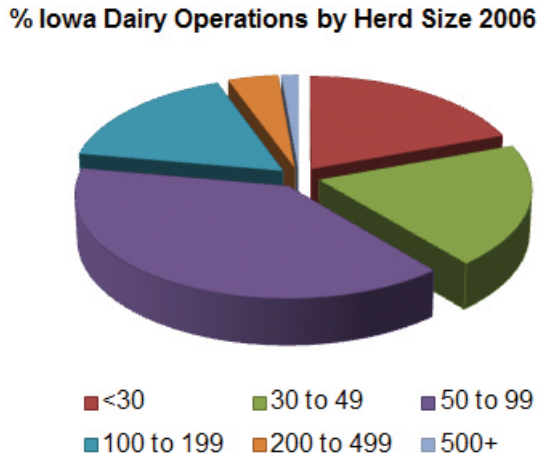


Figure 3. *(Source: NASS)*

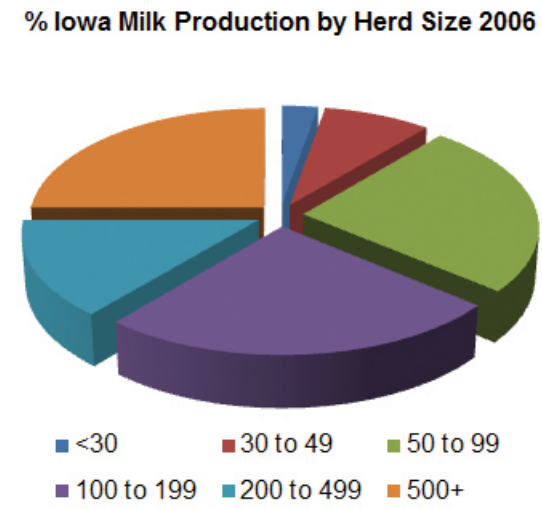


Figure 4. *(Source: NASS)*

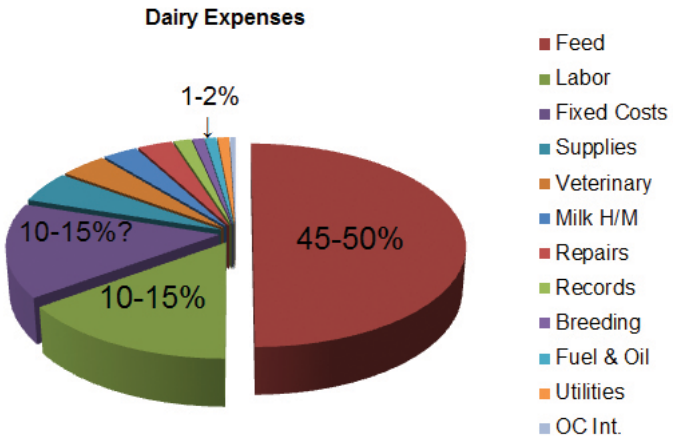


Figure 5. *(Source: NASS)*

The charts show that Iowa milk comes from many different sized operations, with an increased percentage from larger operations; yet, farms with herd sizes less than 500 cows produce more than 75% of the milk. Consistent high levels of milk production insure the transportation and processing infrastructure to sustain growth in the industry. In addition, seventy percent of the farmers are members of cooperatives that own the processing facilities. Both large and small operations require nearly the same number of employees per number of cows, so all sizes of operations are regarded as positive contributors to their communities.

The combination of stable pricing, quality products and access to quality feed and support services creates a highly competitive scenario for existing and potential dairy operations in the state. According to NASS, the 2010 average total operating costs per CWT sold was $13.73. These operating costs include the average total feed, services and utilities expenses across all types of operations.

Competitiveness of the Iowa Dairy Industry

Location matters when deciding to expand or locate a dairy business. Livestock businesses all require three essentials – water, feed and a feasible means of handling manure. These three key aspects are in synch in Iowa because of diversified agriculture, supportive policy and natural resources. The heritage of livestock in this state and region exists because of the balance nature provides that Iowans are determined to maintain. 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, a progressive organization dedicated to enhancing Iowa's water and wastewater industries, offer professional training and technical assistance. This association regularly takes a role in rural economic development and enterprise financing.

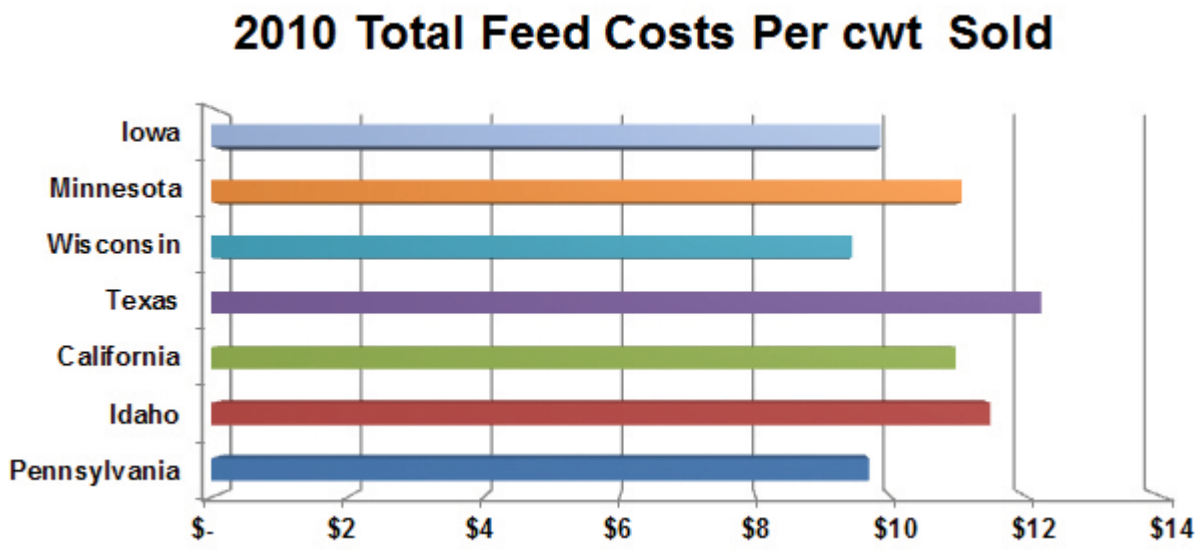
Iowa is served by a very modern, comprehensive rural water system of "processed" treated water. Water quality regulation has been consistently strengthened at a state level over the past 20 years as livestock production restructured and environmental goals became a public focus. The U.S. Geological Surveys (USGS), in cooperation with the Iowa Department of Natural Resources (DNR), collects and compiles water-level data from a statewide network of about 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 hand in glove for the best outcomes.

