

Economic Analysis of Animal Agriculture 2005-2015

MICHIGAN

**A Report for
United Soybean Board**



September 2016



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11107 Aurora Ave

Urbandale, IA 50322

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Contents

Contents	2
Michigan Executive Summary	3
Michigan Economic Impact of Animal Agriculture	4
Michigan Output	5
Michigan Jobs	5
Michigan Earnings	6
Michigan Taxes Paid by Animal Agriculture	6
Michigan Animal Agriculture Soybean Meal Consumption	7
Michigan Animal Unit (AU) Trends	8
Michigan Additional Information and Methodology	12
Michigan Multipliers	13
Appendix	14

Michigan Executive Summary

The use of soybean meal as a key feed ingredient is a moderate part of Michigan's animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Michigan. The success of Michigan animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Michigan during 2015 animal agriculture contributed:

- \$6.7 billion in economic output
- 41,824 jobs
- \$1.5 billion in earnings
- \$374.5 million in income taxes paid at local, state, and federal levels
- \$217.5 million in the form of property taxes

Plus, from 2005-2015 animal agriculture in Michigan has increased economic output by over \$2.4 billion, boosted household earnings by \$545.1 million, contributed 14,737 additional jobs and paid \$134.0 million in additional tax revenues.

Michigan's animal agriculture consumed almost 589.6 thousand tons of soybean meal in 2015. This soybean meal was fed primarily to:

- Dairy Cows (307.8 thousand tons)
- Hogs (130.3 thousand tons)
- Egg-Laying Hens (81.7 thousand tons)

This report examines animal agriculture in Michigan over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Michigan, many opportunities and challenges will arise. It is expected that animal agriculture will continue to be a major contributor to the economic well-being of the people of Michigan and beyond.

Michigan Economic Impact of Animal Agriculture

Animal agriculture is an important part of Michigan's economy. In 2015, Michigan's animal agriculture contributed the following to the economy:

- About \$6.7 billion in economic output
- \$1.5 billion in household earnings
- 41,824 jobs
- \$374.5 million in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Michigan's animal agriculture has:

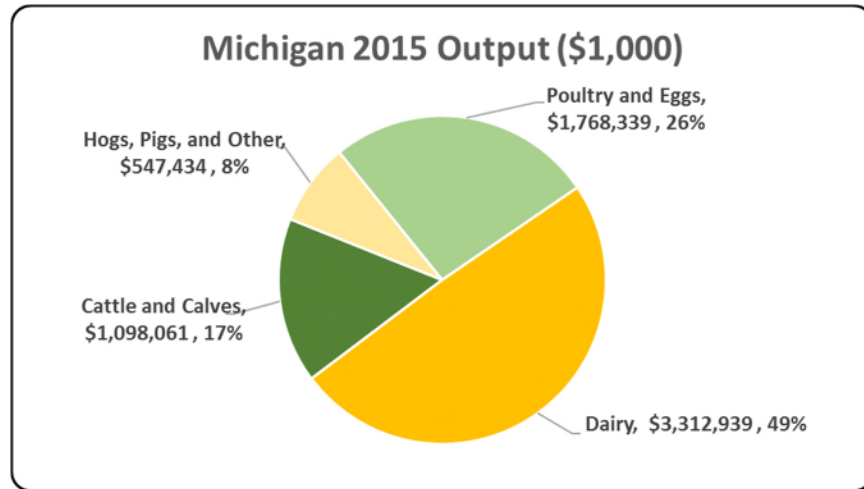
- Increased economic output by \$2.4 billion
- Boosted household earnings by \$545.1 million
- Added 14,737 jobs
- Paid an additional \$134.0 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2015	Change 2005-2015	% Change 2005-2015
Output (\$1,000)	\$ 6,726,773	\$ 2,439,984	56.92%
Earnings (\$1,000)	\$ 1,523,665	\$ 545,100	55.70%
Employment (Jobs)	41,824	14,737	54.41%
Income Taxes Paid (\$1,000)	\$ 374,517	\$ 133,985	55.70%
Property Taxes Paid in 2012 (\$1,000)	\$ 217,503		

