

Economic Analysis of Animal Agriculture 2005-2015

OHIO

**A Report for
United Soybean Board**



September 2016



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Ohio Executive Summary

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

- \$9.6 billion in economic output
- 56,072 jobs
- \$2.1 billion in earnings
- \$513.0 million in income taxes paid at local, state, and federal levels
- \$235.7 million in the form of property taxes

Plus, from 2005-2015 animal agriculture in Ohio has increased economic output by about \$4.2 billion, boosted household earnings by \$902.7 million, contributed 23,441 additional jobs and paid \$220.6 million in additional tax revenues.

Ohio's animal agriculture consumed almost 810.8 thousand tons of soybean meal in 2015. This soybean meal was fed primarily to:

- Hogs (232.8 thousand tons)
- Dairy Cows (203.8 thousand tons)
- Egg-Laying Hens (203.3 thousand tons)

This report examines animal agriculture in Ohio 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 Ohio, 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 Ohio and beyond.

Ohio Economic Impact of Animal Agriculture

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

- About \$9.6 billion in economic output
- \$2.1 billion in household earnings
- 56,072 jobs
- \$513.0 million in income taxes

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

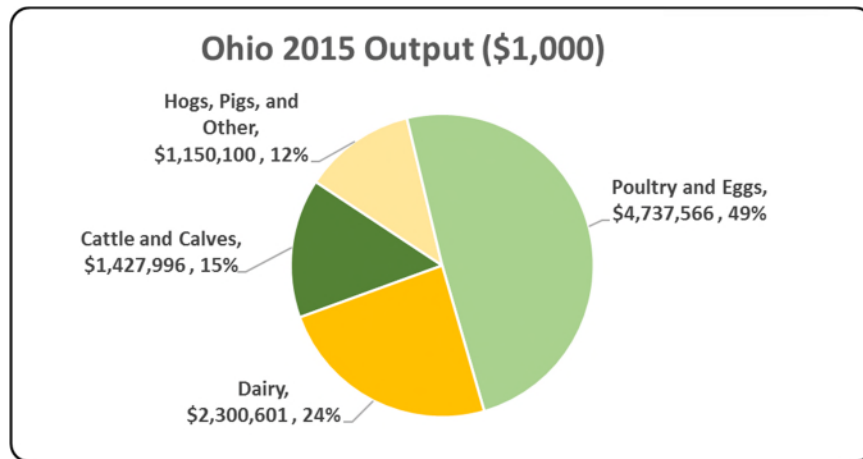
- Increased economic output by \$4.2 billion
- Boosted household earnings by \$902.7 million
- Added 23,441 jobs
- Paid an additional \$220.6 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2015	Change 2005-2015	% Change 2005-2015
Output (\$1,000)	\$ 9,616,263	\$ 4,184,157	77.03%
Earnings (\$1,000)	\$ 2,098,957	\$ 902,743	75.47%
Employment (Jobs)	56,072	23,441	71.83%
Income Taxes Paid (\$1,000)	\$ 512,964	\$ 220,621	75.47%
Property Taxes Paid in 2012 (\$1,000)	\$ 235,741		