Feedstuff Advantages

The Iowa land resource was leveled by glaciers and built over eons of tall grass prairie, and now supports the strongest and most intense crop production in the world. Iowans are historically early adopters of technology. So, even as the state has seen huge growth in 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 35 dry-grind plants and six wet mills, producing approximately 3.6 billion gallons of ethanol and over 11 million tons of distillers grains and other feed co-products in 2011 *(Source: 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 fertile lands allow the production of high quality feed grains and quality grass and hay, it's central location in the Midwest also makes easy to access other feedstuffs and ingredients essential to maintaining a high-quality low-cost rations. According to NASS data, Iowa is highly competitive in the costs of purchased and total feed costs per CWT sold. The ability to grow a variety of high-quality feedstock on-farm adds to profitability and less dependence on fluctuating feed prices.



Figures 6. *(Source: NASS)*

Manure Advantages

In Iowa, the annual grain production requires replenishment of fertility to the soil. Deep soils and high yields are a perfect solution for recovering value from manure. Technologies for better spreading and more efficient handling are applied everywhere in Iowa. The livestock industry is so immense in the state that technology providers and service providers abound. Iowa State University offers research-based information.

Studies show that Iowa has more than enough land and more than enough fertilization need to handle 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. *(Source: An Economic Analysis of Waste Management for Texas Cattle Feedlots: 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 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 waste 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 resulting 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 corn crop and more. This means a dairy producer could contract with a farmer for his 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 barters the manure value for the corn stalk removal, the farmer will actually see his fertility increase over time. This is a highly significant "win-win" that is being done. This means the dairy operation can focus its capital on the milk enterprise while finding feed plus land resources to utilize manure value.

To put manure value in perspective, look at these values. Assuming Nitrogen at $.60 per unit; Phosphorus at $.60 per unit and Potassium at $.50 per unit and assuming a 15 ton application rate the total value delivered to the field is $108 N + $54 P + $90 K = $252 of commercial fertilizer value. This does not account for significant sulfur, magnesium and organic matter which also bring value.

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 (Table 1), with substantial processing capacity a short distances across neighboring state lines.

The output side of the value chain has 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 more than 12 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. *(Source: Center on Globalization, Governance & Competitiveness (CGGC). Top 110 Companies from Dairy Foods, 2008; Supermarkets' share of Dairy, Yonkers, 2008)*

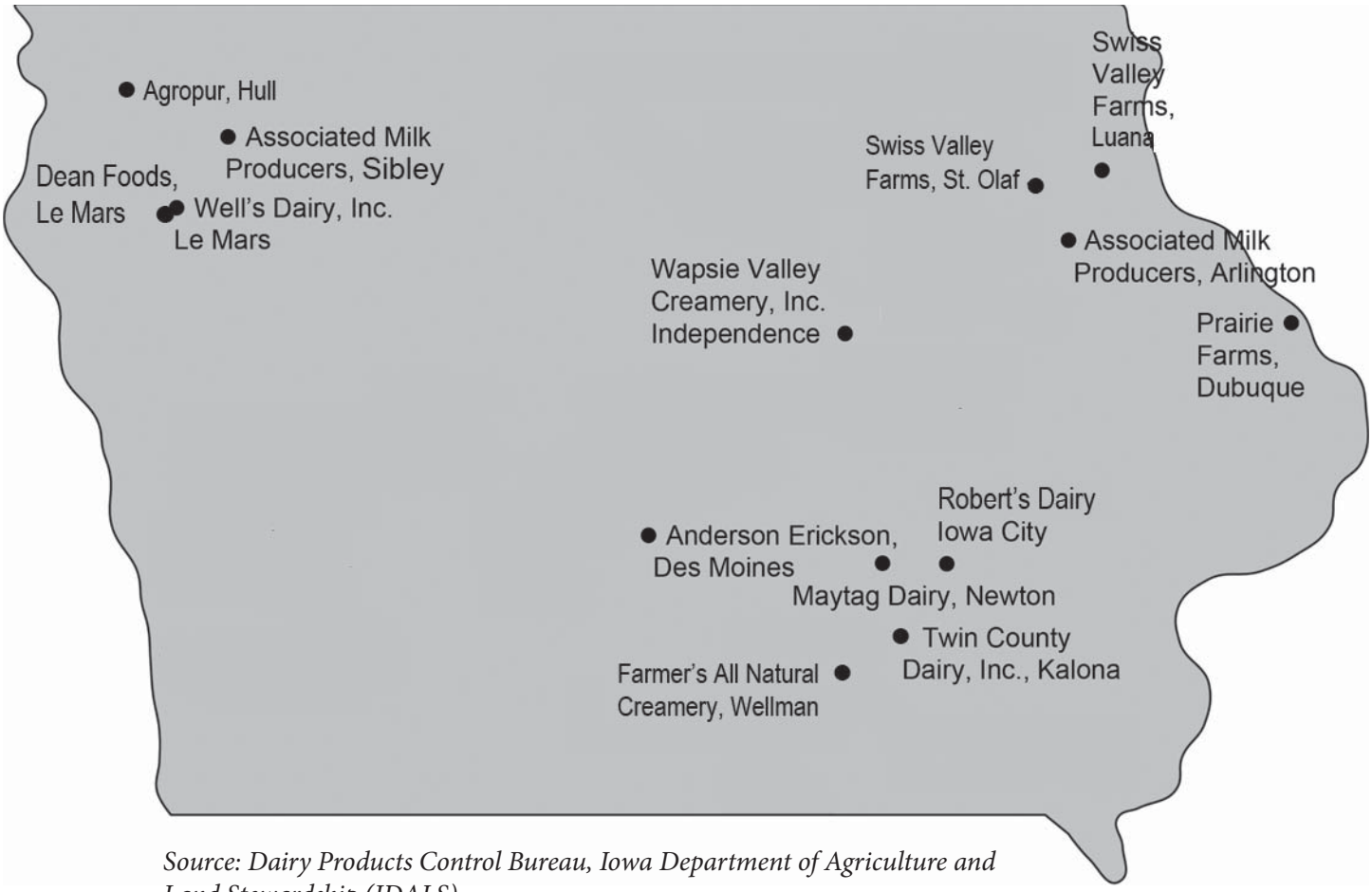
Table 1. Annual Dairy Demand (1,072,668,929 gallons / 85,589,699.55 cwt) in Iowa and States Surrounding Iowa in gallons(first row) / cwt (second row) of production/year:

