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Economic Importance of the Indiana Dairy Industry

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The Indiana dairy industry is an important part of the state's agricultural sector. Indiana's milk production in 2004 was estimated at 3 billion pounds (344 million gallons) of milk, equivalent to 1.7% of the total milk produced in the United States. This production represented \$491 million in cash receipts to the state at the farm gate level (Indiana Agricultural Statistics). The industry also provided fulltime employment to about 3,750 Indiana residents and paid a total of \$107 million in salaries (estimates from IMPLAN model for Indiana).

The economic importance of the Indiana dairy industry goes beyond farm cash receipts. Milk production in the state also generates additional income and employment in the Indiana economy through backward linkages. Backward linkages include all inputs and services utilized and paid for by the dairy producers. The dairy industry input and service suppliers, such as grain farmers and veterinary services, in turn generate more economic activity through their spending and employment. Economic activity is also associated with households spending money earned from the dairy operations or input suppliers on household consumption. This paper estimates that the Indiana dairy industry is responsible for \$986.4 million in gross sales in the state, and supports the employment of 7,357 Indiana residents who earn incomes of \$229.4 million.

This report documents the size and structure of the Indiana dairy industry, and presents the total economic activities associated with the dairy industry in the state.

Indiana's Dairy Industry Production, Value and Location

Milk production has historically been an important farm enterprise in Indiana. In 1978 about 2.2 billion pounds of milk were produced in the state. This represented \$230 million in cash receipts. During the next decade production was rather stable at 2.3 billion pounds of milk. By 2004 production had increased by 30% to 3 billion pounds. This production ranked Indiana 14th in U.S. milk production (Indiana Agricultural Statistics), and the farm gate value was estimated at an all time high of \$491 million (Figure 1). In 2004 dairy farmers received the highest annual average milk prices ever. Farmers received on average \$16.70 per hundredweight of milk. The price was \$3.80 higher than the previous annual average and \$3.06 higher than the average for the previous decade.

High milk prices in 2004 were the result of limited supply and increasing demand forces. During the first half of 2004 there was a significant reduction in U.S. farm milk supply. USDA estimates showed an average 1% decrease in production levels of the top 20 dairy producing states compared to the same period in 2003. The reduction in milk supply was due to several

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factors. Due to low prices for the previous 2 years, farmers cut production by reducing the sizes of their herds. In May 2003 the U.S. banned the importation of replacement dairy cows from Canada following the disclosure of a bovine spongiform encephalopathy (BSE) case. As milk prices started to increase, dairy farmers had difficulties increasing production because of the limited supply of replacement heifers.

Another factor that affected milk supply was the lower amount of BST (bovine somatotropin) available to U.S. dairy farmers. The hormone is used to increase average milk yield by 10 pounds per cow per day. About 2% of the U.S. milk supply is attributed to the use of bST. The Cooperatives Working Together (CWT) program was also created in July 2003. This program was created and funded by dairy cooperatives, whose interest is to address the supply and demand imbalances that can depress milk prices by retiring dairy herds, reducing milk marketings, and increasing exports (GAO, 2004).

Milk production in the state has increased despite the decline in the number of dairy cows. The increase in milk production for the last 26 years has occurred due to the increasing milk productivity of cows. Yearly milk production per cow (lbs) in 1978 was 10,729 lbs per month (Figure 2). By 2004, the yearly milk production per cow had increased by 84% to 19,747 lbs. This increasing productivity is due primarily to improved genetics, improved feeding rations, changing technology and higher intensity management of the dairy herds. In 2004 Indiana ranked 10th in the U.S. in milk production per cow. The increase in productivity has been able to outpace the decreasing number of cows in the state. The lowest number of cows in the state for the past quarter century occurred in 1999 with approximately 136,000 milk cows, a 33% decrease of cow numbers in 1978. By 2004, the number of cows in the state increased marginally to 150,000 cows (Indiana Agricultural Statistics).


Milk production occurs in 99% of all Indiana counties. Yet most of the milk production occurs in the northern and northwestern counties of the state. Table 1 presents the counties with the highest dairy cow inventory in January 1, 2005 (Indiana Agricultural Report). The top five counties which represent 43% of the total dairy cows in the state are Elkhart, Newton, Jasper, Lagrange and Marshall.


