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# The Economic Impact of Michigan's Food and Agriculture System

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William A. Knudson
and
H. Christopher Peterson

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80 Agriculture Hall, Michigan State University,
East Lansing, MI 48824

## Introduction

Michigan's food and agriculture system is a major contributor to income and employment in the state's economy. The food and agriculture system accounts for approximately $91.4 billion in direct, indirect and induced economic activity. This sector also accounts for an excess of 923,000 jobs both directly, indirectly and through induced activity.

The food and agriculture system is fairly complex. The supply chain for products produced by this sector goes through several steps. Inputs are used at the farm level to grow the crops, livestock and milk, and fruits and vegetables. Farm products in turn are collected, graded, sorted, etc. After this step, the commodities are sent to food processors to create manufactured food products or in the case of fresh fruits and vegetables sent to wholesalers and brokers to be sold to retailers such as supermarkets or the food service industry. The manufactured food markets are then wholesaled and retailed or consumed in restaurants.

Agricultural products used for energy such as ethanol which uses corn as a feedstock follows a somewhat different path. In the case of ethanol, corn is collected and the ethanol is extracted from the corn. The primary residual product Dried Distillers Grains (DDGs), is used as an animal feed.

As the above outline shows, the food and agricultural system is complex and interconnected. Agriculture is much more than farming. As such, in order to obtain a complete picture of the economic impact of the sector, allied economic activity and employment also need to be considered as well as the income and employment generated throughout the system. The primary method used to generate figures on the total economic activity generated by the food and agriculture system is an input-output model with multipliers generated by IMPLAN, a company that specializes in economic impact analysis software. More information about IMPLAN and the underlying assumptions the program uses can be found in the appendix.

This paper will analyze the economic impact of the farm, food processor and wholesale and retail levels of the agri-food supply chain on the Michigan economy. The input supply sector will also be considered as will first level handlers of agricultural commodities such as grain elevators. For the purposes of this report, the nursery and landscape industries will also be considered part of the agri-food sector. Michigan is an important producer of many nursery and landscape products. The size and impact of the ethanol sector will also be discussed. Currently, the state has five ethanol plants and no biodiesel facilities in operation. However, there are several biodiesel facilities and advanced biofuel facilities under consideration. The Agri-Energy industry will likely grow in the future.

It should be noted that the research methodology in this paper is based on that in Professor John N. Ferris' Staff Paper 00-11, An Analysis of the Importance of Agriculture and the Food Sector to the Michigan Economy, which was written in May of 2000. In most respects, this paper is an update of Professor Ferris' previous study.

# Economic Impact of the System

## Input Supply Firms

Farm products are produced through converting inputs such as fertilizer, fuel, credit, equipment, land, chemicals, seed, and other factors of production into milk, beef, grains, fruits, vegetables and other farm products. The farm input supply industry is a critical link in the food and agriculture supply chain. For example, in 2010, Michigan farmers purchased $599.1 million in fertilizer and lime, $222.6 million in pesticides, and $275.2 million in petroleum fuels and oil (Michigan Agricultural Statistics Service, p.10).

The total economic impact of the input supply sector is included in the multiplier effects of the farm sector. The income and economic activity generated at the farm level includes the farm input supply industry.

## The Farm Sector

### Livestock and Dairy

In dollar terms, livestock and dairy ranks behind field crops in terms of economic activity. Table 1 shows the economic impact of the livestock and dairy sector. These figures are a three year average from 2008 through 2010. As table 1 indicates, the total direct impact of the livestock and dairy sector was $2.77 billion. Of this amount dairy accounted for almost $1.32 billion or about 50 percent of the total. Dairy farming is the largest single livestock industry in the state. Other major livestock activities included cattle, hogs, eggs and turkeys. Dairy, eggs and turkeys show an upward trend in production and value.

These figures are derived from IMPLAN, and are adjusted to take double counting into account. The value of the livestock products include the value of feed which is also included in the value of grain and hay production. In order to obtain a more accurate figure, the value of feed was subtracted out.

The total economic impact of the livestock and dairy sector is approximately $4.73 billion. This includes both direct and backward linked indirect economic activity resulting from livestock and dairy farming. Backward linked industries in the farm sector are input supply industries that were discussed previously.