State	Milk	Dairy Case	Frozen Dairy	Misc. Dairy	Total Dairy Market Per State
IA	62,972,683	15,174,638	15,057,443	6,642,070	99,846,834
	5,415,651	1,305,019	1,294,940	571,218	8,586,828
MN	109,539,190	26,395,850	26,191,994	11,553,692	173,680,726
	9,438,025.86	2,271,188.16	1,290,783.29	858,221.90	13,858,219.21
WI	118,053,838	28,447,640	28,227,937	12,451,778	187,181,193
	10,171,657.99	2,447,731.08	1,391,117.84	924,932.80	14,935,439.71
IL	270,865,786	65,271,003	64,766,911	28,569,683	429,473,383
	23,338,115.73	5,616,137.63	3,191,816.83	2,122,189.79	34,268,259.98
MO	123,886,835	29,853,228	29,622,669	13,067,016	196,429,748
	10,674,235.92	2,568,672.58	1,459,852.47	970,633.39	15,673,394.36
NE	37,398,854	9,012,067	8,942,467	3,944,660	59,298,048
	3,222,329.41	775,428.73	440,699.04	293,014.00	4,731,471.18
SD	16,780,107	4,043,532	4,012,303	1,769,889	26,605,831
	1,445,793.82	347,919.14	197,732.72	131,469.53	2,122,915.11
Total Surrounding States by Product	676,524,610	163,023,320	161,764,281	71,356,718	1,172,515,763
	58,290,158.73	14,027,077.32	7,972,002.19	5,300,461.31	94,176,527.55

(Source: Iowa State University Leopold Center for Sustainable Agriculture, U.S. Food Industry Market Estimator http://www.ctre.iastate.edu/marketsize/Default.aspx .
Where 1.0 gal. of milk = 8.6 lbs of milk; 1.0 qt. = 2.15 lbs of milk; 1.0 pt. = 1.075 lbs of milk; and (100 lbs. whole milk) yields: 4.4 lbs. butter or 9.5 lbs. of cheese. 1.0 cwt = 100 lbs = 1016 kg. Source: NC Cooperative Extension Agricultural Conversion Factors, http://www.ces.ncsu.edu/chatham/ag/conversion.html.)

Figure 7.

Iowa Grade A Bottling Plants and Dairy Products Manufacturing Facilities



Source: Dairy Products Control Bureau, Iowa Department of Agriculture and Land Stewardship (IDALS)

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 Science 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 development risk-management planning.

Several marketing and producer cooperatives (Land O'Lakes, Dairy Farmers of America, Swiss Valley Farms, AMPI, Prairie Farms and others) are already established in Iowa. Additionally, strong policy-influencing state dairy and agricultural associations (Iowa State Dairy Association, Midwest 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.

As fuel prices continue to increase, all operating expenses related to ground transportation also will increase. 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 two Interstates intersect in Des Moines, the location of several large dairy processors and link Iowa to neighboring states.

The 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 Davenport, IA, 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.

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 provides information and assistance with business and financial management, production records, employee

management and training including Hispanic 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 (VPAM) group provides testing for milk quality and pathogens, important to Iowa dairy producers. Milk-quality specialists at ISU VPAM are available to help troubleshoot milking equipment and cleaning problems. The ISU VDL Bacteriology processes over 5,000 samples per year with an emphasis on accurate analysis and fast, efficient turnaround.

Iowa has long been noted for the competitive advantage of its outstanding, increasingly diverse workforce. The high-quality workforce is reinforced by Iowa's community college system with outstanding programs for continuing education and farm-management and operator training. Since the creation of the Northeast Iowa Community College Dairy Center, Calmar, IA, in 2000, and the associated Northeast Iowa Dairy Foundation, more than 300 dairy science students have received fundamental and advanced training. *(Source: Northeast Iowa Dairy Education, 2010, http://www.reeis.usda.gov/web/crisprojectpages/218780.html)*

Much of this is due to the assistance of state service providers and extension outreach professionals who have pioneered low-cost parlors and parlor-efficiency renovation support systems.