County	Milk Cows
1. Elkhart	17,100
2. Newton	16,600
3. Jasper	16,400
4. Lagrange	9,100
5. Marshall	6,000
6. Adams	5,100
7. La Porte	4,500
8. Noble	4,100
9. Kosciusko	3,600
10. Cass	3,500

Changing Structure of Indiana Dairy Farms

The dairy industry is undergoing dramatic structural changes. Fewer dairy farms are producing larger amounts of milk. In general the industry is becoming more concentrated. According to the Agricultural Census (1978), there were 7,590 farms with at least one milking cow in Indiana in 1978. About 56% of these farms had 1 to 19 cows and 2.7% had herds of 100 cows or more. There were only 2 farms with herds of 500 or more cows (Figure 3). On average there were 24 milking cows per farm in 1978. By 2002, the number of farms with at least one milking cow had decreased by 63% to 2,799. Of these, about 47% had herds of 1 to 19 cows and 10.5% had herds of 100 cows or more. The number of farms with more than 500 cows grew to 28 farms (Agricultural Census 2002). The average milking cows per farm increased to 52.

The changing structure of Indiana dairy farms and dairy farms in general has occurred due to the industrialization of the farm by technological changes and improved management skills of farmers. Technological advances that have been adopted by dairy farmers include: onfarm refrigerated bulk milk tanks for storage, improved milking equipment, modern and efficient milking parlors, better animal housing, improved feed handling and waste handling systems,

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and improvements in animal nutrition and health. These technological advances coupled with the management of larger herds of milking cows has allowed dairy farms to take advantage of economies of size, i.e. lower per unit production costs as total milk production increases. Larger farms tend to be more cost effective because fixed costs like land and machinery are spread over more units of production. In addition, larger farms may receive volume premiums and hauling discounts because greater volumes of milk can be marketed (Blayney, 2002; GAO, 2001).

Marketing of Indiana Milk

Milk produced in Indiana is both marketed direct as fluid milk products and processed into other dairy products, especially ice cream and milk sherbet. In 2004 Indiana ranked 2nd in ice cream production in the United States. Approximately 91.2 million gallons of ice cream, 34.5 million gallons of low fat ice cream, and 4.6 million gallons of milk sherbet were produced in the state. Production of these products has increased for the last decade. The production of ice cream and low fat ice cream have increased by 103% and 54% respectively since 1994 (Figure 4). Approximately twelve pounds of milk are necessary for the production of one gallon of ice cream. Thus the equivalent of 53% of Indiana's milk production in 2004 was processed into ice cream. Milk from other states was also utilized in the production of ice cream, thus it is not clear the proportion of Indiana milk destined for fluid milk products and processing products.

Data regarding Federal Milk Marketing Orders (FMMO) in 2004 showed that approximately 94% of all milk produced in Indiana was marketed under Federal Milk Marketing Orders (FMMO). FMMO is a federal program that establishes minimum pricing rules for the sale of raw fluidgrade milk from the producer to the processor or manufacturer (Blayney and Normile, 2004).

The minimum prices set by the FMMO are based on the type of dairy products the milk is used to produce: Class I (fluid milk used for beverage products), Class II (milk for perishable manufactured products such as ice cream and cottage cheese), Class III (milk for cream cheese and hard cheese manufacturing), and Class IV (milk for butter and dry product manufacturing). There are 10 Federal milk orders in the United States: Appalachian, ArizonaLas Vegas, Central, Florida, Mideast, Northeast, Pacific Northwest, Southeast, Southwest and Upper Midwest (Figure 5). In 2004, Indiana produced about 13% of the milk marketed in the Appalachian order, 11% of the milk marketed in the Mideast order and 0.7% of the Central order. Indiana also sourced the Florida, Southeast, and Upper Midwest orders, but Indiana specific data is not available due to confidentiality.