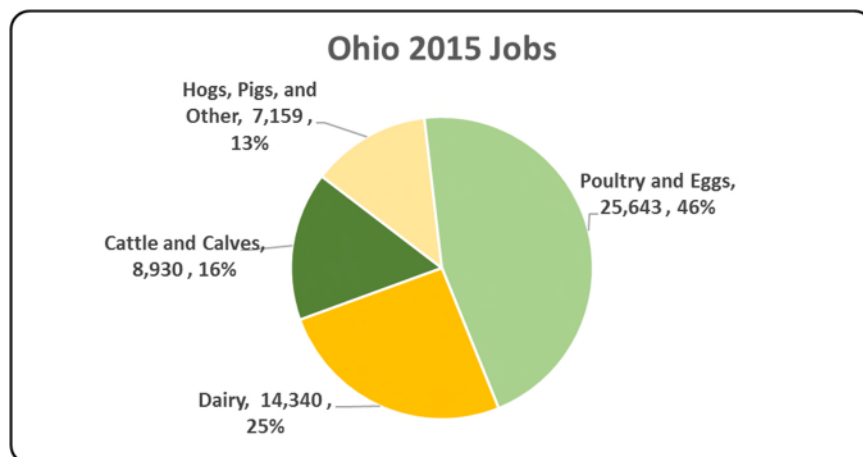
Ohio Output

“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 Ohio economy. Animal agriculture’s impact on Ohio total economic output is about \$9.6 billion.



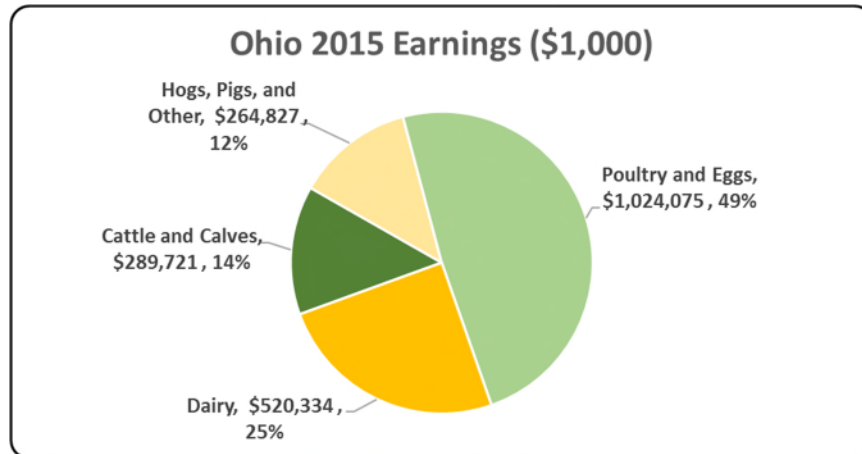
Ohio Jobs

“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 Ohio in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Ohio total jobs, contributing 56,072 jobs within and outside of animal agriculture.



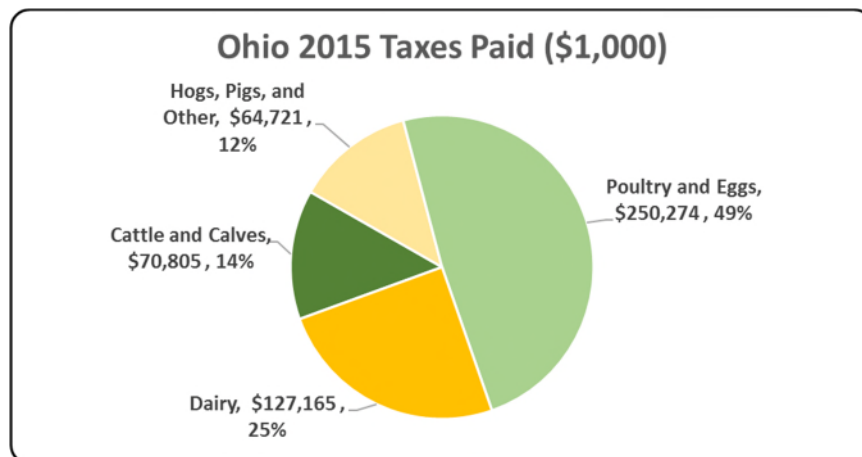
Ohio Earnings

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 Ohio economy in terms of earnings. Ohio’s animal agriculture contributed about \$2.1 billion to household earnings in 2015.