**Table 1: Economic Impact of Livestock Products (Average 2008-2010)**

| Product | Direct Impact ($1,000s) | Total Impact ($1,000s) |
|---|---|---|
| Cattle | 351,426 | 633,890 |
| Milk | 1,320,219 | 2,294,716 |
| Eggs | 174,732 | 307,195 |
| Hogs | 265,740 | 450,047 |
| Honey | 6,753 | 11,437 |
| Horses* | 485,190 | 736,567 |
| Mink | 2,747 | 4,652 |
| Sheep and Lambs | 4,728 | 8,007 |
| Wool | 169 | 286 |
| Trout | 910 | 1,541 |
| Turkeys | 108,666 | 191,045 |
| Other | 51,189 | 86,692 |
| **Total** | **2,772,469** | **4,726,075** |

Source: * Economic Impact of the Michigan Equine Industry
Michigan Agricultural Statistics Service: Michigan Agricultural Statistics 2010-2011

**Table 2: Economic Impact of Field Crops (Average 2008-2010)**

| Crop | Direct Impact ($1,000s) | Total Impact ($1,000s) |
|---|---|---|
| Barley | 1,463 | 2,598 |
| Corn for Grain | 1,324,726 | 2,352,615 |
| Dry Beans | 123,589 | 246,901 |
| Hay | 326,966 | 574,088 |
| Maple Syrup* | 4,930 | 9,849 |
| Mint | 2,403 | 4,801 |
| Oats | 10,373 | 18,420 |
| Potatoes | 160,221 | 320,083 |
| Soybeans | 819,244 | 1,429,667 |
| Sugarbeets* | 160,692 | 299,302 |
| Wheat | 218,461 | 387,944 |
| Other | 38,843 | 77,599 |
| **Total** | **3,191,911** | **5,723,867** |

* 2007-2009
Source: Michigan Agricultural Statistics Service: Michigan Agricultural Statistics 2010-2011

## Field Crops

Field crops are the largest sector the Michigan farm economy. Table 2 shows the economic impact of the major field crops grown in the state. The three largest field crops in dollar terms are corn, soybeans, and hay. Corn has become the largest single farm sector with sales in excess of $1.3 billion. Wheat, sugar beets, potatoes and dry beans also account for more than $100 million each a year in direct economic activity per year. Michigan ranks second in the U.S. in the production of dry beans.

The total direct economic activity generated by the field crops is $3.19 billion. Total economic activity including backward linked activity such as farm input supplies is $5.72 billion.

## Vegetables

Michigan is known for the wide variety of vegetables grown in the state. Table 3 lists the major vegetables grown in the state and the economic value generated by these products. In dollar terms, cucumbers and tomatoes are the largest category of vegetables produced in the state. However, there are many vegetables which by themselves are small, however when aggregated they are quite large, which is reflected in the size of the "other" category.

The state is an important producer of many specific categories of vegetables. In 2010, the state was the number one producer of cucumbers for pickles and squash and ranked second in celery production and fresh market carrot production. The state is the third largest producer of asparagus and fresh market cucumbers (Michigan Agricultural Statistics, p.1).

The direct value of the vegetable sector is $311.2 million with a total economic impact, including backward linked industries of approximately, $673.5 million. It should be noted that IMPLAN treats all vegetables the same no matter what type of vegetable produced or whether the vegetable is produced for the fresh market or for the processed market.

**Table 3: Economic Impact of Vegetable Production (Average 2008-2010)**

| Crop | Direct Impact ($1,000s) | Total Impact ($1,000s) |
|---|---|---|
| Carrots for Processing* | 4,975 | 10,766 |
| Cucumbers for Processing | 46,737 | 101,143 |
| Snap Beans for Processing | 13,325 | 28,837 |
| Tomatoes for Processing | 12,112 | 26,211 |
| Snap Beans | 5,960 | 12,898 |
| Cabbage | 11,052 | 23,918 |
| Carrots | 12,128 | 26,246 |
| Sweet Corn | 21,278 | 46,048 |
| Cucumbers | 17,734 | 38,378 |
| Onions | 12,337 | 26,698 |
| Tomatoes | 22,390 | 48,454 |
| Asparagus | 16,339 | 35,359 |
| Celery | 15,828 | 34,253 |
| Bell Peppers | 11,888 | 25,727 |
| Pumpkins | 13,135 | 28,425 |
| Squash | 12,009 | 25,989 |
| Other | 61,995 | 134,163 |
| **Total** | **311,222** | **673,513** |

* average of 2006-2008

Source: Michigan Agricultural Statistics Service Michigan Agricultural Statistics 2010-2011

## Fruit

As is the case with vegetables, the state is a major producer of fruits. Table 4 shows the economic impact of fruit production in the state.

The largest fruit categories in dollar terms are apples, blueberries, and tart cherries. The state leads the nation in the production of tart cherries and blueberries. The state is the third largest producer of apples. Grape production includes both juice and wine grapes. Given the growth in the wine industry, this figure is likely to be understated.

