

The Commercial Agriculture Program at the University of Missouri completed this report. This program is an interdisciplinary group of faculty in agricultural economics, agricultural engineering, animal science, plant science and veterinary medicine. Their mission is to create new opportunities for Missouri entrepreneurs and develop partnerships with firms that are dedicated to both profitable and sustainable agriculture and food systems.

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Summary

The objective of this study was to assess the economic contribution of Missouri's dairy product manufacturing industries to the state's economy. Missouri's past history as a major milk producing state endowed the state with a diverse dairy product manufacturing sector that is a major employer.

As of 2011, Missouri's dairy product manufacturing industries directly employed 5,515 workers. Average wages of \$46,850 per worker created a total state payroll of \$258 million. Missouri's dairy manufacturing plants produced an estimated \$4.4 billion worth of dairy products.

The total economic contribution of the dairy product manufacturing industries upon Missouri's economy was developed using estimated revenue and economic modeling software to capture all of the multiplier effects. In 2011, Missouri's dairy product manufacturing industry revenues translated into statewide total economic output worth \$7.7 billion. Including all the direct, indirect, and induced jobs stimulated by Missouri's dairy product manufacturing industries, a total of 23,297 jobs were supported. These jobs provided \$1.2 billion in labor income to Missourians in 2011. Missouri's gross domestic product (GDP) was \$2.0 billion larger due to the value added by Missouri's dairy product manufacturing industries.

Farmers, privately held companies, and public corporations all own major parts of Missouri's dairy product manufacturing industry. Missouri's large milk bottling plants are owned by dairy farmers through their dairy cooperatives. Bottling plants operating under various well-known brands in Kansas City, St. Louis, Springfield and Jefferson City are managed by Prairie Farms cooperative and owned directly by them or in joint ventures with Dairy Farmers of America (DFA) cooperative. These same two dairy cooperatives also own additional dairy processing plants making soft products, specialty drinks and other custom dairy products. DairiConcepts, a dairy ingredient company headquartered in Springfield with a plant in Eldorado Springs, is also owned by dairy farmers via a joint venture between DFA and Fonterra cooperatives.

Missouri's non-farmer owned dairy product manufacturing facilities are owned by privately held companies and public corporations. Privately held companies include Schreiber Foods and Jasper Products. Public corporations include Kraft, Unilever, Smucker and DuPont.

In recent years Missouri dairy farmers have also started a number of smaller scale processing ventures to capture value from their milk production directly through niche marketing. As of December 2012, sixteen dairy farmer processing ventures were in operation in Missouri.

Many other industries such as trucking, trading, and dairy infrastructure have grown significantly in Missouri because of their association with the state's milk product manufacturing industries. Examples include Opies Transport, Western Dairy Transport, T.C. Jacoby & Company and Mueller.

Industry Background

The dairy product manufacturing industry is composed of businesses that process dairy products from raw milk, processed milk, and dairy substitutes. The process of transforming raw milk from the farm into dairy products includes a few basic steps complemented by extensive efforts to add value. The basic steps include separating the milk fat from the milk, standardizing the fat content, pasteurizing the milk to kill bacteria, and homogenizing the milk to keep the fat in suspension. Further steps could involve bottling, culturing, churning, drying, cheese making, aging, cutting, wrapping, and packaging.

Dairy products commonly manufactured in Missouri include fluid milk, specialty milk drinks, yogurts, ice creams, frozen custards, infant formula, health supplements, sports drinks, energy drinks, cheeses, flavoring agents, dry dairy ingredients and numerous other custom and specialty products. Additionally, some Missouri plants specialize in further processing and packaging dairy products originating from other states. All of these dairy plants provide jobs to Missourians and stimulate local economies, providing economic benefits to Missouri.

Most dairy products consumed in the U.S. are perishable. This perishable nature creates the need to manufacture and distribute those products in short time frames close to consumers on a continual basis. Distribution costs are a significant cost for the industry. Economies of scale exist in dairy processing, but economies of scale in distribution are major drivers of consolidation. Plants producing perishable products traditionally have been close to consumer populations in order to minimize distribution costs which include continually replenishing perishable products at retailers.