Ohio Taxes Paid by Animal Agriculture

Ohio’s animal agriculture is also a significant source of tax revenue. In 2015, the state’s animal agriculture industry paid about \$513.0 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$235.7 million in property taxes paid by all of Ohio agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



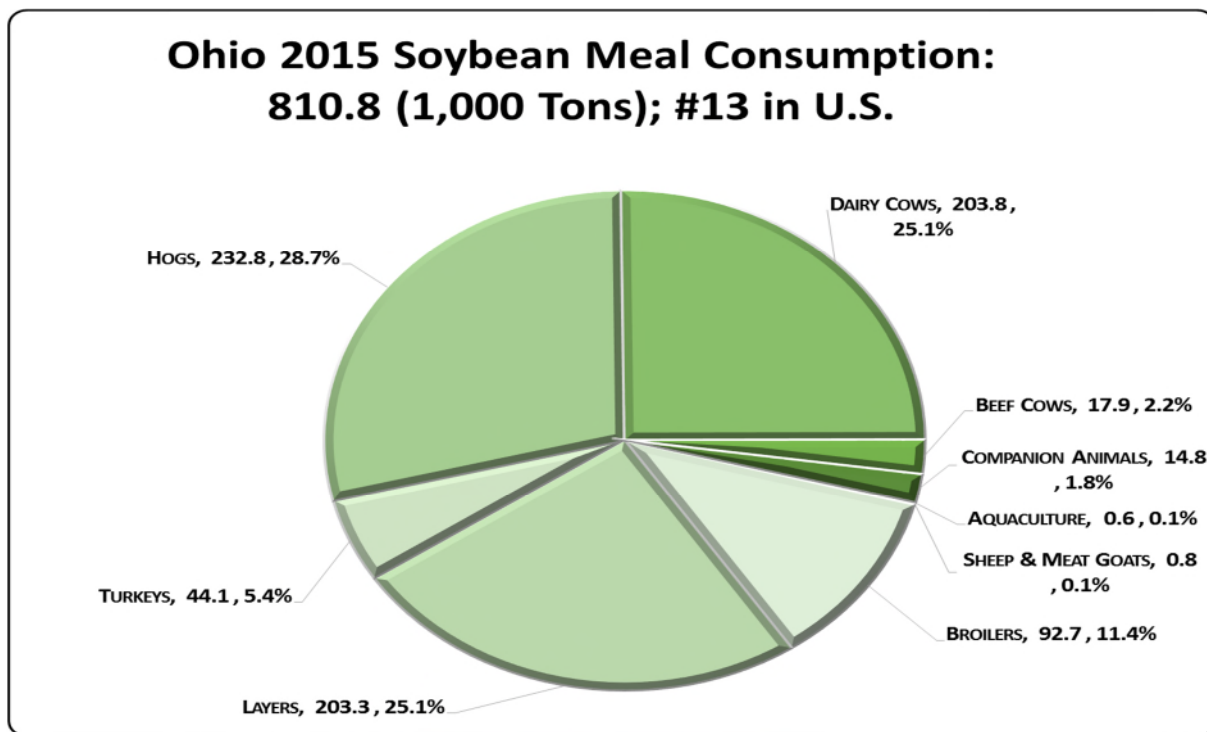
Ohio Animal Agriculture Soybean Meal Consumption

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.

Ohio’s animal agriculture consumed almost 810.8 thousand tons of soybean meal in 2015, placing the state as #13 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:

- Hogs (232.8 thousand tons)
- Dairy Cows (203.8 thousand tons)
- Egg-Laying Hens (203.3 thousand tons)