**Table 4: Ecomomic Impact of Fruit Production (2008-2010)**

| Crop | Direct Impact ($1,000s) | Total Impact ($1,000s) |
|---|---|---|
| Apples | 117,400 | 263,514 |
| Blueberries | 120,050 | 269,462 |
| Tart Cherries | 42,757 | 95,972 |
| Sweet Cherries | 13,192 | 29,610 |
| Grapes | 21,360 | 47,944 |
| Peaches | 11,286 | 25,332 |
| Pears | 971 | 2,179 |
| Plums | 947 | 2,126 |
| Strawberries | 5,517 | 12,383 |
| Other | 4,420 | 9,921 |
| **Total** | **337,900** | **758,443** |

Source: Michigan Agricultural Statistics Service Michigan Agricultural Statistics 2010-2011

The direct economic impact of fruit production in the state is $337.9 million. The total economic activity including backward linked industries related to fruit production is $758.4 million. As is the case with vegetable farming, IMPLAN uses the same multiplier for all types of fruit and for the fresh and processed markets.

## Nursery/Landscape

Michigan ranks third in the nation after California and Florida in the production of nursery and landscape products. It is first in the nation in the production of Geraniums, Impatiens, and Petunias. It is second in the nation in the production of Hostas, Marigolds and garden Chrysanthemums (Michigan Agricultural Statistics, p.1). The state is a major producer of Christmas trees as well. The economic impact of this industry is often overlooked.

The direct impact of nursery and landscape production is estimated to be $621.2 million. The total impact of the nursery and landscape production including backward linked industries is $1.20 billion.

## Miscellaneous Farm Production and the Size of Michigan Farming

There are several miscellaneous products produced on farms throughout the state. These products do not fit neatly into any of the above categories. The total direct output from these activities is estimated to be $4.4 million. The total economic impact of these miscellaneous commodities is estimated to be $8.8 million.

The total economic impact of Michigan farming is summarized in table 5. Table 5 overstates the total impact of the farm sector due to double counting. For example, breeding livestock can be both a cost of production and a source of revenue. Adjusting for double counting will occur when all aspects of the food and agriculture system are taken together. Table 5 does show the importance of the farm sector on the Michigan economy. Even after adjusting for double counting, the sector accounts for about $11 billion in total economic activity and more than $6 billion in direct economic activity.

## Food Processing and Manufacturing

The next step along the supply chain from the farm level is food processing and manufacturing. Intermediate steps such as collection, transportation, grading, sorting, etc. are backward linked to food processing and manufacturing. Just as there is a multiplier effect for farming there is also a multiplier effect for food processing and manufacturing. Table 6 shows the impact of food processing and manufacturing in Michigan. These figures come from the 2007 economic census. While the 2007 census figures are the most recent and accurate figures available, they likely underestimate the current value of food processing and manufacturing. Increases in farm prices as well as general inflation have likely increased food processing sales and related economic impact.

Table 6 shows the wide range of activities carried out by the food processors and manufacturers in the state. The legacy of the prepared cereal entrepreneurs can be seen in the size of the breakfast cereal industry in the state which accounts for more than $2 billion in total economic activity. The size of the Michigan dairy industry is reflected in the size of the fluid milk industry, and the production of other dairy products. The great diversity of agricultural commodities grown in the state is reflected in the size of processed fruit and vegetable products industries.

**Table 5: Impact of Michigan Farm Production (Average 2008-2010)**

| Type of Product Produced | Direct Impact ($1,000s) | Indirect and Induced Impacts ($1,000s) | Total Impact ($1,000s) |
|---|---|---|---|
| Livestock/Dairy | 2,772,469 | 1,953,606 | 4,726,075 |
| Field Crops | 3,191,911 | 2,531,956 | 5,723,867 |
| Vegetables | 311,222 | 362,291 | 673,513 |
| Fruits | 337,900 | 420,543 | 758,443 |
| Floriculture/ nursery/turfgrass | 621,221 | 579,458 | 1,200,679 |
| Miscellaneous | 4,412 | 4,402 | 8,814 |
| **Total** | **7,239,135** | **5,852,256** | **13,091,391** |

Source: Michigan Agricultural Statistics Service Michigan Agricultural Statistics 2010-2011

The total size of the food processing and manufacturing industries is $14.7 billion in direct economic activity and approximately $24.6 billion in total economic activity. Indirect and induced economic activity resulting from food processing and manufacturing is about $9.91 billion.

## Food Wholesaling and Retailing

Most of the value added in the food and agriculture system is a result of activities in food wholesaling and retailing. The figures for these activities were estimated using the U.S. Department of Agriculture figures for spending on food in 2010, and adjusting for Michigan's share of the U.S. population. The multiplier used is a weighted average of wholesaling, retail and food service multipliers. It is estimated that direct impacts of the wholesaling, retailing and food service sectors of the agri-food system is approximately $29.1 billion with a total economic impact of approximately $51.5 billion.