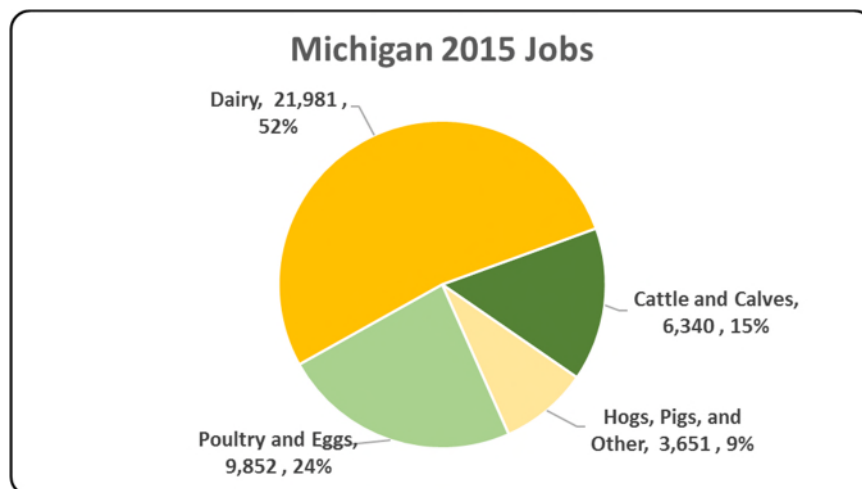
Michigan Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The chart illustrates the impact of animal agriculture to the Michigan economy. Animal agriculture’s impact on Michigan total economic output is about \$6.7 billion.



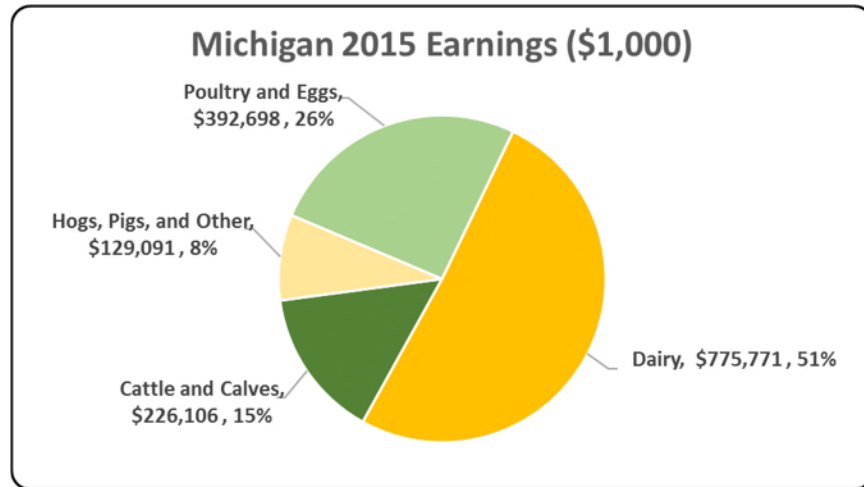
Michigan Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The chart illustrates the contribution to Michigan in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Michigan total jobs, contributing 41,824 jobs within and outside of animal agriculture.



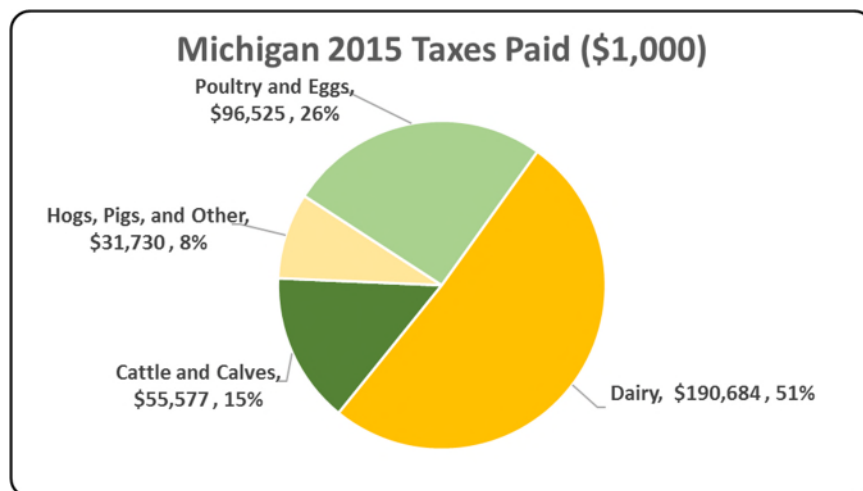
Michigan Earnings

Earnings includes wages and salaries plus proprietors' income, which is the net earnings of sole-proprietors and partnerships. The chart illustrates the impact of animal agriculture to the Michigan economy in terms of earnings. Michigan's animal agriculture contributed about \$1.5 billion to household earnings in 2015.