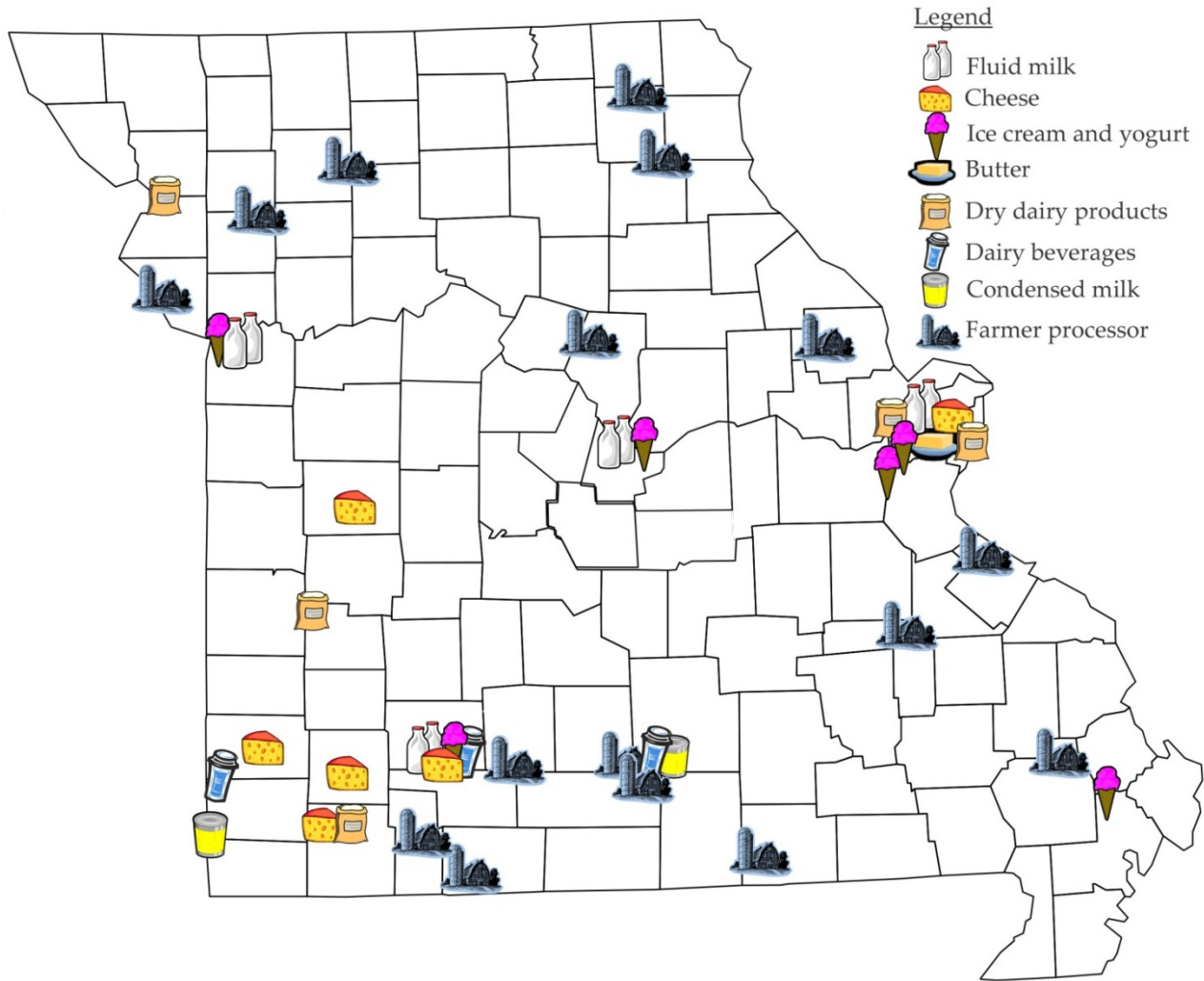
Major trends facing the U.S. dairy processing industry in recent years include:

- Migration of U.S. milk production to larger dairy farms in the western states,
- Consolidation of grocery retailing into fewer and fewer major chain stores,
- Declining per capita demand for fluid milk and increased regulation of milk for schools,
- Rising demand for cheese and cultured products such as yogurt,
- Increasing export demand for U.S. dairy products and ingredients, and
- Increasing interest in local foods and connecting with producers.

Missouri's dairy processing industry has adapted to these trends. Existing commercial plants have been repurposed and remodeled to process more volume through fewer plants. Some plants have moved toward further specialized processing or packaging of commodity dairy products. Manufacturing customized products and toll-packaging have been used by some plants to maintain viability. Farmer processors and cooperatives have emphasized local farmer ownership to build local brands.

Dairy products and cities of where these plants are located can be found in Exhibit 1. Plants range from large commercial production to smaller on-farm production. A complete directory of these plants can be found in the Appendix of this report.