**Table 6: Economic Impact of Food Processing 2007**

| Industry | Direct Impact ($1,000s) | Indirect and Induced Impacts ($1,000s) | Total Impact ($1,000s) |
|---|---|---|---|
| Pet Food Manufacturing | 14,420 | 8,421 | 22,841 |
| Other Animal Food Manufacturing | 196,957 | 102,689 | 299,646 |
| Flour Milling/oilseed/Fats and Oils Processing | 193,701 | 180,517 | 374,218 |
| Breakfast Cereal Manufacturing | 1,241,137 | 782,140 | 2,023,277 |
| Sugar Manufacturing | 459,520 | 407,466 | 866,986 |
| Candy and Chocolate Manufacturing | 272,214 | 188,318 | 460,532 |
| Frozen Food Manufacturing | 418,288 | 355,412 | 773,700 |
| Fruit and Vegetable Canning/Pickling/Drying | 985,837 | 669,427 | 1,655,264 |
| Fluid Milk and butter Manufacturing | 1,283,759 | 979,818 | 2,263,577 |
| Cheese Manufacturing | 274,832 | 185,875 | 460,707 |
| Dry/Condensed/Evaporated Milk Manufacturing | 2,330,785 | 1,590,887 | 3,921,672 |
| Ice Cream and Frozen Dessert Manufacturing | 70,379 | 55,756 | 126,135 |
| Animal (except poultry) Slaughtering | 1,059,640 | 621,840 | 1,681,480 |
| Poultry Processing | 664,034 | 377,610 | 1,041,644 |
| Meat Processed from Carcasses | 528,799 | 310,154 | 838,953 |
| Bread and Bakery Product Manufacturing | 1,320,977 | 1,166,306 | 2,487,283 |
| Cookie/Cracker/Pasta Manufacturing | 14,983 | 10,226 | 25,209 |
| Tortilla Manufacturing | 188,171 | 133,118 | 321,289 |
| Snack Food Manufacturing | 142,927 | 91,226 | 234,153 |
| Coffee and Tea Manufacturing | 71,783 | 56,738 | 128,521 |
| Seasoning and Dressing Manufacturing | 324,137 | 211,748 | 535,885 |
| All Other Food Manufacturing | 346,658 | 272,275 | 618,933 |
| Soft Drinks and Ice Manufacturing | 2,155,532 | 1,091,340 | 3,246,872 |
| Breweries | 66,725 | 36,616 | 103,341 |
| Wineries | 30,995 | 20,228 | 51,223 |
| **Total** | **14,657,190** | **9,906,151** | **24,563,341** |

Source: U.S. Census Bureau Economic Census 2007

# Total Value of the Food and Agriculture System

The last two components of the Food and Agriculture System not accounted for in previous sections are leather processing and ethanol. Their respective economic impacts are included in the summary Table 7. The ethanol figures have been adjusted to exclude the value of corn used in the production of ethanol and to include the value of dried distillers grains produced as a result of the ethanol production process.

Total 7 presents the total value of the Michigan Food and Agriculture System. Direct economic activity is estimated to be $52.4 billion, an increase of 45.9% 2004-2010. The total economic impact of these industries is equal to $91.4 billion, an increase of 51.9% 2004-2010. The activities accounted for are not entirely complete. For example, farm market sales are not included, nor are some agri-tourism activities. The figures should be considered estimates and not the definitive picture of Michigan food and agriculture. They are the best estimates given the level of information available and the assumptions made. The Appendix provides a more complete discussion of the methodology used.

**Table 7: Aggreate Estimates of Direct and Extended Values of Output in Michigan's Food and Agriculture System (2010)**

| | Economic Output (millions $) | | |
|---|---|---|---|
| | **Direct** | **Indirect and Induced** | **Total** |
| **Agricultural Production and Processing** | | | |
| Farming | 7,239 | 5,852 | 13,091 |
| Food Processing and Manufacturing | 14,657 | 9,906 | 24,563 |
| Leather Processing | 52 | 32 | 84 |
| Total | 21,948 | 15,790 | 37,738 |
| Adjustment for Double Counting | (1,231) | (909) | (2,140) |
| **Net Total** | **20,717** | **14,881** | **35,598** |
| | | | |
| **Food Wholesale and Retail** | **29,046** | **22,000** | **51,046** |
| | | | |
| **Total Food and Agriculture before Related Sectors** | **49,763** | **36,881** | **86,644** |
| | | | |
| Floricultural/ornamental/turfgrass services and retail | 2,472 | 2,043 | 4,515 |
| | | | |
| Net Impact of Ethanol Production | 195 | 28 | 223 |
| | | | |
| **Grand Total for the Food and Agriculture System** | **52,430** | **38,952** | **91,382** |

# The Impact of the Food and Agriculture System on Employment

## Introduction

The techniques used to determine the level of employment attributed to the food and agriculture system is similar to determining the economic impact of this sector. One thing that makes the analysis easier is the fact that double counting is less of an issue; a job is only counted once. Jobs are not inputs in other jobs. One thing that makes the analysis more difficult however is that employment estimates are on a jobs basis and do not discern full and part-time employment. Basing employment in terms of full-time equivalents (FTEs) would make comparisons easier. Adjusting for FTEs is done at the farm level but is not done in the other industries.