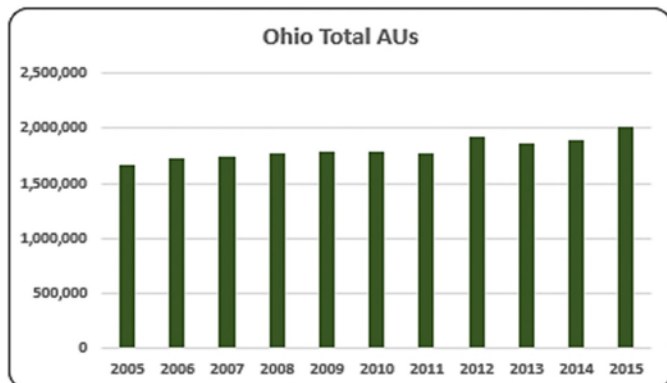
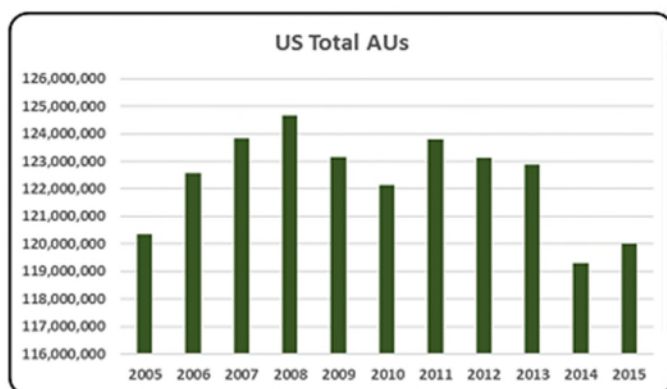


Ohio Animal Unit (AU) Trends

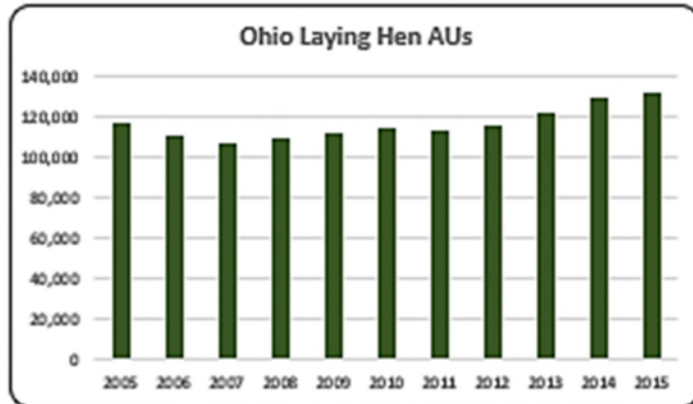
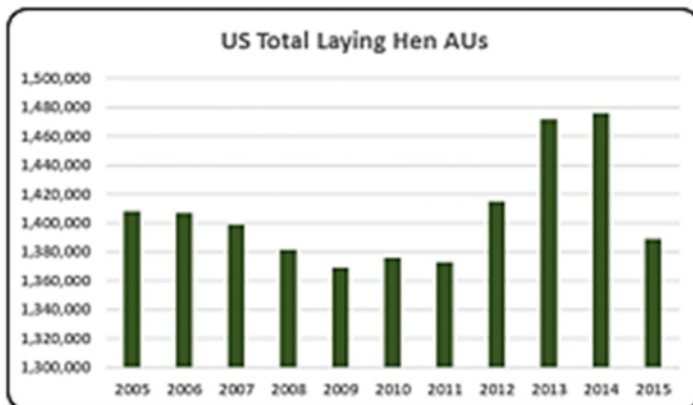
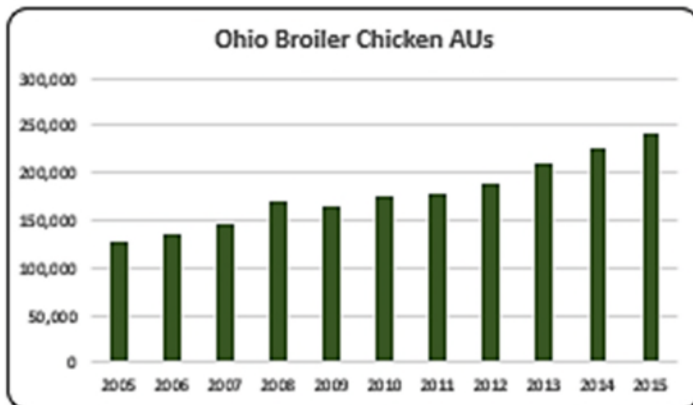
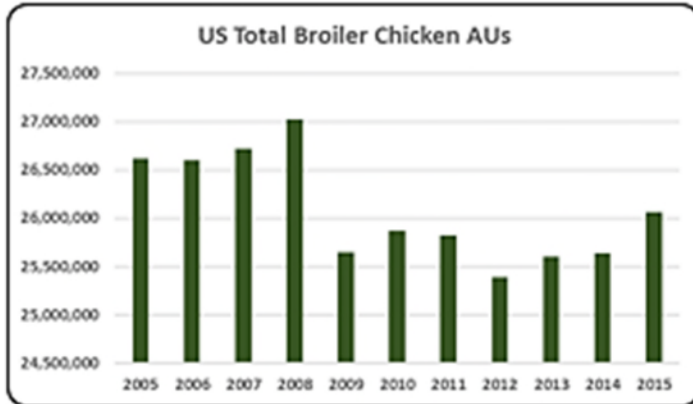
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Ohio. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. 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 Ohio and to give perspective on Ohio'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.