Michigan Taxes Paid by Animal Agriculture

Michigan's animal agriculture is also a significant source of tax revenue. In 2015, the state's animal agriculture industry paid about \$374.5 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$217.5 million in property taxes paid by all of Michigan agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



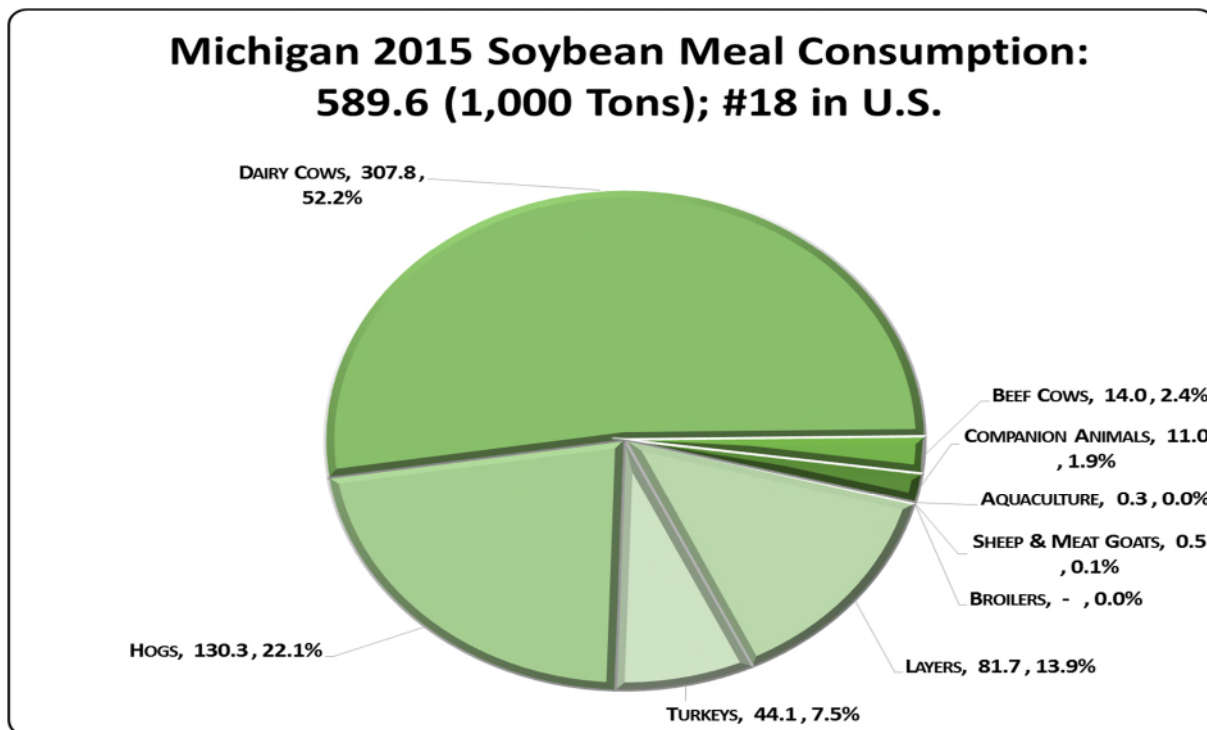
Michigan Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation’s top nutritionists and researchers from both private industry and public institutions, “bottom up” estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2014-15 soybean marketing year by up to sixteen specific animal species has been estimated.

Michigan’s animal agriculture consumed almost 589.6 thousand tons of soybean meal in 2015, placing the state as #18 in the nation in terms of soybean meal consumption (see figure below). The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Dairy Cows (307.8 thousand tons)
- Hogs (103.3 thousand tons)
- Egg-Laying Hens (81.7 thousand tons)

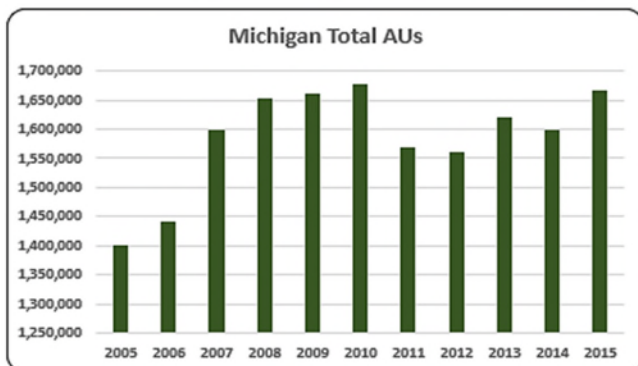
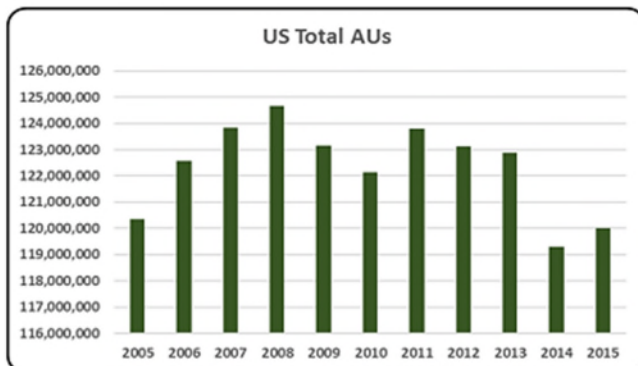