Exhibit 1 Products and Locations of Missouri Dairy Product Plants



Missouri’s large milk bottling plants are owned by dairy farmers through their dairy cooperatives. These bottling plants operate under various well-known brands such as Roberts in Kansas City, Peavely and Prairie Farms in St. Louis, Hiland in Springfield and Central Dairy in Jefferson City. Prairie Farms cooperative runs these bottling plants either directly or in joint ventures with Dairy Farmers of America (DFA) cooperative. These same two dairy cooperatives also own additional dairy processing plants making soft products, specialty drinks and other custom dairy products. DairiConcepts, a national dairy ingredient company headquartered in Springfield with a plant in Eldorado Springs, is also owned by dairy farmers via a joint venture between DFA and Fonterra cooperatives.

Missouri’s non-farmer owned dairy product manufacturing facilities are owned by privately held companies and public corporations. Privately held companies include Schreiber Foods and Jasper Products. Public corporations include Kraft, Unilever, Smucker and DuPont.

In recent years Missouri dairy farmers have also started a number of smaller scale processing ventures to capture value from their milk production directly through niche marketing. As of December 2012, sixteen dairy farmer-processing ventures were in operation in Missouri.

The U.S. Bureau of Labor Statistics reports industry statistics on establishments, employee numbers and wages for the dairy manufacturing sector. Exhibit 2 provides information concerning Missouri’s dairy product manufacturing industry in the year 2011. Total wages paid to Missouri dairy manufacturing employees totaled \$258 million. There were a total of 5,515 employees employed in the overall dairy product manufacturing industry and average annual wages per employee were \$46,850.

Exhibit 2 Missouri Dairy Product Manufacturing (2011)

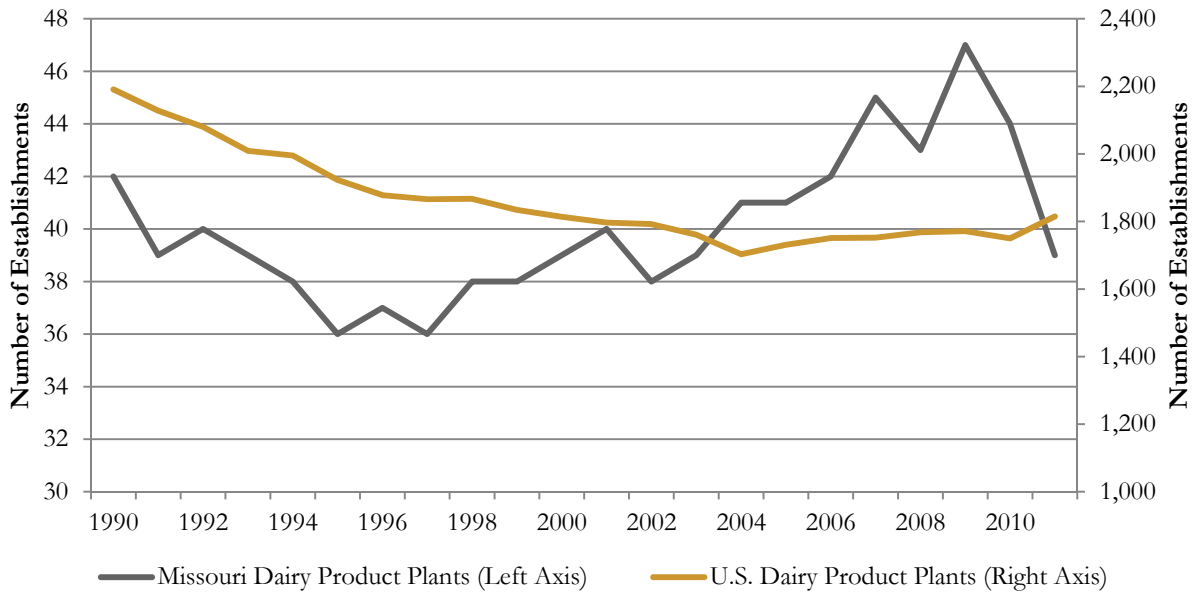
| Metric | Dairy product manufacturing (including ice cream and frozen desserts) |
|------------------------------|--|
| Employees (#) | 5,515 |
| Total wages (dollars) | \$258,000,000 |
| Average annual pay (dollars) | \$46,850 |

Source: U.S. Bureau of Labor Statistics

While the overall trend in the number of dairy manufacturing establishments in Missouri is positive over the past twenty years, over the past few years, there has been a decline. See Exhibit 3. An establishment refers to a physical location that produces dairy or related products that fits under an industrial classification. A company may own multiple establishments, such as the case with DFA or Schreiber Foods in Missouri. The U.S. has a declining trend in the number of dairy manufacturing establishments over the past twenty years, but has started growing slowly over the past five years.