Iowa is becoming the rapidly-expanding home of the robotic milking industry. *(Source: ISU Extension develops tools for evaluating finances of robotic milking system, AgriNews, 2011, http://www.agrinews.com/isu/extension/develops/tools/fo/evaluating/finances/of/robotic/milking/system/story-4074.html)* Robotic milking works for all segments of the industry from small to large and from grazing to confinement operations. Major manufacturers including Westfalia, Lely and DeLaval offer systems in the Midwest and Boumatic will soon be introducing a new system. With about 14,000 robotic systems worldwide, installation of robotic milking systems in Iowa is expected to more than triple in 2012, and it is possible that by 2020, 10 to 30 percent of Iowa's existing dairy producers will be using robotic systems according to Iowa State University (ISU) dairy specialists. To help producers and lenders make informed decisions on the economic variables associated with robotic systems, ISU Extension farm and agribusiness management specialists, have developed a partial budget spreadsheet. This tool will be available on the ISU Extension dairy team website in 2012.

Iowa's dairy scene is a diverse picture where operators from 18 to 8,000 head have more efficiently out-produced surrounding states for the past two decades. This is in spite of the fact that Iowa, like many other Plains states, has seen loss of population from many of its rural areas, causing financial hardship to many rural communities. Considering the substantial impact dairy production has on rural communities, this has created opportunities for dairy producers of almost any size to locate operations in several Iowa counties are considered economic incentive zones. State and private development groups continually concentrate resources to bring agricultural industry and support services to these areas.

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.

Utility providers contribute to another group, The Iowa Area Development Group (IADG). Since its beginning in 1985, IADG has assisted with over 1,700 successful new-business and business-expansion development projects representing a capital investment of more than $6.0 billion and creation of over 40,000 retained and new jobs. *(Source: the Iowa Area Development Group, 2011, http://www.iadg.com/default.aspx)* IADG services are offered at no charge to new and expanding businesses. The group provides information essential to any site location decision, using an extensive database of site, building and community-data.

Economic Impacts

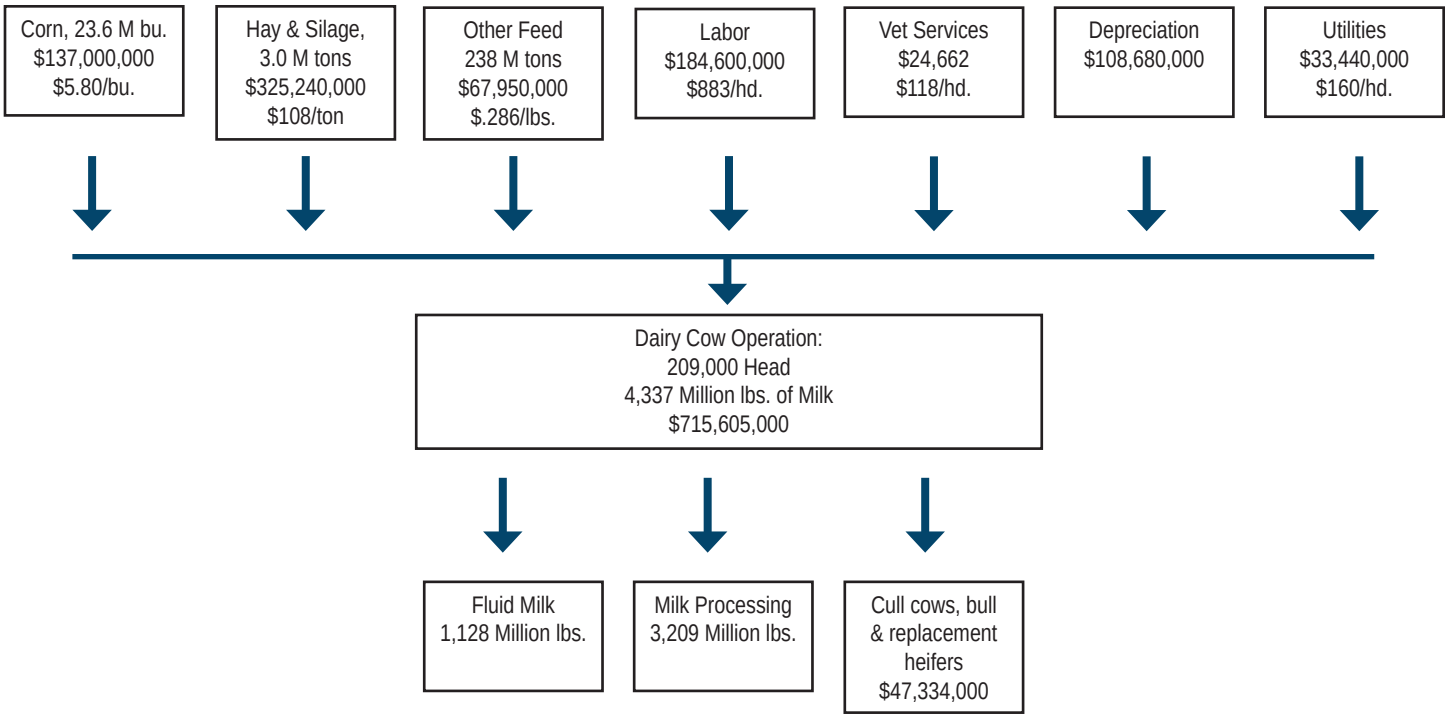
Dairy production and dairy processing have an undisputable reputation for generating positive economic growth and job creation for their communities. The impact for Iowa can best be illustrated using the combined resources and data collected by the Iowa State University Department of Economics and prepared using an IMPLAN modeling system. The IMPLAN system is an Input-Output (I-O) model originally developed by the U.S. Forestry Service and currently maintained by the Minnesota IMPLAN Group. This modeling system is widely used by regional scientists to estimate economic impact. Data for the input modeling was collected from Iowa State University dairy budgets.