As a result the employment figures listed in this section may overstate the full effects of employment resulting from the food and agriculture system. As noted, the farm sector is adjusted to include employment on an FTE basis. Most other industries such as wholesaling and many food manufacturing operations also employ people on a full time basis. Other industries such as the food service industry employ many people on a part-time basis. This is not adjusted for in the figures, and therefore the impacts of employment may be overstated.

The employment numbers have multiple sources across several different years. An attempt was made to use the latest data available. Data source include the 2007 Economic Census, the Michigan Economic Development Corporation and Bureau of Labor Statistics (BLS) for the state of Michigan, and the 2007 Census of Agriculture for farm level employment. Food wholesale and retail estimates used output/employee and total sector revenues. (See the Appendix for additional detail.)

As is the case with the economic impact figures, the employment figures will be split by farm sector, food processing/manufacturing, wholesaling, and retailing. Employment in the nursery/landscape/turf grass and ethanol industries will also be considered.

## Input Supply Firms

As is the case with the economic impact figures, employment figures in the input supply industries are linked backward into agricultural production. The input supply industry is an important aspect of the food and agriculture system. Employees in this industry serve a vital role in providing goods and services to farmers.

As farming become more complex the need for the services offered by input supply firms is likely to increase. The utilization of custom harvesting, custom spraying, crop scouting, and other services will likely increase in the future, placing more emphasis on the input supply industry.

## Farming

The Census of Agriculture breaks both farmers and farm labor down according to the number of hours worked. This allows an estimate of the number of FTEs employed in farming. In 2007, the state had 56,014 farmers, not all of them full-time producers. There were also 86,072 hired farm workers in 2007. Table 8 gives a breakdown of the number of farmers and hired farm workers in 2007.

**Table 8: Employment on Michigan Farms 2007**

| Type of Employment | Total Number | Full-Time Equivalents |
|---|---|---|
| Days Worked Off Farm | | |
| None | 20,533 | 20,533 |
| Less than 200 | 13,068 | 8,131 |
| More than 200 | 22,413 | 2,242 |
| **Total** | **56,014** | **30,906** |
| | | |
| Hired Labor | | |
| Days Worked on Farm | | |
| 150 or More | 24,284 | 24,284 |
| Less than 150 | 61,788 | 18,536 |
| **Total** | **86,072** | **42,820** |
| | | |
| **Grand Total** | **142,086** | **73,726** |

Sources: USDA Census of Agriculture

Table 8 shows the dichotomy of Michigan farms. Most farmers are either full-time farmers or part-time farmers who derive little income from their on-farm activities. It is estimated that there are 30,906 farmer FTEs. Farming is also an important employer; especially for part-time or seasonal work. The number of hired labor FTEs is estimated to be 42,820. In 2007, there were 142,086 people employed at the farm level with a total number of FTEs in the industry estimated to be 73,726. Using an employment multiplier of 1.421 yields a total number of those employed in farming and backward linked industries of 104,764. Indirect and induced employment is equal to 142,086. Compared with the 2006 study, the level of employment in farming is steady or increasing slightly.

## Food Processing and Manufacturing

Due to the diversity of Michigan agriculture, the state has a wide range of food processing and manufacturing facilities. The employment resulting from food processing and manufacturing is outlined in table 9. This figure should be considered an estimate. Many industries have one or a few firms. Many employment numbers are suppressed in order to protect the iden-