Michigan Animal Unit (AU) Trends

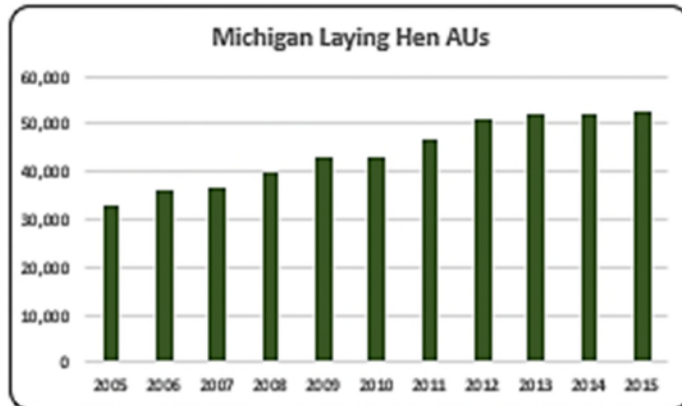
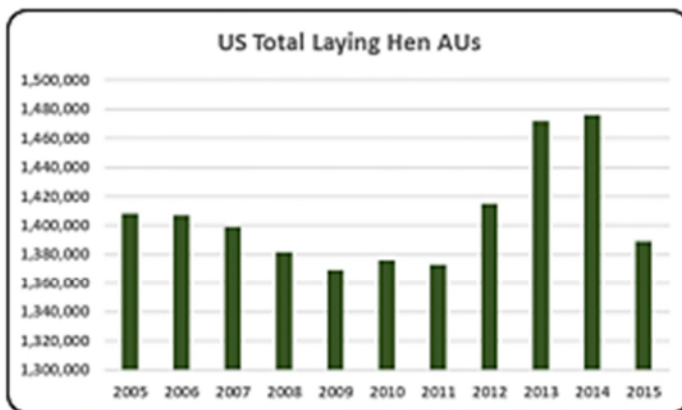
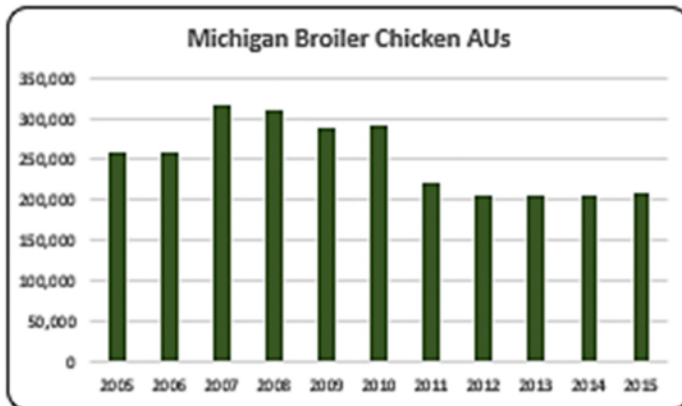
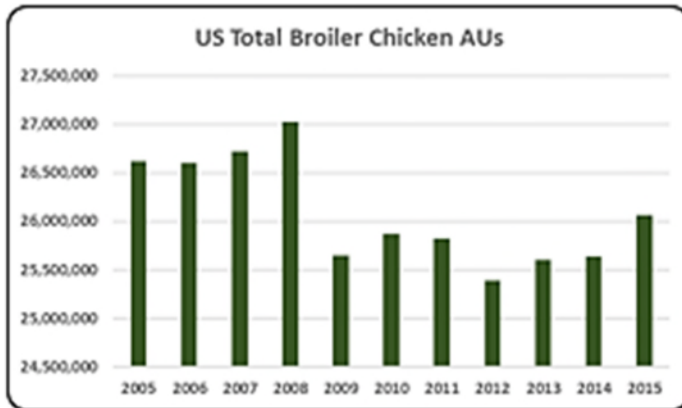
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Michigan. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Michigan and to give perspective on Michigan’s contribution to the nation’s animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