The basic scenario in this analysis looks at the overall importance and contribution of the dairy industry to the Iowa economy based on the 2010 economy climate and current levels of production in the Iowa dairy industry. Economic impacts of the dairy industry in Iowa were estimated utilizing the IMPLAN input-output economic modeling software customized with state and federal statistical data to capture the economic impact specific for the state of Iowa. IMPLAN uses historical data to estimate linkages between industries in the regional economy and determine how changes in one industry affect other industries within Iowa's economy.

The Iowa dairy industry involves over $715 million in sales of milk production and $1.2 billion of processed dairy products making it one of the five largest commodity groups in the state. Including the secondary impacts of input purchasing and consumer spending by farmers and workers involved in the dairy industry brings the total economic effects to $4.9 billion. Other indicators include $914 million of earnings and 22,263 jobs.

The $715 million of dairy sales reported in 2010 represent one measure of the aggregate value of the dairy industry at the farm level. Because of close relationships with processing activities in the dairy industry, it is convenient to incorporate dairy processing activities as part of the direct or primary component of the Iowa dairy industry. In addition to these direct industry effects, the backward and forward linkages generate significant additional impacts throughout the Iowa economy. The backward linkages include purchased inputs, supplies and services used by dairy producers. The forward linkages include further value-added activities occurring after the farm-gate such as dairy processing and cheese and ice cream production.

Figure 8. *(Source: Iowa IMPLAN Study.)*



The cost of production and input usage is calculated for the Iowa dairy numbers based on average costs of production in the ISU dairy budgets. Based on statewide numbers of cows and milk production, totals of feed use, other direct inputs, annual depreciation on capital investments, labor requirements and returns to management and capital are generated. These aggregates are depicted in Figure 8.

The first row of the schematic in Figure 8 represents purchased cash inputs used by producers at the farm level. The prices and values in this section are intended to reflect long-run conditions and prices in the industry and are consistent with projections made by The Food and Agricultural Policy Institute (FAPRI). The estimated total value of direct feed inputs used in Iowa sum to $530.75 million. Additional costs for depreciation of fixed assets and facilities total an estimated $108.7 million. Labor and management expenses add an additional $184.6 million of costs for a total of $823.4 million of aggregate input costs used in dairy production in Iowa. The residual value between inputs and marketings can be described as returns to unpaid labor and management.

The largest single category of expenditure is feed costs. Annually, an estimated 23.6 million bushels of corn valued at $137 million are used in the dairy industry. Other feeding costs include an estimated 3.0 million tons of hay and silage representing another $325 million of value.

In addition to the backward linkage effects of inputs purchased by dairy producers, forward linkages can be traced to further processing activities in the form of cheese, butter, ice cream, dried milk and fluid milk. The schematic chart illustrates the flow of milk production into various forms of further processing.

Economic Importance of the Dairy Industry in Iowa

Dairy has a long history in rural Iowa and has made significant contributions to the state's economic vitality. The dairy farm itself plus all the related processing and service industries impact the greater economic performance of the state. Current estimates of employment in the dairy sector (both farm and non-farm) are approximately 23,000 FTE, (Figure 9). The total economic impact in dollars is over $900,000,000 from direct, indirect, and induced employment. The basic scenario in this analysis looks at the overall importance and contribution of the dairy industry to the Iowa economy based on the 2010 situation and current levels of production in the Iowa dairy industry. Economic impacts of the dairy industry in Iowa were estimated utilizing the IMPLAN input-output economic modeling software customized to capture the economic impact for the state of Iowa. IMPLAN uses historical data to estimate linkages between industries in the regional economy and determine how changes in one industry affect other industries within Iowa's economy. Input-output models are used to estimate three types of effects:

- **Direct** effects are economic impacts generated directly by the dairy industry.
- **Indirect** effects are economic impacts generated by purchases of goods and services by the dairy industry in other sectors, such as logistics, utilities, transportation, financial services, etc.
- **Induced** effects are the impact of spending by employees on goods and services outside the industry, like grocery stores, education, and other retail. Employment comes in many forms; on farm help, dairy product processing, transportation, veterinary services, plus secondary and tertiary employment in small town retail and service industries.

As a result, the full set of linkages of dairy production to in-state feed grain production and processing as well as the consumer effects are included as part of the total impacts.

The results of the I-O analysis are presented in Table 2 with estimates of total output, personal income, value-added, and employment presented. The table for this baseline scenario presents estimates of the farm level employment and income effects separate from the rest of agriculture while the dairy slaughtering and processing effects are included in the manufacturing sector. The key indicators of economic activity reported include total industry output, total income, value-added, and employment.

Total industry output measures total dollars of goods and services produced by an industry, including government and non-government activity. The estimated $715 million of gross output from dairy production activity is linked to approximately $2.1 billion gross sales in the state's dairy processing sectors. The total sales from these direct components of the dairy production and processing sectors support additional input purchases, spending on transportation and other services, as well as the consumer-related purchases worth $2.0 billion of direct and indirect sales throughout the Iowa economy.