This trend in the number of dairy manufacturing facilities may reflect the overall food industry trend of continual concentration into fewer, larger plants operating at higher volumes with lower cost structures. At the same time as fewer large plants produce a higher share of the packaged food market, a number of smaller firms proliferate to fill the niches vacated by the expanding firms. A prime example of this trend would be the concentration of the U.S. beer industry juxtaposed with the arrival of hundreds of microbrew companies filling geographic and consumer preference niches.

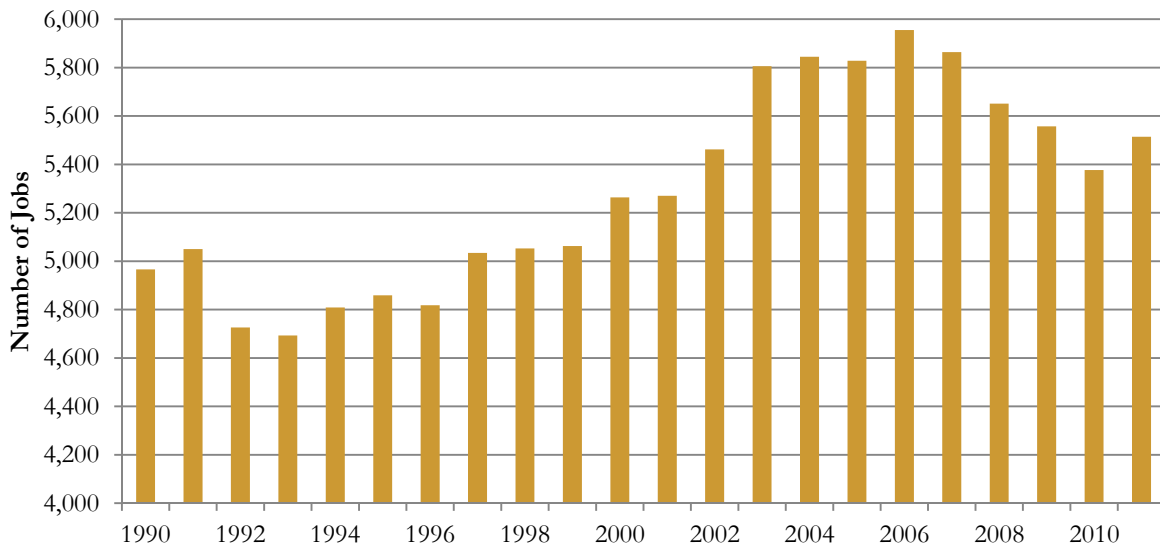
Exhibit 3 Missouri and U.S. Dairy Product Manufacturing Establishments



Source: U.S. Bureau of Labor Statistics

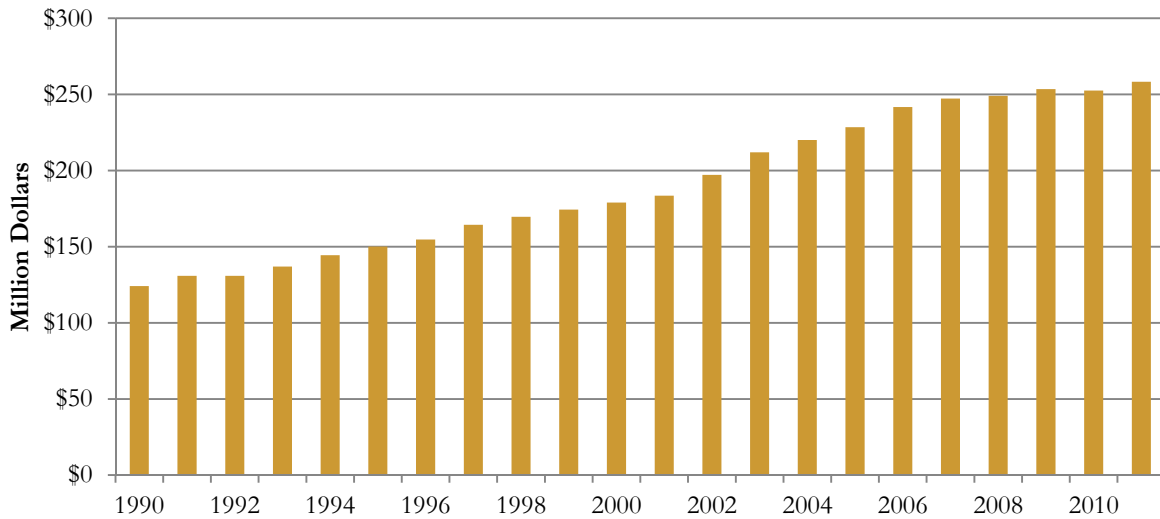
Other historical trends for Missouri’s dairy product manufacturing industry can be found in Exhibits 4 and 5. Annual average employment in the dairy manufacturing industry peaked in the year 2006, but has remained strong in regards to earlier years. Total wages paid to the dairy manufacturing industry has consistently increased over the past twenty years, as indicated in Exhibit 5.