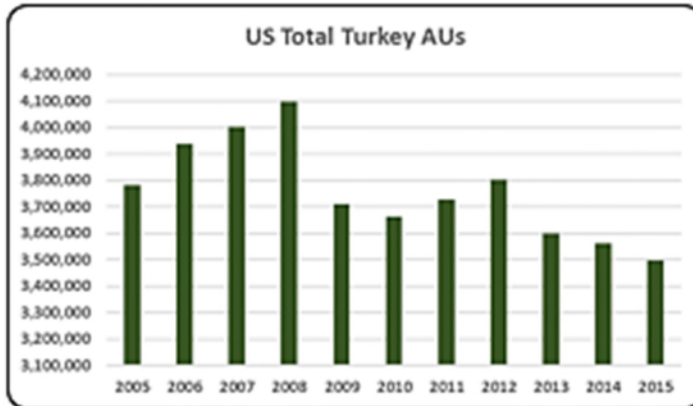
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Michigan, the largest three segments of animal agriculture in terms of AUs during 2015 were: Dairy Cows (564,200 AUs), Beef Cows (400,050 AUs), and Hogs (363,600 AUs). Total animal units in Michigan during 2015 were 1.67 million AUs.



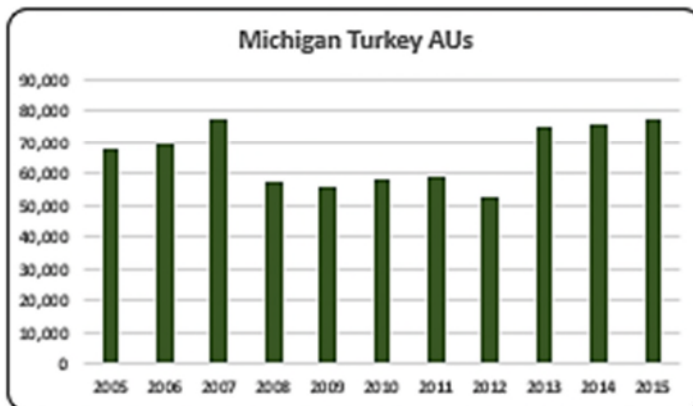
- Overall U.S. total AUs have varied from 2005 to 2015. In 2014 AUs were at an all-time low reflecting, in part, the impact of severe weather on cattle production in some parts of country. During the 2005-15 time period, total AUs in the nation peaked in 2008.
- About 1.39% (1.67 million) of all AUs in the U.S. in 2015 were contributed by Michigan. The average total for Michigan in this decade was 1.59 million AUs.



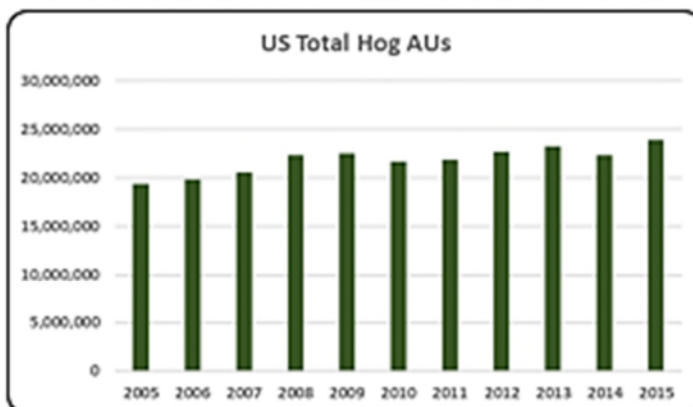
- U.S. broiler production is clustered in a number of states, with Georgia being the largest producer. On average from 2005 to 2015, broiler chicken AUs were about 26.0 million. In 2015, AUs rebounded 3% from the low AUs numbers in 2012 (25.4 million AUs).
- Michigan’s broiler numbers began declining in 2010. Broiler AUs in 2015 were at 208,414.
- On average, the layer AUs during 2005-2015 were 1.4 million. In 2015 layer AUs were 1.3 million, down 6% from the 2014 decade high (1.4 million AUs). This drastic decrease in 2015 was due to the losses in major egg laying states from the avian influenza outbreak.
- Michigan’s egg sector substantially increased from 33,040 layer AUs in 2005 to 52,506 layer AUs in 2015.