This output, or gross sales number should be used with caution because the value of the dairy is counted twice -- at the farm level and

Table 2 Iowa Dairy Industry Economic Contribution Indicators

Impact Type	Employment	Labor Income $	Total Value Added $	Output $
Direct Effect	10,365.2	389,331,128.6	463,971,083.9	2,875,682,725.0
Indirect Effect	6,935.1	356,516,603.8	594,144,097.1	1,496,452,354.4
Induced Effect	4,963.2	169,027,966.4	303,407,249.3	528,049,401.9
Total Effect	22,263.5	914,875,698.8	1,361,522,430.3	4,900,184,481.3

Source: Iowa Workforce Development

as part of the total value of dairy products when it is sold from the processor. While much of the impacts is concentrated in the agricultural and input supply sectors, economic linkages beyond the farm gate capture additional activities such as transportation, handling, processing and the personal consumer spending effects. As a result, the effects of the dairy industry are distributed throughout the economy, benefiting rural and urban areas including the services and trade sectors. Total personal income is a composite of wage and salary income and return to proprietors. This more comprehensive measure of income is chosen because most farm income is reported as proprietor income. The estimate of $185 million of direct income to dairy producers is linked to an additional $204 million of earnings to workers in dairy processing and to $525.6 million of additional income throughout the Iowa economy for a total impact of $914.9 million of personal income (Figure 10). Again the service and retailing sectors receive strong stimulus from the initial effect of income earned in the dairy sector.

Total value added measures the total gain in economic activity to the economy resulting from production of goods or services. Wages, salaries, taxes, and profits are included in the value-added measure. The value-added measure is a good indicator of net economic activity as only the net incremental value is summed at each transaction to avoid double counting. The estimated $125 million of value added for dairy production and $338 million in dairy processing is linked to $897 million of additional indirect and induced value-added activity in the state's economy for a total value added of $1.364 million (Figure 11).

Employment is based on a per job unit consistent with the definitions used by the U.S. Commerce Department. The employment levels are likely to be nearly full-time equivalents for the manufacturing and production-oriented jobs. Retail and service sector positions tend to involve many part-time positions. The 2,400 farms in 2010 and 7,100 direct jobs in dairy producing activities involve farm workers as well as farm proprietors and can be interpreted as full-time equivalent positions. These 7,100 direct jobs at the farm level along with the 3,260 at the processing level generate a chain of economic activity that supports an additional 11,898 jobs throughout the rest of the economy. The distribution of impacts is similar to the pattern for the other indicators in that effects are present in all sectors. The service and retail sectors provide a large number of secondary jobs. The higher number of jobs in these sectors combined with the lower levels of income suggests that many of these jobs are less than full time.

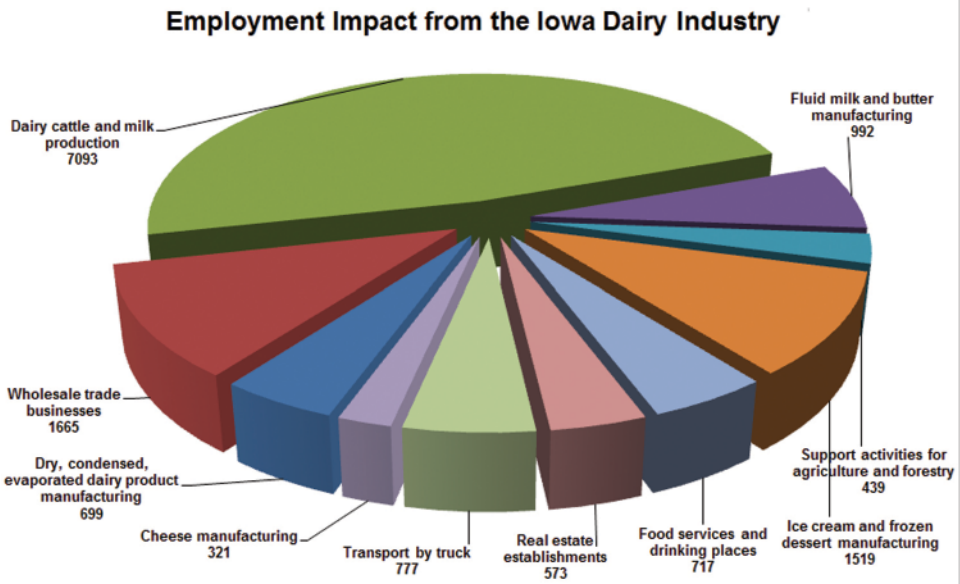


Figure 9. *(Source: Iowa IMPLAN Study)*

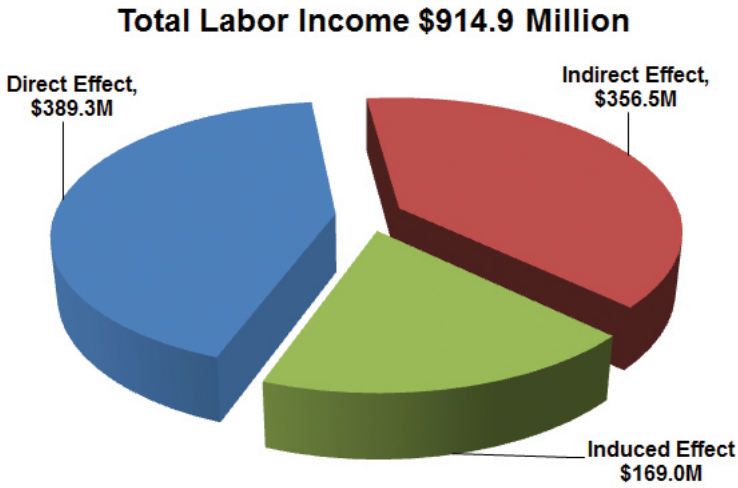
Impact on Dairy Processing Employment

Data from the Iowa Workforce Development files can be used to track employment and earnings in these dairy processing sectors between 1980 and 2010. Total employment in dairy processing has stayed relatively constant over the past 30 years, although the composition of that employment has changed. In 2010, an estimated 3,260 workers are employed in dairy processing activities with the majority of these workers in the ice cream production. Fluid milk processing, which used to be the largest category is currently the second largest employer of dairy processing workers. (Table 3).