Exhibit 4 Annual Employment for the Missouri Dairy Product Manufacturing Industry



Source: U.S. Bureau of Labor Statistics

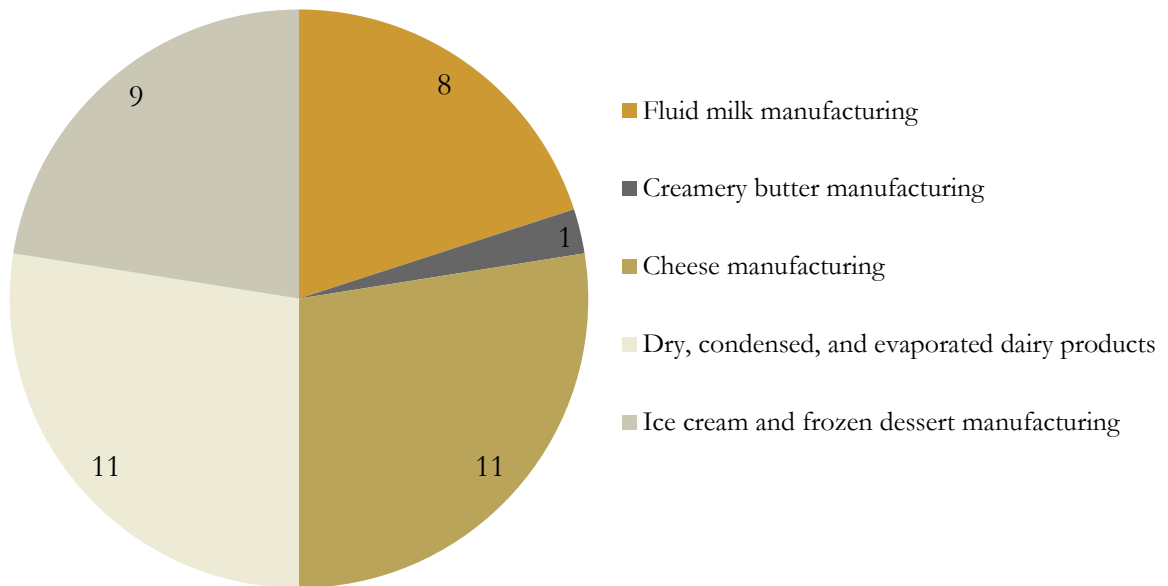
Exhibit 5 Annual Wages for the Missouri Dairy Product Manufacturing Industry



Source: U.S. Bureau of Labor Statistics

The dairy manufacturing industry can be further broken down into subsectors which include fluid milk; creamery butter; cheese; dry, condensed, and evaporated milk; and ice cream and frozen desserts. Exhibit 6 shows the breakdown of dairy product manufacturing establishments in Missouri by industry sector.

Exhibit 6 Missouri Dairy Product Manufacturing Establishments by Sector



Note: Dairy manufacturing plants may be engaged in multiple sectors.

Source: U.S. Bureau of Labor Statistics

Economic Impact of the Missouri Dairy Manufacturing Industry

Dairy product manufacturing provides valuable economic contributions to the state of Missouri. Estimations were prepared based on the use of the IMPLAN economic impact software system. IMPLAN is an input-output model and includes economic data sets, multipliers, and demographic statistics for the entire U.S. economic infrastructure. It is a robust tool that assesses the effects of changes in the economy by sector and is widely used by economists and analysts. Estimations in this report used the 2011 IMPLAN data set for the state of Missouri.

Revenue for the Missouri dairy product manufacturing industry was estimated based on methodology provided by Stevens et al. (2008). While sales revenue is not officially reported, it was estimated through IMPLAN based on average annual employment by dairy product sector (North American Industry Classification System Sectors 311511, 311512, 311513, 311514 and 31152). Employment numbers were reported by the U.S Department of Labor and validated by interviews from dairy company personnel. For the year 2011, gross sales revenue across all dairy manufacturing sectors in Missouri was estimated to total approximately \$4.4 billion.

The impacts from IMPLAN can be separated into three different economic effects: direct, indirect, and induced. A **direct** effect can be defined as the direct changes in an area as a result of a change in an industry. For example, the estimated sales revenue from the dairy product manufacturing plants is a direct economic effect. An **indirect** effect would be when plants purchase goods or services from other industries (milk, transportation, utilities, repairs, etc.). **Induced** effects are the changes in household spending from income generated by direct and indirect effects. For instance, employees will spend their income to buy real estate, shop at grocery stores, or spend on other goods or services in the local economy.