Total Economic Activities Associated with the Indiana Dairy Industry

Total economic activities associated with the dairy industry can be separated into three categories: direct, indirect and induced. The direct economic activities are related to the sales, income and employment that are generated solely by the Indiana dairy industry. Sales represent the total value of all the dairy products and byproducts that are sold by the industry. Income represents the salaries received by the people that are employed by the dairy industry.

The indirect economic activities are related to the dairy industry's purchases of materials and services from ancillary industries within the state. Examples of ancillary industries to the state's dairy industry include trucking firms that transport raw and finished product, vendors of farm equipment and plant equipment, vendors of processing equipment, veterinary services, real estate agencies and financial institutions. The purchases by the Indiana dairy industry represent sales to the vendors who provide their services and materials. The vendor's sales are then allocated as income payments to their employees and to purchases from other vendors. The transactions between the dairy industry and their vendors and between vendors of the vendors result in multiple rounds of linked economic activities.

The induced economic activities occur because the employees and business owners that spend at least some of their incomes on consumer goods and services within the state of Indiana. The purchase of food, television sets, air conditioners, vehicles and the like by people that earn their incomes through the dairy industry and its vendors would then be credited as induced economic activities.

The sum of the direct, indirect and induced economic activities make up the total economic activities related to Indiana dairy industry. For this study, an Input-Output model for the state of Indiana was used to assess the interaction among sectors of the economy of Indiana. Specifically IMPLAN (Impact Analysis for PLANning) software was used to identify and

estimate the value of the linkages of purchases and sales of commodities between industries, businesses and final consumers. A model using 2002 data (most recent available) was constructed for the state of Indiana and was utilized to measure the indirect and induced economic activities related to Indiana's dairy industry. The IMPLAN model contains the linkages between 509 sectors of the Indiana economy.

The direct economic activities were estimated using enterprise budgets for the dairy industry from Ohio State University and Iowa State University. The budget includes the cost of one cow lactation plus dry period as well as a replacement heifer. Cows are assumed to be in the herd for three years, thus the budgets include one third of the feed costs required to raise a heifer. Since there were three times as many cows as heifers raised in Indiana in 2004 (Indiana Agricultural Statistics) the budget gives a good approximation of the costs of maintaining the herd of cows and raising the replacement heifers in 2004. Data from Indiana Agricultural Statistics for 2004, such as input prices, milk production levels and cow inventories, were used to complete the budget. [Table 2](#) presents the income and cost of producing milk in the state of Indiana.

Income from milk production in 2004 was estimated at \$533 million dollars. Dairy farmers produced 2.962 billion pounds of milk and obtained an average return of \$16.70 per hundredweight of milk. Indiana farmers received \$490,646,000 for their production. Dairy farmers complemented their incomes by selling calves and cows that were taken off production. Indiana farmers received \$42 million from the sale of cull milk cows and calves.

The cost of producing milk was estimated at approximately \$483 million. Feed expenses accounted for 38% of the total cost. The Indiana dairy industry made the following purchases to feed their cows: 9.3 million bushels of corn at a cost of \$18 million, 219 thousand tons of soybean meal at a cost of \$64 million, 1.8 million tons of corn silage at a cost of \$32 million, 486 thousand tons of hay equivalents at a cost of \$40 million and other feed additives, such as vitamins, minerals and fats, at a cost of \$27 million.

The second highest cost category for milk production after feed is labor. Our budget assumes that 60 hours of labor a year per cow are employed by the industry. We utilized a labor charge of \$11.90 per hour which includes workers compensation, social security, and fringe benefits for operations and management employees. To approximate employment in the industry, the required labor to manage the 150,000 cows in Indiana was calculated. This figure was then divided by 2400 hours, considered to be the hours of labor per year required for a full time job. It is estimated that the industry employed 3,750 Indiana residents working full time in 2004. These employees earned total salaries and benefits of \$107 million. It is important to point out that the dairy industry may indeed employ more people. Dairy farmers with smaller herds of cows may have a second job and thus devote only a fraction of their time to milk production. Estimating the total number of part time jobs in milking is difficult, and a full time equivalent estimate seems more appropriate.