**Table 9: Food Processing Employment in Michigan**

| Industry | Direct Employment | Indirect and Induced Employment | Total |
|---|---|---|---|
| Pet Food Manufacturing | 47 | 178 | 225 |
| Other Animal Food Manufacturing | 359 | 1,271 | 1,630 |
| Flour Milling | 512 | 3,228 | 3,740 |
| Starch and Vegetable Oil Manufacturing | 259 | 1,352 | 1,611 |
| Breakfast Cereal Manufacturing | 3,908 | 11,548 | 15,456 |
| Sugar Manufacturing | 1,136 | 3,169 | 4,305 |
| Chocolate and Confectionary Manufacturing | 769 | 1,077 | 1,846 |
| Nonchocolate Confectionary Manufacturing | 129 | 174 | 303 |
| Frozen Food Manufacturing | 2,286 | 3,596 | 5,882 |
| Fruit and Vegetable Canning/Pickling/Drying | 4,374 | 9,061 | 13,435 |
| Fluid Milk and Butter Manufacturing | 3,196 | 12,123 | 15,319 |
| Cheese Manufacturing | 730 | 3,129 | 3,859 |
| Ice Cream and Frozen Dessert Manufacturing | 272 | 576 | 848 |
| Animal (except poultry) Processing | 2,554 | 4,765 | 7,319 |
| Poultry Processing | 1,762 | 1,455 | 3,217 |
| Meat Processed from Carcasses | 1,418 | 2,619 | 4,037 |
| Seafood Processing | 156 | 256 | 412 |
| Bread and Bakery Product Manufacturing | 6,969 | 6,369 | 13,338 |
| Cookie, Cracker and Pasta Manufacturing | 1,300 | 2,713 | 4,013 |
| Tortilla Manufacturing | 198 | 178 | 376 |
| Snack Food Manufacturing | 1,024 | 2,711 | 3,735 |
| Coffee and Tea Manufacturing | 680 | 2,478 | 3,158 |
| Flavoring Syrup and Concentrate Manufacturing | 73 | 313 | 386 |
| Seasoning and Dressing Manufacturing | 853 | 1,926 | 2,779 |
| All Other Food Manufacturing | 904 | 1,521 | 2,425 |
| Soft Drink and Ice Manufacturing | 4,012 | 8,896 | 12,908 |
| Breweries | 344 | 787 | 1,131 |
| Wineries | 568 | 814 | 1,382 |
| Distilleries | 36 | 75 | 111 |
| **Grand Total** | **40,828** | **88,358** | **129,186** |

Sources: Economic Census. Michigan Economic Development Corporation

tity and employment levels of specific firms. Employment figures for food processing were provided by the 2007 Economic Census updated to 2010 by information from the Michigan Economic Development Corporation.

The number of employees in food processing and manufacturing industries is estimated to be 40,828. There were an additional 149 workers employed in the leather tanning and finishing industry with a total employment, both direct and indirect of 380. The total level of employment directly in these industries is 40,977 with a total level of direct and related backward linked industries of 129,566. The level of employment in food processing and manufacturing appears to be increasing.

## Food Wholesaling and Retailing

As is the case when dealing with the financial impacts of wholesaling and retailing employment in these industries is broken down by employment resulting from Michigan based agricultural commodities and employment based on non-Michigan agricultural commodities. Employment in wholesaling is outlined in table 10. In total, the wholesaling sector accounted for 29,179 jobs in direct employment and a total of 61,911 in direct, indirect and induced employment. Employment in food wholesaling appears to be holding steady or increasing slightly.

Employment in retailing is extremely difficult to estimate. Food products are sold virtually everywhere: gas stations, club stores, bookstores, golf courses, and bowling alleys to name a few. Furthermore, much of the employment at retail level is part-time. This is especially true for those employed in the food service industry. Conversely, not all purchases at grocery stores or other traditional food outlets are spent on food products.

One way to estimate employment at the retail level is to divide the expenditures on food purchases by retail sales per employee. This was used to derive a figure for food store employment. Figures for food service are from the 2007 Economic Census.

Total employment in the wholesale, retail and food service sectors of the food and agriculture system is estimated to be 435,320. The total impact of these sectors on employment is 593,188. It appears that employment in these sectors is declining, especially in the retail and food service industries. Consumers are moving away from traditional supermarkets toward more efficient mass merchandisers such as Meijer and Wal-Mart.

**Table 10: Employment in Agri-Food Wholesaling Industries**

| Industry | Direct Employment | Indirect and Induced Employment | Total Employment |
|---|---|---|---|
| General Line Grocery Merchant Wholesalers | 6,676 | 7,490 | 14,166 |
| Packaged Frozen Food Wholesalers | 1,434 | 1,608 | 3,042 |
| Fish and Seafood Wholesalers | 295 | 330 | 625 |
| Meat and Meat Product Wholesalers | 1,504 | 1,687 | 3,191 |
| Fruit and Vegetable Wholesalers | 1,976 | 2,216 | 4,192 |
| Dairy Product Wholesalers | 1,462 | 1,640 | 3,102 |
| Poultry Product Wholesalers | 41 | 46 | 87 |
| Confectionary Wholesalers | 1,662 | 1,864 | 3,526 |
| Other Grocery Product Merchant Wholesalers | 7,513 | 8,429 | 15,942 |
| Nursery and Florist Merchant Wholesalers | 1,305 | 1,464 | 2,769 |
| Alcoholic Beverage Wholesalers | 5,311 | 5,958 | 11,269 |
| **Total** | **29,179** | **32,732** | **61,911** |

Source: Economic Census, BLS Quarterly Census of Employment and Wages

## Ethanol

One ethanol plant normally employs 35 people. The five plants in operation in Michigan employ 175 people directly. Using a multiplier of 3.875 yields a total direct and indirect employment for these plants of 678 persons.