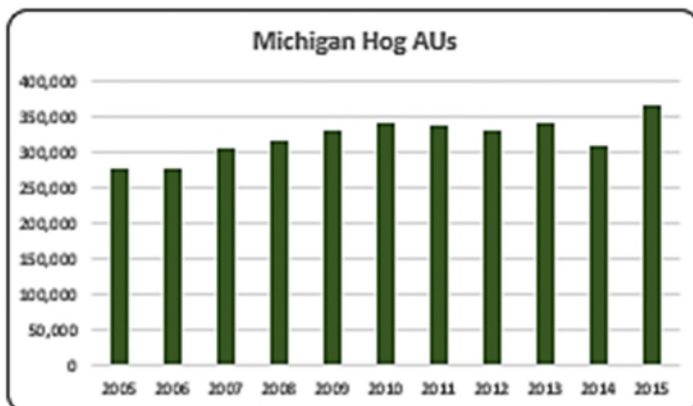
- In 2015 turkey AUs were the lowest of the decade at 3.5 million, decreasing 15% compared to 2008 (4.1 million turkey AUs) the largest turkey AUs of the decade. The most recent contributor to this decline has been avian influenza.



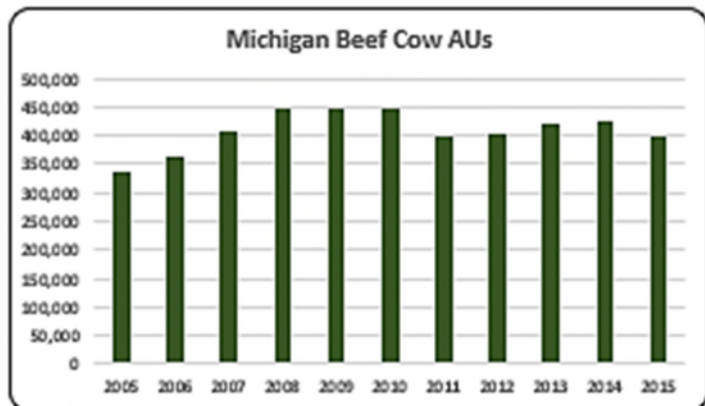
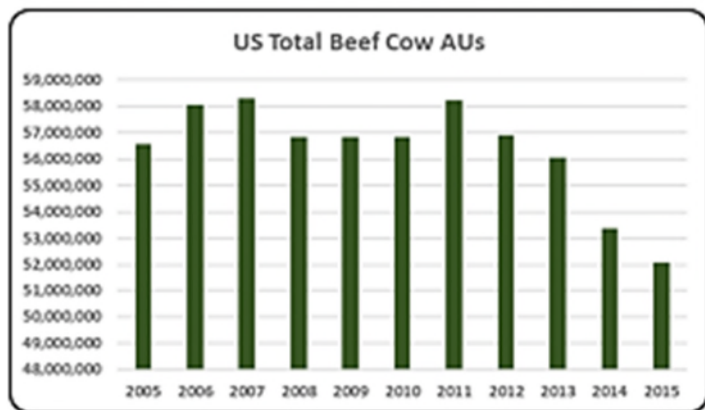
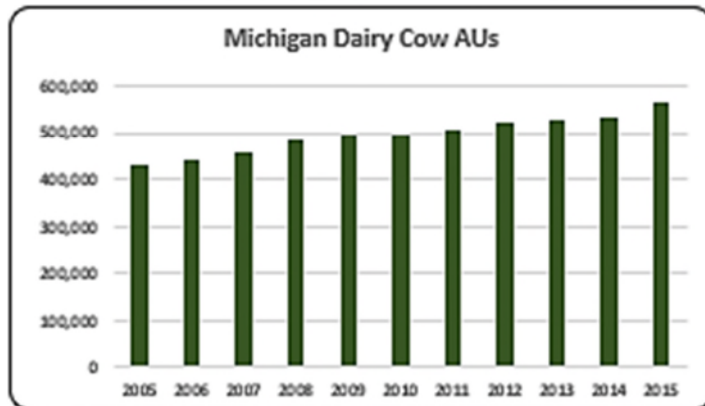
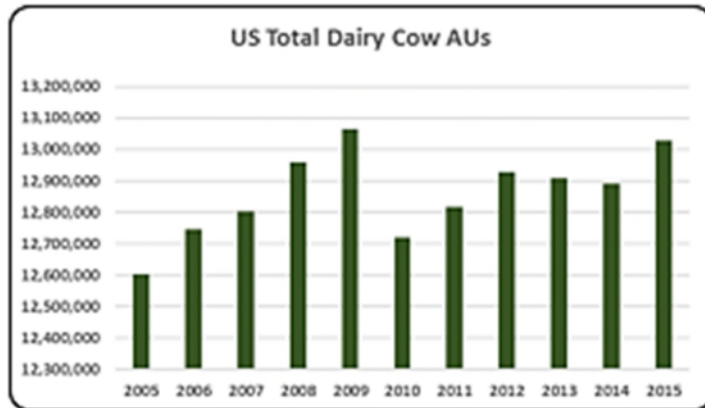
- Turkey production in Michigan declined in the middle of the decade but has recovered the past few years, the average of this decade is 66,013 turkey AUs.