Economic impacts from IMPLAN are categorized by various indicators such as output, jobs, value-added and labor income. **Output** reflects the total value of industry production. Another economic indicator is the number of **jobs** supported by the industry, which can be either full-time or part-time. **Value-added** refers to the difference between the industry output (value of production) and the cost of the inputs used in its production, which can also be interpreted as the net gain or contribution to the state's gross domestic product. Salaries, wages, taxes and profit would be included in this value-added classification. **Labor income** is another economic measure that is included in the value-added category. It reflects the total of employee compensation (wages and benefits) and proprietor income (self-employment).

Exhibit 7 details the economic contribution of Missouri dairy product manufacturers to the state of Missouri in the year 2011. Missouri dairy manufacturing plants produced \$4.4 billion worth of dairy products in the year 2011. After accounting for indirect and induced economic effects, dairy manufacturing plant estimated revenues in Missouri translate into total statewide output of \$7.7 billion. Missouri's dairy product manufacturing industry supported 23,297 jobs and provided \$1.2 billion in labor income (wages, benefits and proprietor income). Total value added or contribution to Missouri's gross domestic product (GDP) was approximately \$2.0 billion.

Exhibit 7 Economic Contribution of the Missouri Dairy Manufacturing Industry

| Impact Type | Employment (Jobs) | Labor Income (Dollars) | Value Added (Dollars) | Output (Dollars) |
|---------------------|------------------------------|-----------------------------------|----------------------------------|-----------------------------|
| Direct effect | 5,515 | \$363,460,751 | \$545,527,194 | \$4,403,804,727 |
| Indirect effect | 11,553 | \$572,585,197 | \$984,705,410 | \$2,536,855,218 |
| Induced effect | 6,229 | \$255,359,933 | \$458,197,381 | \$772,205,810 |
| Total effect | 23,297 | \$1,191,405,881 | \$1,988,429,985 | \$7,712,865,754 |

Note: May not sum due to rounding

The economic contribution of the Missouri dairy product manufacturers can be broken down by industry sector. Exhibit 8 shows the top ten industries impacted by Missouri dairy product manufacturers and their economic impact metrics. Information reported includes all economic effects (direct, indirect and induced). Cheese manufacturing industry is the largest overall employment industry sector, with dairy cattle/milk production and wholesale trade businesses following second and third, respectively.

Exhibit 8 Top Ten Industries Affected by the Missouri Dairy Manufacturing Industry (Ranked Based on Total Employment)

| Industry Sector Description | Total Employment (Jobs) | Total Labor Income (Dollars) | Total Value Added (Dollars) | Total Output (Dollars) |
|--|--|---|--|-----------------------------------|
| Cheese manufacturing | 3,222 | \$205,188,327 | \$274,296,728 | \$2,793,730,010 |
| Dairy cattle and milk production | 2,014 | \$10,694,578 | \$111,168,312 | \$299,988,618 |
| Wholesale trade businesses | 1,404 | \$102,194,835 | \$178,118,011 | \$243,392,928 |
| Transport by truck | 1,329 | \$72,810,657 | \$88,617,591 | \$188,844,572 |
| Dry, condensed, and evaporated dairy product manufacturing | 1,325 | \$101,791,743 | \$153,197,179 | \$1,094,048,335 |
| Ice cream and frozen dessert manufacturing | 1,017 | \$61,709,510 | \$89,348,352 | \$406,590,007 |
| Food services and drinking places | 987 | \$19,720,650 | \$28,500,510 | \$55,276,374 |
| Fluid milk and butter manufacturing | 789 | \$50,586,392 | \$113,621,118 | \$842,457,319 |
| Management of companies and enterprises | 718 | \$76,004,521 | \$87,638,206 | \$149,459,511 |
| Real estate establishments | 646 | \$8,122,462 | \$61,145,517 | \$88,181,946 |

While many of the primary dairy manufacturing industry sectors are positively impacted, it is important to note that many support industries are directly benefited from the dairy manufacturing industry. Trucking, trading, and dairy infrastructure have grown significantly in Missouri because of their association with the state's milk product manufacturing industries. Examples include Opies Transport, Western Dairy Transport, T.C. Jacoby & Company and Mueller.

Tax revenues (also included in value-added classification) include those paid to local, state, and federal entities. Tax impact values show the amount of revenue generated from employee compensation, proprietor income, indirect business taxes, households, and corporations. The Missouri dairy manufacturing industry stimulated \$138 million in state and local taxes to Missouri and \$239 million in federal taxes in the year 2011 (Exhibits 9 and 10).