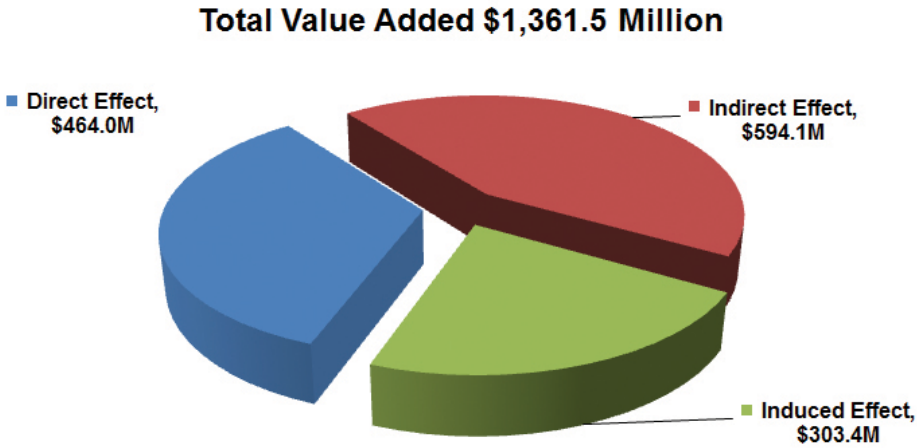
Value added processes generate an even greater impact. Dairy production itself produces a direct effect of $125,000,000; dairy processing adds another $338,000,000. Additional indirect and induced value-added activity produces a staggering $897,000,000 impact. Some examples of this; ice cream and frozen dessert manufacturing generates $173,000,000 in value added inputs; dry, condensed and evaporated dairy products produce almost $43,000,000, fluid milk and butter $103,000,000, even the trucking industry generates an $18,000,000 impact just moving dairy products. These impacts work their way into the economic fabric of Iowa. Table 4 outlines the top ten industries that produce added-value in the dairy stream.

One way of looking at the potential economic impact of the dairy industry in Iowa is to break it down to tangible increments. Based on the IMPLAN data reduced to a per cow unit, the estimated impacts on jobs and total economic impact follow.

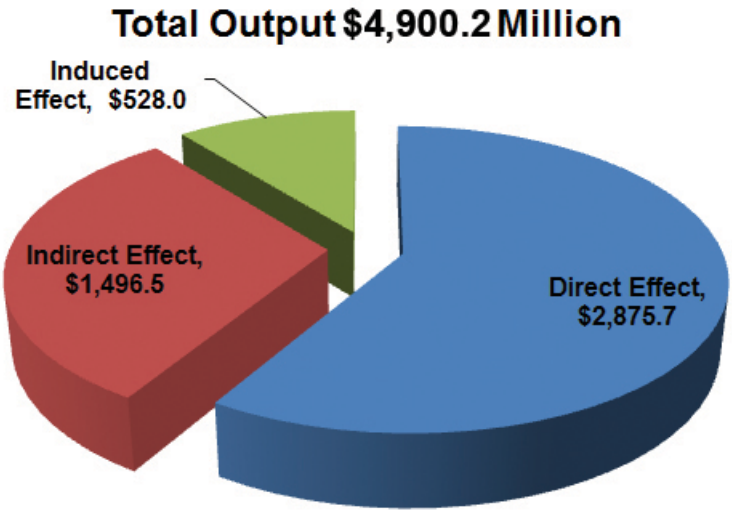
Dairy cows and the economic activity that they generate in the local economy have always and continue to be one of the most robust economic stimuli that exist. The most recent IMPLAN model (2011) quantifies that fact with the fol-



Figures 10. *(Source: Iowa IMPLAN Study)*



Figures 11. *(Source: Iowa IMPLAN Study)*



Figures 12. *(Source: Iowa IMPLAN Study)*

Table 3. Employment in Iowa's Dairy Processing Industries, 1980-2010

Industries	NAICS	1980 Employ	1990 Employ	1995 Employ	2000 Employ	2005 Employ	2010 Employ
Butter	311512	15	5	-	-	15	-
Cheese	311513	224	907	728	704	494	584
Dried Milk	311514	1,002	931	927	910	268	265
Ice Cream	311520	101	793	1,495	1,920	2,280	1,460
Fluid Milk	311511	2,371	860	853	833	857	951
Total		3,713	3,496	4,003	4,366	3,914	3,260

Source: Iowa Workforce Development

Table 4. Top Ten Industries Affected by Iowa Dairy Industry

Description	Total Employment	Total Labor Income $	Total Value Added $	Total Output $
Dairy cattle and milk production	7,092.8	186,991,031.4	125,659,979.1	715,303,113.1
Wholesale trade businesses	1,664.9	97,745,696.0	151,454,466.9	717,511,910.1
Ice cream and frozen dessert mfg.	1,519.1	100,901,558.7	173,244,409.7	246,964,549.0
Fluid milk and butter manufacturing	991.8	62,767,955.7	103,070,731.7	702,765,428.7
Transport by truck	776.7	12,828,008.8	18,113,598.3	39,182,332.9
Food services and drinking places	716.5	33,466,334.1	42,993,356.8	97,451,613.3
Dry, condensed and evaporated dairy product manufacturing	699.3	55,047,794.2	111,520,025	793,598,383
Real estate establishments	572.7	4,877,612.9	35,502,314.0	48,399,465.9
Support activities for agriculture and forestry	438.9	20,257,336.6	29,594,656.2	410,000,217.9
Cheese manufacturing	321.2	7,525,754.2	6,491,712.4	8,398,539.0