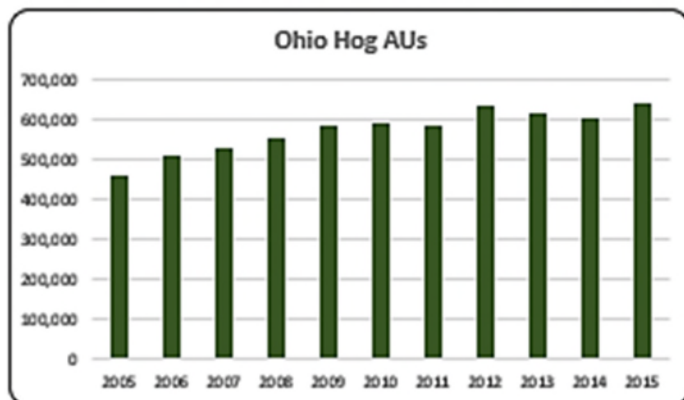
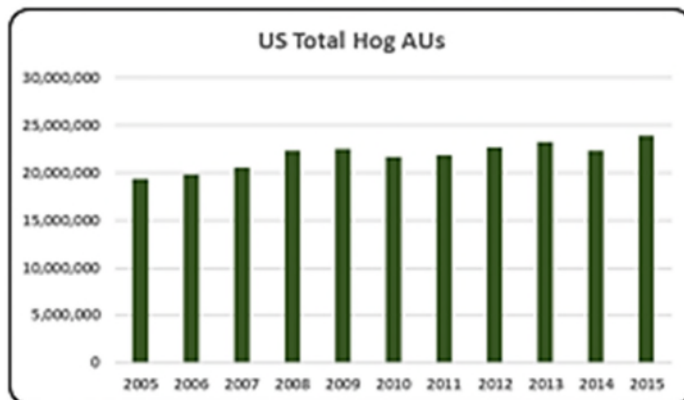
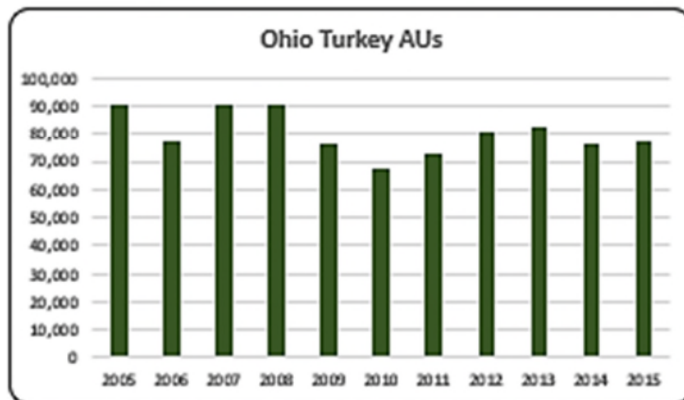
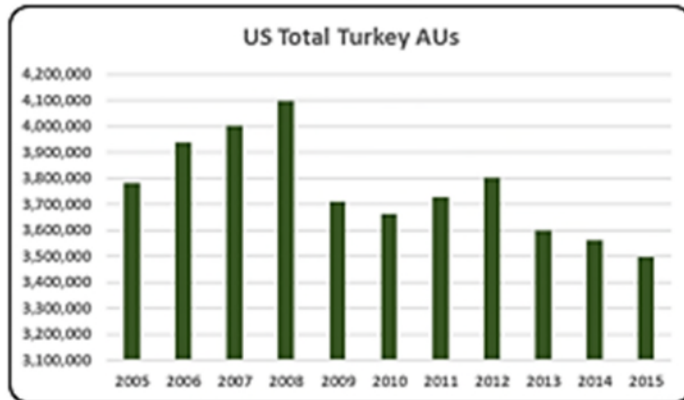
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Ohio, the largest three segments of animal agriculture in terms of AUs during 2015 were: Hogs (637,500 AUs), Beef Cows (544,050 AUs), and Dairy Cows (375,200 AUs). Total animal units in Ohio during 2015 were 2.0 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 1.7% (2.0 million) of all AUs in the U.S. were in Ohio in 2015. Layer production represented 6.54% (131,249 layer AUs) of all AUs in the state and 9.45% of all layer AUs in the U.S.