Exhibit 9 State and Local Tax Impact for Missouri Dairy Product Manufacturers

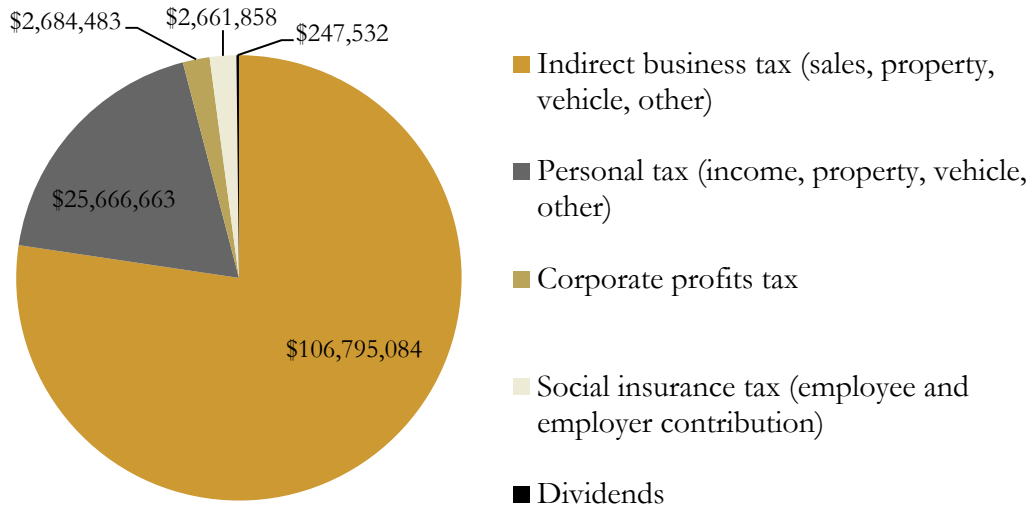
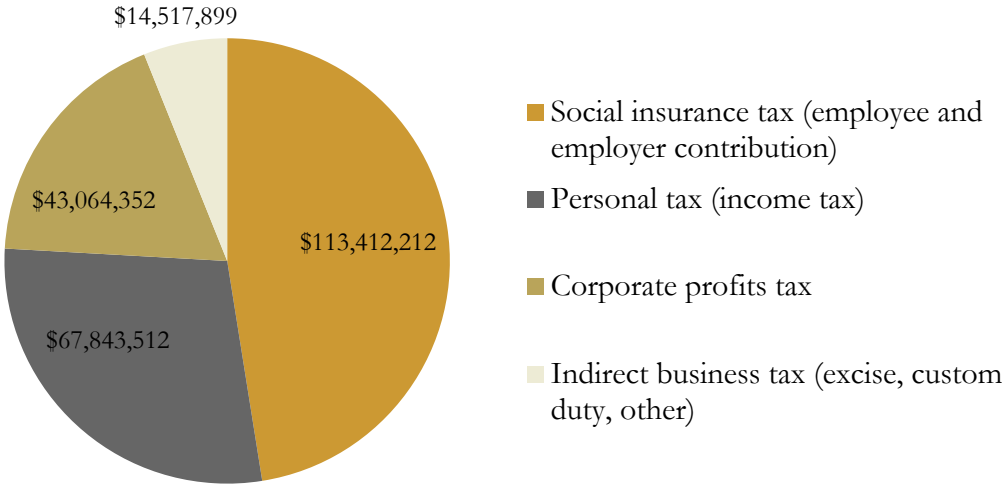


Exhibit 10 Federal Tax Impact for Missouri Dairy Product Manufacturers



References

MIG, Inc. “IMPLAN Economic Impact Software.” Website: <http://implan.com/>

Missouri State Milk Board. Contacted through interview, email and phone. Website: <http://mda.mo.gov/animals/milk/>

Stevens, T., A. Hodges, W. Mulkey, and R. Kilmer. 2008. “Economic Contributions of the Dairy Farming and Dairy Product Manufacturing Industries in the Southeast United States in 2005.” EDIS document FE731. Food and Resource Economics Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.

U.S. Bureau of Labor Statistics. “Quarterly Census of Employment and Wages.” Accessed at <http://www.bls.gov/cew/>.