Given the increased interest in alternative energy and technological advances in methane digesters and other forms of bio-energy, employment and output in agri-energy may increase in the future. However, increases from corn ethanol are unlikely.

## Employment Summary

Table 11 gives the breakdown of employment in Michigan's Food and Agriculture sector by industry. There is some adjustment for double counting due to the fact that some on farm employment may be counted under more than one activity (such as crop production and livestock production). Also, some processing occurs on farm which could lead to double counting of farming and processing employment. Two sectors not commented on separately but shown in Table 11 are leather processing and floriculture/ornamental/turfgrass services and retail. Floriculture/ornamental/turfgrass adds an additional 20,517 direct jobs with a total impact on employment of 33,393.

It is estimated that the Food and Agriculture System accounted for 617,854 jobs in direct activity and 305,643 jobs in indirect and induced activity for a total of 923,497 jobs in the state.

It appears that the level of employment in the food and agriculture system has declined since the 2006 study. Overall employment has declined by more than 124,000 or 11.8 percent. All of the decline appears to be in the food retail and food service sectors, although there may be some decline in the ornamental horticulture retail and services industries as well. This decline may be due to the recession, increased concentration in the food retail sector and technological change such as the growth of self-serve food checkout lanes.

According to the BLS, there were approximately 4.2 million people employed in the state in 2010 not adjusted for FTEs. The Food and Agriculture System accounted for approximately 22 percent of all the jobs in the state. This sector is an important source of jobs and income to the state's residents.

**Table 11: Total Employment in Michigan Food and Agriculture System**

| **Agricultural Production and Processing** | **Direct** | **Indirect and Induced** | **Total** |
|---|---|---|---|
| Farming | 73,726 | 31,038 | 104,764 |
| Food Processing and Manufacturing | 40,828 | 88,358 | 129,186 |
| Leather Processing | 149 | 231 | 380 |
| **Total Agricultural Production and Processing** | **114,703** | **119,627** | **234,330** |
| | | | |
| **Wholesale and Retail** | | | |
| Wholesale | 29,179 | 32,732 | 61,911 |
| Retail and Food Service | 453,320 | 139,868 | 593,188 |
| **Total Retail and Food Service** | **482,499** | **172,600** | **655,099** |
| | | | |
| Floricultural/Ornamental/Turgrass Services and Retail | 20,517 | 12,876 | 33,393 |
| | | | |
| Ethanol | 175 | 503 | 678 |
| | | | |
| **Grand Total** | **617,894** | **305,606** | **923,500** |

# Comparisons of 2004 and 2010 Economic Impacts and Employment

This report represents a complete update and restatement of a similar report published by the Product Center in 2006. That report was largely based on 2004 data while this report is largely based on 2010 data. Table 12 presents comparisons across the 6-year period.

The total economic impact of the Food and Agricultural System increase dramatically — 52% in total for a compound annual growth rate of 7.2%. Every part of the value chain grew except the relatively small sector of leather processing. Farming had a substantial increase of 96% for a compound annual growth rate of 11.8%.

The change was not positive on the employment side. Overall system employment was down slightly less than 11%. Further analysis shows that the decline is nearly entirely in the Food Wholesale and Retail sector while the remainder of the system grew. Food and Agricultural Production and Processing created just under 14,000 jobs, a 6.3% increase which is significant given the downturn in the general economy over the same period. Food Wholesale and Retail lost 124,000 jobs, a 15.9% decline.

Considering what was happening to the state's economy from 2004 to 2010, the positive story is the dramatic increase in dollars of economic output while the employment situation is mixed, positive for food and agricultural production and processing while negative most especially for food retailing. The food and agriculture system is a major source of economic activity and adds a level of stability to a state that is dependent on industries that are susceptible to business cycle fluctuations.

**Table 12: 2004-2010 Comparison of Total Economic Impact and Employment in Michigan's Food and Agriculture System**

| Category | Economic Impact (millions $) | | | Employment | | |
|---|---|---|---|---|---|---|
| **Food & Agricultural Production & Processing** | **2004** | **2010** | **% Change** | **2004** | **2010** | **% Change** |
| Farming | 6,694 | 13,091 | 95.6% | 102,900 | 104,764 | 1.8% |
| Food Processing and Manufacturing | 18,035 | 24,563 | 36.2% | 116,295 | 129,186 | 11.1% |
| Leather Processing | 874 | 84 | -90.4% | 1294 | 380 | -70.6% |
| Adjustment for Double Counting | | (2,140) | | | | |
| **Net Total** | **25,603** | **35,598** | **39.0%** | **220,489** | **234,330** | **6.3%** |
| | | | | | | |
| **Food Wholesale and Retail** | **31,456*** | **51,046** | **62.3%** | **779,105*** | **655,099** | **-15.9%** |
| | | | | | | |
| **Total Food & Agriculture before Related Sectors** | **57,059** | **86,644** | **51.8%** | **999,594** | **889,429** | **-11.0%** |
| | | | | | | |
| Floricultural/ornamental/turf grass services and retail | 3,025* | 4,515 | 49.3% | 35,338* | 33,393 | -5.5% |
| | | | | | | |
| Net Impact of Ethanol Production | 75 | 223 | 197.3% | 135 | 678 | 400.0% |
| | | | | | | |
| **Total Food and Agriculture** | **60,159** | **91,382** | **51.9%** | **1,035,067** | **923,497** | **-10.8%** |