- On average from 2005 to 2015, hog AUs were about 21.8 million. Hog AUs in 2015 increased 24% to 23.9 million AUs compared to the decade low in 2005 (19.4 million AUs). Despite the fluctuation in AUs, the pork supply was relatively stable.



- Michigan’s hog sector represented about 21.8% (363,600) of all the state’s animal units in 2015.



- From 2005 to 2015 dairy cow AUs averaged 12.8 million. In 2015, dairy cow AUs (13.0 million) finally reached near the 2009 high of 13.1 million AUs. Milk supplies have steadily risen.

- Dairy cows accounted for 33.9% (564,200) of Michigan’s animal units in 2015 and represented 4.3% of national dairy cow AUs.

- From 2005 to 2015 beef cow AUs averaged 56.3 million. In 2015 beef cow AUs decreased to 52.0 million, the lowest of the decade. States that traditionally raise a lot of cattle like Texas and Oklahoma continue to work through the lingering effects of the drought of the last several years.

- There were 400,050 beef cow AUs in 2015 representing 24.0% of animal units in the state of Michigan.

Michigan Additional Information and Methodology

Animal agriculture is an important part of Michigan's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

- Economic impact of animal agriculture to local (state) economies during the 2005-2015 time period
- Soybean meal usage by animal species during the 2014/15 soybean marketing year
- Animal Unit (AU) trends from 2005-2015

Given the long-term presence of animal agriculture in Michigan, of interest is the degree to which the industry impacts the Michigan economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Michigan animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Michigan's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2005-2015 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Michigan which have occurred. As shown in this state report, Michigan has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Michigan. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2014-15 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.257.6077.

Michigan Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Michigan’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Michigan, \$1.58 to \$1.99 million in total economic activity, \$0.37 to \$0.46 in household wages and 10 to 13 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.782	\$ 0.367	10.3
	Hogs, Pigs, and Other	\$ 1.584	\$ 0.374	10.6
	Poultry and Eggs	\$ 1.989	\$ 0.442	11.1
	Dairy	\$ 1.947	\$ 0.456	12.9

Appendix

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Animal Units (AUs)	Beef Cattle AUs	335,550	363,450	408,300	447,660	447,660	447,660	398,700	401,400	421,950	427,050	400,050
	Hog and Pig AUs	278,100	275,400	303,600	314,550	330,750	340,350	337,800	330,150	339,450	306,600	363,600
	Broiler AUs	257,813	256,073	315,782	310,857	289,024	292,912	220,712	205,045	204,329	203,169	208,414
	Turkey AUs	67,856	69,380	77,006	57,103	55,934	58,262	59,301	52,682	75,311	75,982	77,320
	Egg Layer AUs	33,040	36,408	36,688	40,016	42,928	43,076	46,612	51,218	51,903	52,341	52,506
	Dairy AUs	429,800	439,600	457,800	481,600	494,200	495,600	505,400	519,400	527,800	533,400	564,200
	Total Animal Units	1,402,160	1,440,311	1,599,176	1,651,786	1,660,496	1,677,860	1,568,525	1,559,895	1,620,743	1,598,542	1,666,090
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 259,915	\$ 266,622	\$ 314,853	\$ 334,715	\$ 284,066	\$ 348,948	\$ 418,199	\$ 464,842	\$ 518,536	\$ 630,490	\$ 616,092
	Hogs and Pigs (\$1,000)	\$ 219,390	\$ 201,668	\$ 223,478	\$ 242,596	\$ 221,066	\$ 307,177	\$ 403,124	\$ 349,236	\$ 377,604	\$ 393,428	\$ 339,063
	Broilers (\$1,000)	\$ 216,650	\$ 167,837	\$ 243,702	\$ 248,976	\$ 214,813	\$ 224,486	\$ 196,536	\$ 204,310	\$ 248,948	\$ 261,165	\$ 227,844
	Turkeys (\$1,000)	\$ 66,838	\$ 81,375	\$ 87,385	\$ 70,127	\$ 63,869	\$ 80,368	\$ 89,388	\$ 86,282	\$ 132,727	\$ 151,007	\$ 166,046
	Eggs (\$1,000)	\$ 61,870	\$ 73,097	\$ 155,371	\$ 217,526	\$ 156,701	\$ 170,763	\$ 198,496	\$ 239,603	\$ 271,400	\$ 325,518	\$ 495,170
	Milk (\$1,000)	\$ 1,039,500	\$ 946,295	\$ 1,502,125	\$ 1,490,496	\$ 1,067,712	\$ 1,416,610	\$ 1,780,380	\$ 1,699,299	\$ 1,878,620	\$ 2,315,769	\$ 1,701,998
	Other	\$ 7,095	\$ 5,623	\$ 6,367	\$ 6,099	\$ 6,394	\$ 6,835	\$ 6,476	\$ 6,498	\$ 6,519	\$ 6,540	\$ 6,561
	Sheep and Lambs (\$1,000)	\$ 4,697	\$ 3,334	\$ 4,186	\$ 4,027	\$ 4,430	\$ 4,980	\$ 4,730	\$ 4,860	\$ 4,990	\$ 5,120	\$ 5,249
	Aquaculture (\$1,000)	\$ 2,398	\$ 2,289	\$ 2,181	\$ 2,072	\$ 1,964	\$ 1,855	\$ 1,746	\$ 1,638	\$ 1,529	\$ 1,420	\$ 1,312
	Total (\$1,000)	\$ 1,871,257	\$ 1,742,517	\$ 2,533,281	\$ 2,610,534	\$ 2,014,620	\$ 2,555,188	\$ 3,092,600	\$ 3,050,070	\$ 3,434,354	\$ 4,083,917	\$ 3,552,774