Source: Iowa IMPLAN Study

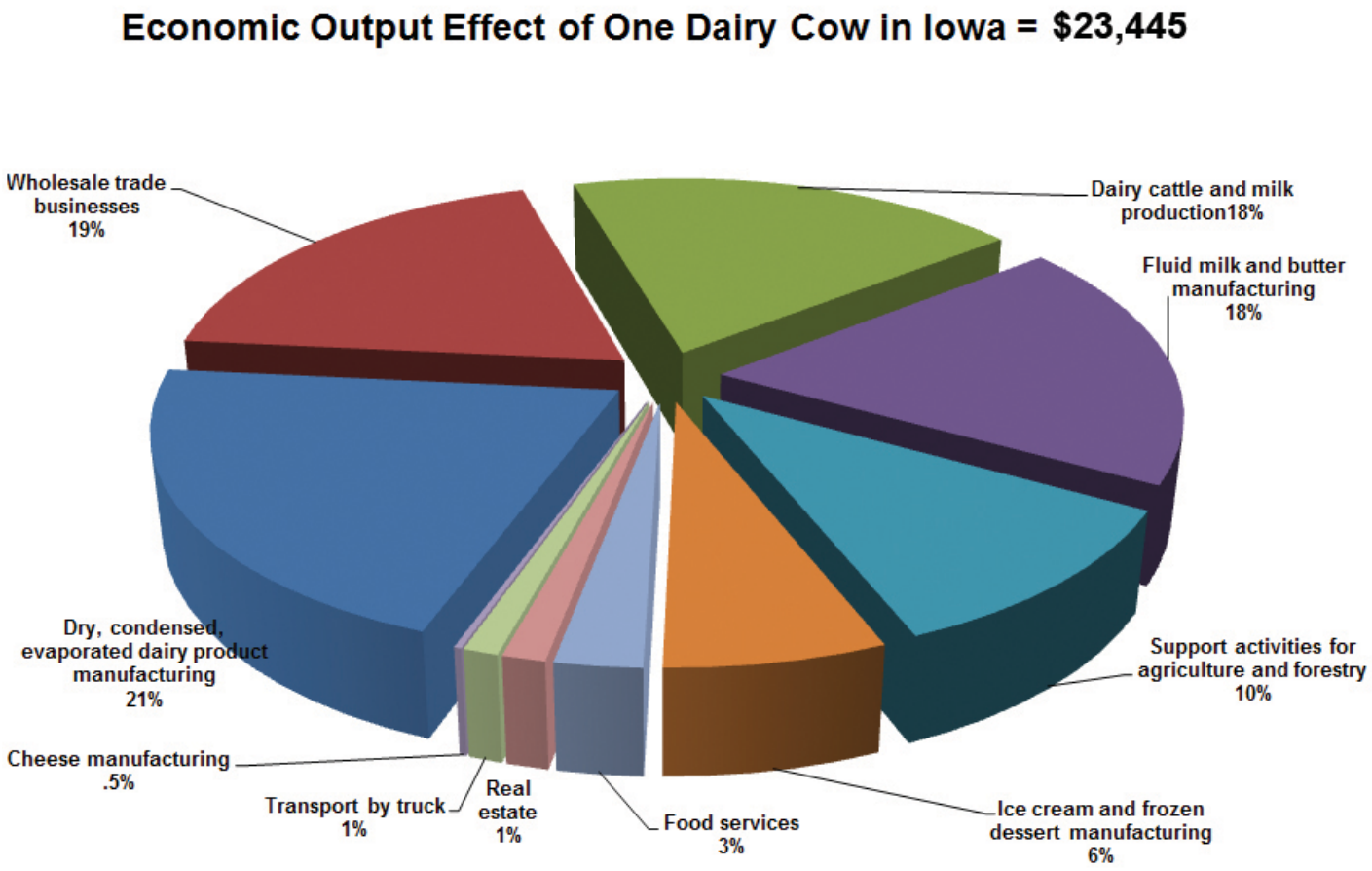
lowing statistics.

- $23,445 is the total economic output per cow through direct/indirect and induced commerce (Figure 12 & 13).
- Each cow generates the equivalent of .1 full time job created throughout the entire dairy production and processing sectors.
- Over 22,000 jobs are supported by the activities directly, indirectly and induced by a strong dairy presence.

Much of the impact is outside traditional agricultural businesses and touch the main street businesses of rural Iowa such as transportation services, financial services, wholesale and retail trade businesses including restaurants, repair shops and equipment dealers. The raw products create numerous manufacturing and processing opportunities, according to the IMPLAN study the number of jobs supported by the dairy industry is over 17,000 directly related to dairy production processing with an additional 5,000 more jobs induced through the economic stimulus created by those sectors.

In conclusion, a healthy and vibrant dairy industry is a significant economic driver that not only creates quality jobs it provides a diverse and wide-reaching ripple effect that creates substantial economic activity within their communities resulting in more economic stability to the local and state fabric of Iowa.

Figure 13. *(Source: Iowa IMPLAN Study)*



Report Authors

This report was written and compiled by the Value Added Agriculture Program, the Department of Animal Science and the Department of Economics at Iowa State University. Source references are cited within the report narratives in an informal manner with every effort made to attribute data originating outside the team's resources. Mistakes in citing, if any, are unintentional. For more information, contact the VAAP at 1111 NSRIC, Ames, IA 50011-3310 or www.extension.iastate.edu/valueaddedag.

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