*Changes in the classification of Floricultural/ornamental/turfgrass retail and other minor adjustments make these figures not directly comparable to the 2006 Report classifications.

# Summary of Economic and Employment Impacts

Michigan's food and agriculture system accounts for a total of almost $91.4 billion in total economic activity and more than 923,000 jobs. The sector generates more than $52.4 billion in direct activity (farming, food processing and manufacturing, wholesaling, retailing, and food service), and almost 618,000 jobs in the same activities.

Given these figures, the importance of the food and agriculture system on the economy becomes evident. To a great extent the health of the Michigan economy is dependent on this sector. The food and agriculture system also adds to the stability of the state's economy. Much of Michigan's economy is based on industries that have strong adverse reactions to economic downturns. Due to the fact that food is a necessity, the food and agriculture system is more resistant to the negative impacts of a recession.

## APPENDIX: Research Methodology

### Overview

The research methodology in this paper is based on that in Professor John N. Ferris' Staff Paper 00-11, *An Analysis of the Importance of Agriculture and the Food Sector to the Michigan Economy*, which was written in May of 2000. In most respects, this paper is an update of Professor Ferris' previous study.

One shortcoming to this study is that different years were used for the analysis. The most recent data available was used to generate the estimates. However, for processing and manufacturing, the most recent available numbers were from the U.S. Economic Census and are based on 2007 figures. Farm employment is based on the 2007 Agriculture Census and is also somewhat dated. Nonetheless, this analysis does give a good general perspective on the size and scope of the food and agriculture system.

### The Farm Sector and Food Manufacturing

The output on farms is a three year average from 2008 through 2010. Due to climate and other factors, farm output can vary widely from year to year; a three year average eliminates some of this variability. The multipliers used to determine the total economic impact of farming are derived from IMPLAN; related industries were subtracted out in order to reduce the potential for double counting.

On farm employment is derived from the U.S. Census of Agriculture data for Michigan. The same adjustments were made for part-time labor and part-time farmers to generate a figure for FTEs.

Food manufacturing output figures come from the 2007 U.S. Economic Census, the employment figures were provided by the Michigan Economic Development Corporation.

### Wholesaling and Retailing

Output for wholesaling and retailing were generated from the USDA Economic Research Service's Food CPI, Prices and Expenditures; Food and Alcoholic Beverages: Total Expenditures historical data series for 2010. These figures for food consumed at home, consumed away from home and alcoholic beverages were multiplied by Michigan's share of the U.S. population to get Michigan's share of total consumption.

Sales per employee was used to estimate the number of employees in food retail. The 2007 Economic Census and County Business Patterns were used for retailing in the ornamental horticulture retail and food services industries.

### Agri-Energy

The estimates for employment related to ethanol production were derived from Dale Swenson's *Model*

*Economic Analyses: An Economic Impact Assessment of an Ethanol Production Facility in Iowa*. The economic impact estimate was based on the value of ethanol produced and the value of DDGS minus the value of the corn that was used to produce the ethanol.

## IMPLAN

IMPLAN is a standard economic impact software package. From direct effects, in the case of this study, sales in the various industries, the total impact on the economy can be estimated. This includes the direct impacts, the indirect impacts which are changes in the inter-industry purchases as the respond to the directly affected industry and induced impacts with reflect changes in households as a result of the activity; in this case agri-food industry activity (IMPLAN, p102).

In order to minimize double counting an IMPLAN run was done for every agriculture commodity, food processing activity, food wholesaling, retailing and food service. The impacts on related industries in the system were then subtracted out.

IMPLAN uses the following assumptions to derive its results: constant returns to scale; no supply constraints; fixed commodity input structure; homogenous sector output, and it assumes the technology used is constant (IMPLAN, p.103).

Constant returns to scale means that if output increases the amounts of the inputs used increase by the same proportion. No supply constraints mean that inputs are unlimited and that output is limited only by the demand for its products. This assumption is not an issue in this study; this is actual output not potential output. Fixed commodity input structure means that firms will not substitute one input for another if input prices change. Homogenous sector output means that the proportions of all the commodities produced by that industry remain the same as output increases or decreases. As a result of these assumptions the results of the economic impact and impact on employment should be considered estimates.

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