Appendix

Missouri Dairy Product Manufacturing Plant Name, City, Products and Website

| Plant | City | Products | Website |
|-----------------------|------------------|--|--|
| Baetje Farms | Bloomsdale | Goat milk and cheese | www.baetje farms.com/ |
| Belfonte | Kansas City | Ice cream, yogurt, cottage cheese, sour cream & dips, milk, juices and creams | www.belfontedairy.com |
| Beyond Organic | Koshkonong | Cheese, cultured drink | www.mybeyondorganic.com/ |
| Central Dairy | Jefferson City | Milk, flavored milk, orange juice, sour cream & dips, cottage cheese, ice cream, eggnog, half and half | www.centraldairy.biz/ |
| College of the Ozarks | Point Lookout | Milk | www.cof.edu/page/students/academic-programs/agriculture/farms-work-stations.383.html |
| Dairiconcepts | Eldorado Springs | Butter and cream powder, cheese powder, cream cheese, sour cream, cheese | www.dairiconcepts.com/ |
| Dairy House | St. Louis | Chocolate dairy powders, milk flavors, eggnog, stabilizers | dairy-house.net/ |
| Danisco | St. Joseph | Dry milk powder, vitamin formulas, stabilizer | www.danisco.com/ |
| DFA - Cabool | Cabool | Condensed skim milk, Cream, Infant formula, LACF facility | www.dfamilk.com/ |
| DFA - Monett | Monett | Condensed cream, Barrel cheese, processed cheese | www.dfamilk.com/ |
| DFA - Springfield | Springfield | Sports drinks, Coffee drinks, receiving station, truck wash | www.dfamilk.com/ |
| Goatsbeard Farm | Harrisburg | Goat cheese | www.goatsbeardfarm.com/ |
| Golden L Creamery | Silex | Cheese | www.goldenlcreamery.com/ |
| Green Dirt Farm | Weston | Sheep cheese and yogurt | www.greendirtfarm.com/ |
| Heartland Dairy | Newark | Cow and goat- milk, cheese, cream | heartlandcreamery.com/ |
| Hiland Dairy | Springfield | Milk, flavored milk, buttermilk, eggnog, ice cream, juice, tea | www.hilanddairy.com/ |
| Homestead Dairy | Jamesport | Cheese | |
| Ice Cream Specialties | St. Louis | Ice cream, novelties | www.prairiefarmsdairy.com/index.php?p=534 |
| Instant Whip Foods | St. Louis | Toppings | www.instantwhip.com/ |
| Jasper Products | Joplin | Aseptic processing, high protein shakes, soy milk, | www.jasperproducts.com/ |

| Plant | City | Products | Website |
|-------------------------|----------------|--|--|
| | | rice milk, smoothies | |
| Kraft, Inc. | Springfield | Cheese | www.kraftfoodsgroup.com/ |
| Lorenae Dairy | Galena | Raw milk and cheese, curds | www.lorenaedairy.com/ |
| Madison Farms | St. Louis | Butter, butter oil | www.prairiefarmsdairy.com/index.php?p=540 |
| Memory Lane Dairy | Fordland | Milk, flavored milk, eggnog | www.memorylanedairy.com/ |
| Pacific Valley Dairy | Pacific | Yogurt, custard, ice cream | www.pvdairy.com/ |
| Prairie Farms Dairy | Hazelwood | Milk, cream, buttermilk, flavored milk, eggnog, sour cream and juice | www.prairiefarmsdairy.com/ |
| Milnot | Seneca | Condensed and evaporated milk | www.milnot.com/ |
| Ozark Mountain Creamery | Mountain Grove | Milk and flavored milk | ozarkmtncreamery.com/ |
| Roberts Dairy Foods | Kansas City | Milk, flavored milk, acidophilus, juice, drinks and tea | www.robertsdairy.com/ |
| Sanitary Dairy Foods | St. Louis | Bakers cheese | |
| Schreiber Foods | Mount Vernon | Cheese, process cheese, shredded cheese | www.schreiberfoods.com/ |
| Schreiber Foods | Carthage | Cheese, process cheese, shredded cheese | www.schreiberfoods.com/ |
| Schreiber Foods | Monett | Cheese, process cheese | www.schreiberfoods.com/ |
| Schreiber Foods | Clinton | Shredded cheese, sliced cheese | www.schreiberfoods.com/ |
| Schreiber Foods | Carthage | Cheese, distribution | www.schreiberfoods.com/ |
| Sensory Effects | Bridgeton | Eggnog powder, chocolate milk powder | www.sensoryeffects.com/ |
| Shatto Dairy | Osborn | Milk, eggnog, cream, cheese, butter, ice cream | www.shattomilk.com/ |
| Shepherd's Crook | Belleview | Sheep cheese | |
| Terrell Creek Farm | Fordland | Goat cheese | terrellcreekfarm.com/ |
| Unilever Ice Cream | Sikeston | Ice cream and novelties | www.unileverusa.com/ |
| Weiler Dairy | Rutledge | Milk, flavored milk, cream, eggnog | |

Source: Missouri State Milk Board