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	4,765	4,115	5,253	6,042	
	Cattle feedlots (112112)	1,791	2,232	1,481	344	
	Dairy cattle and milk production (11212)	3,177	2,489	1,971	1,672	
	Hog and pig farming (1122)	1,178	838	1,017	686	
	Poultry and egg production (1123)	400	604	1,635	1,146	
	Sheep and goat farming (1124)	681	942	1,241	1,419	
	Animal aquaculture and other animal production (1125,1129)	4,387	7,215	6,829	6,347	
Value of Sales (\$1,000)	Cattle and Calves	284,374	298,517	449,371	603,653	
	Hogs and Pigs	227,452	200,027	357,495	482,177	
	Poultry and Eggs	169,246	146,700	258,994	472,218	
	Milk and Other Dairy Products	646,771	697,920	1,285,571	1,540,609	
	Aquaculture	2,028	3,316	5,721	3,982	
	Other (calculated)	50,312	63,327	66,139	39,877	
	Total	1,380,183	1,409,807	2,423,291	3,142,516	
Input Purchases	Livestock and poultry purchased	(Farms)	11,086	11,647	11,151	12,053
		\$1,000	175,474	196,578	308,543	326,573
	Breeding livestock purchased	(Farms)	<i>n/a</i>	5,274	4,442	4,980
		\$1,000	<i>n/a</i>	31,345	68,144	79,605
	Other livestock and poultry purchased	(Farms)	<i>n/a</i>	7,934	8,184	8,785
		\$1,000	<i>n/a</i>	165,233	240,399	246,968
	Feed purchased	(Farms)	17,888	24,297	22,314	24,389
	\$1,000	414,770	390,264	740,126	1,240,433	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2015 Animal Agriculture	Cattle and Calves	\$ 1,098,061	\$ 226,106	6,340	\$ 55,577
	Hogs, Pigs, and Other	\$ 547,434	\$ 129,091	3,651	\$ 31,730
	Poultry and Eggs	\$ 1,768,339	\$ 392,698	9,852	\$ 96,525
	Dairy	\$ 3,312,939	\$ 775,771	21,981	\$ 190,684
	Total	\$ 6,726,773	\$ 1,523,665	41,824	\$ 374,517
Change from 2005 to 2015	Cattle and Calves	\$ 535,863	\$ 110,341	3,094	\$ 27,122
	Hogs, Pigs, and Other	\$ 112,078	\$ 26,429	748	\$ 6,496
	Poultry and Eggs	\$ 934,696	\$ 207,569	5,207	\$ 51,021
	Dairy	\$ 857,347	\$ 200,760	5,688	\$ 49,347
	Total	\$ 2,439,984	\$ 545,100	14,737	\$ 133,985
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.782	\$ 0.367	10.3	
	Hogs, Pigs, and Other	\$ 1.584	\$ 0.374	10.6	
	Poultry and Eggs	\$ 1.989	\$ 0.442	11.1	
	Dairy	\$ 1.947	\$ 0.456	12.9	
Tax Rates	Federal effective income tax rate				12.7%
	Federal Social Security tax rate				7.7%
	State Effective Rate				4.3%
	Total				24.6%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax Policy Institute and Tax Foundation.