Other costs to the industry included:

- 1) the hauling of animals and milk products _ \$9 million,
- 2) medicine and services to maintain animal well being \$14.7 million,
- 3) fuels, utilities and repairs \$22.5 million,
- 4) cost of accounting and Dairy Herd Improvement (DHIA) \$4.2 million,
- 5) breeding fees \$6 million,
- 6) bedding, supplies and miscellaneous \$24 million,
- 7) machinery, equipment and facilities \$78 million, and
- 8) interest and insurance on herds \$35.85 million.

These costs add up to \$194.25 million ([Table 2](#)). The residual value between income and total costs can be described as returns to unpaid labor and management.

The economic activity indicators from IMPLAN model which include output, labor income and employment are presented in [table 3](#). The results are separated into direct, indirect and induced activities. The direct output by the dairy industry was valued at \$533 million. The industry paid \$107 million in salaries to its 3,570 fulltime employees. Indirectly, the dairy industry supported sales of \$313 million in the Indiana economy. These sales further generated 2,189 full time jobs in Indiana with labor income of \$76 million. The induced activities associated with the dairy industry resulted in sales of \$140 million, with further full time employment of 1,598 Indiana residents who received \$46 million in labor income. Thus, the total economic activity associated with the Indiana dairy industry was \$986 million in sales and \$229 million in income paid to the 7,357 persons employed in Indiana due to the dairy

industry.

[Table 4](#) presents the total economic activity indicators obtained from the IMPLAN model separated into 9 different industry sectors (i.e., effects on the 509 sectors of the IMPLAN model were aggregated into 9 sectors). The "dairy industry and other agriculture" sector includes both the dairy industry, and other agricultural industries such as corn and soybean farming. The output for this sector represents the total amount of sales of the dairy industry and other agricultural industries supported by it. The value of sales in Indiana for this sector was \$689.5 million. This sector accounted for 70% of the total sales in Indiana associated with the dairy industry. This sector also accounted for 60% of total labor income, and 63% of the total jobs. The average labor income for an employee in this sector was \$29,725 per year. The economic activity generated by the dairy industry is evident in the additional jobs and output generated in the other industry sectors of Indiana. The services sector, which includes educational services, professional services, food services and entertainment accounts for 886 jobs and \$20 million worth of output. The trade sector accounts for 636 jobs and \$20 million worth of output. The other 6 sectors account for 1,206 additional jobs and \$52 million worth of output. The average salary for all jobs associated with the dairy industry is \$31,184.

Indiana Dairy Industry in the Future

The Indiana dairy industry will continue to be a valuable employment and income generator in the state of Indiana. Milk production in the state will continue to increase due to the high milk prices of 2004 and 2005 that have motivated certain farmers to expand the size of their dairy herds. A constraint to dairy herd expansion is the availability and the prices of replacement heifers, which are less restrictive with the easing of restrictions on Canadian imports of replacement heifers. Continued improvement of milk production per cow will further increase total milk production in the state. The industry will continue to consolidate into fewer and larger dairy operations with advanced technology that will allow reductions in per unit cost of producing milk.

The Indiana dairy industry is in a good position to grow. The state has a competitive position compared to other dairy states. The primary advantage of Indiana producers is the availability of low cost feed. Feed represents 38 % of the total cost of producing milk. Any savings on feed has a relatively large impact on production costs. The booming ethanol industry in Indiana will have mixed effects on the dairy industry. On one hand, corn prices may increase locally which will result in an increase in the cost of dairying.

On the other hand a coproduct of ethanol production, distiller's dried grains with solubles (DDGS), may be a substitute for corn and in addition provide protein supplements to the feed (Baker and Zahniser, 2006). The second advantage for the state is market access. Indiana's state motto indeed is the "Crossroads of America". Indiana processors are close to major urban areas such as Chicago, St. Louis, Indianapolis, and have an efficient transportation systems to distribute their products to the densely populated southern and eastern U.S. markets. With increasing fuel prices, Indiana processors will face lower distribution costs than producers located farther away from major markets. Indiana also has a moderate climate that is suitable for dairying. Industry growth in the state means improved farm income through backward linkages to the farm. It will also add income and employment in the processing, marketing and distribution sectors of the industry.

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