- 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).
- There were 241,648 broiler AUs in Ohio in 2015. Broiler production climbed 90% from 2005 to 2015.
- 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.
- In 2015 Ohio was the second largest producer of eggs in the U.S. supplying 9.45% of the country's total egg production. There were 131,249 layer AUs in 2015. Layer production has grown 12% since 2005.

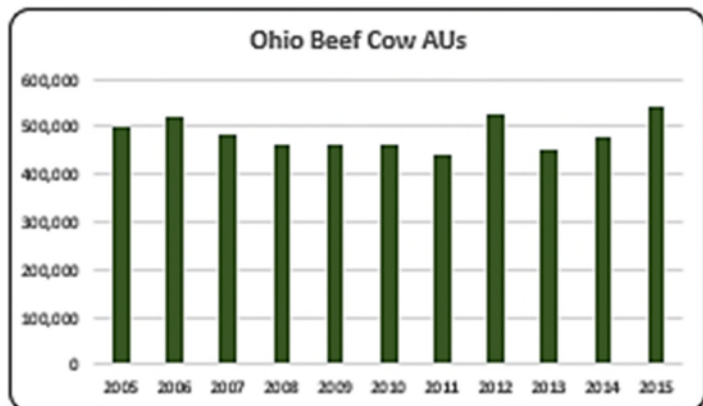
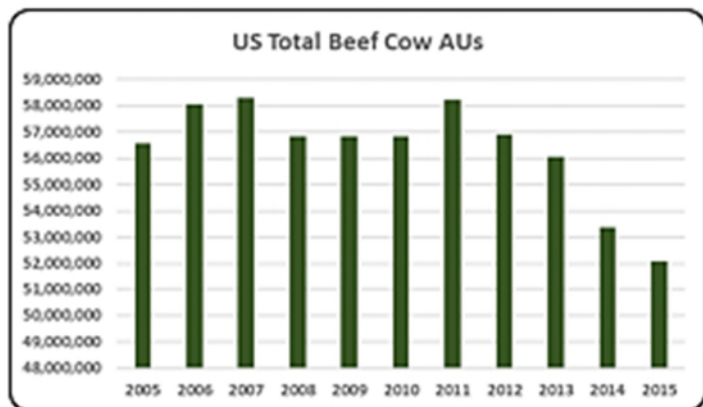
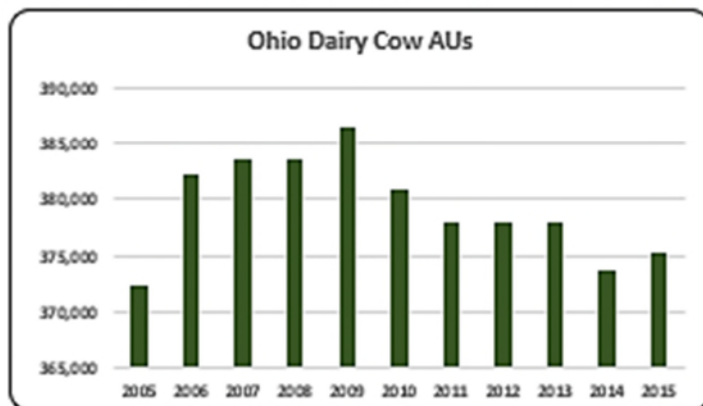
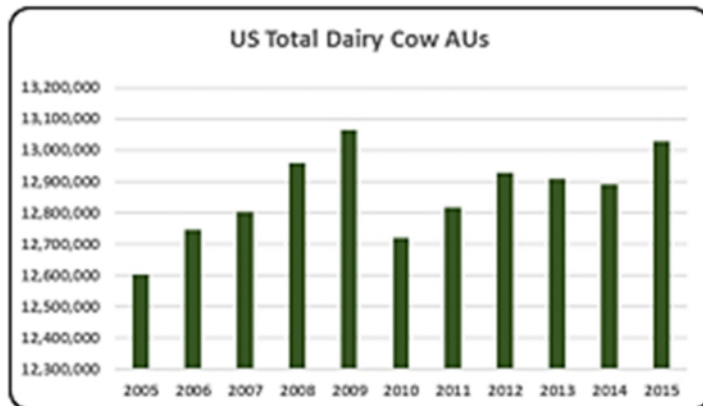


- In 2015 turkey AUs were the lowest of the decade at 3.5 million, decreasing 15% compared to 2008 (4.1 million turkey AUs) the largest turkey AUs of the decade. The most recent contributor to this decline has been avian influenza.

- The average number of turkey AUs in Ohio during the last decade was 77,320. Turkey production declined 15% from 90,475 turkey AUs in 2005 to 77,320 turkey AUs in 2015.

- 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.

- Pork production is the largest animal production in Ohio. In 2015, 31.76% (637,500 hog AUs) contributed to the total AUs for the state.



- 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.
- Eighteen percent (375,200 dairy cow AUs) of AUs in Ohio in 2015 were dairy cows. 2009 was a record high (386,400 AUs) for the dairy cow industry in Ohio.
- 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.
- The average number of beef cow AUs was 484,705 from 2005 to 2015. Beef cow AUs contributed to 27% (544,050) of AUs in the state.

Ohio Additional Information and Methodology

Animal agriculture is an important part of Ohio'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 Ohio, of interest is the degree to which the industry impacts the Ohio economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Ohio 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 Ohio'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 Ohio which have occurred. As shown in this state report, Ohio 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 Ohio. 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.

Ohio 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 Ohio’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 Ohio, \$1.81 to \$2.92 million in total economic activity, \$0.41 to \$0.63 in household wages and 11 to 16 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.003	\$ 0.406	12.5
	Hogs, Pigs, and Other	\$ 1.813	\$ 0.417	11.3
	Poultry and Eggs	\$ 2.918	\$ 0.631	15.8
	Dairy	\$ 2.340	\$ 0.529	14.6

Appendix

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Animal Units (AUs)	Beef Cattle AUs	499,050	523,500	481,200	461,400	461,400	461,400	439,800	529,050	452,100	478,800	544,050
	Hog and Pig AUs	459,750	505,500	525,150	554,250	580,650	589,200	584,100	633,150	615,600	600,450	637,500
	Broiler AUs	126,994	134,326	146,465	169,544	165,952	176,568	179,070	189,966	209,794	227,218	241,648
	Turkey AUs	90,475	76,922	90,595	90,583	76,197	67,292	73,034	80,343	82,552	75,982	77,320
	Egg Layer AUs	116,868	110,176	107,000	109,624	111,108	114,200	113,436	115,082	121,312	129,183	131,249
	Dairy AUs	372,400	382,200	383,600	383,600	386,400	380,800	378,000	378,000	378,000	373,800	375,200
	Total Animal Units	1,665,537	1,732,623	1,734,010	1,769,001	1,781,706	1,789,460	1,767,440	1,925,591	1,859,359	1,885,433	2,006,967
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 369,900	\$ 374,089	\$ 380,827	\$ 371,612	\$ 303,704	\$ 380,804	\$ 411,199	\$ 522,424	\$ 495,967	\$ 611,561	\$ 713,071
	Hogs and Pigs (\$1,000)	\$ 393,142	\$ 383,445	\$ 390,400	\$ 420,245	\$ 392,245	\$ 553,136	\$ 695,683	\$ 671,567	\$ 720,787	\$ 767,231	\$ 618,198
	Broilers (\$1,000)	\$ 100,496	\$ 87,012	\$ 117,777	\$ 150,788	\$ 154,649	\$ 181,618	\$ 172,355	\$ 189,600	\$ 245,714	\$ 274,483	\$ 242,208
	Turkeys (\$1,000)	\$ 97,506	\$ 86,906	\$ 103,626	\$ 134,142	\$ 100,693	\$ 114,684	\$ 131,814	\$ 150,686	\$ 146,926	\$ 153,630	\$ 169,417
	Eggs (\$1,000)	\$ 228,182	\$ 287,198	\$ 483,441	\$ 585,477	\$ 403,793	\$ 427,361	\$ 486,185	\$ 523,315	\$ 587,562	\$ 772,430	\$ 1,211,830
	Milk (\$1,000)	\$ 749,394	\$ 670,680	\$ 991,020	\$ 1,011,595	\$ 732,072	\$ 938,060	\$ 1,116,248	\$ 1,038,870	\$ 1,154,976	\$ 1,334,550	\$ 983,247
	Other	\$ 14,055	\$ 13,973	\$ 12,807	\$ 13,844	\$ 13,898	\$ 15,932	\$ 15,104	\$ 15,396	\$ 15,687	\$ 15,978	\$ 16,270
	Sheep and Lambs (\$1,000)	\$ 10,870	\$ 10,591	\$ 9,229	\$ 10,069	\$ 9,926	\$ 11,764	\$ 10,740	\$ 10,834	\$ 10,929	\$ 11,024	\$ 11,119
	Aquaculture (\$1,000)	\$ 3,185	\$ 3,382	\$ 3,578	\$ 3,775	\$ 3,972	\$ 4,168	\$ 4,365	\$ 4,561	\$ 4,758	\$ 4,955	\$ 5,151
	Total (\$1,000)	\$ 1,952,675	\$ 1,903,303	\$ 2,479,898	\$ 2,687,703	\$ 2,101,054	\$ 2,611,595	\$ 3,028,589	\$ 3,111,858	\$ 3,367,619	\$ 3,929,863	\$ 3,954,241

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,951	10,526	12,297	11,445	
	Cattle feedlots (112112)	2,793	4,191	1,890	548	
	Dairy cattle and milk production (11212)	3,826	3,771	2,955	2,850	
	Hog and pig farming (1122)	2,456	1,781	1,594	1,170	
	Poultry and egg production (1123)	828	1,000	1,650	1,472	
	Sheep and goat farming (1124)	1,292	1,932	2,227	2,188	
	Animal aquaculture and other animal production (1125,1129)	4,137	9,357	7,195	8,071	
Value of Sales (\$1,000)	Cattle and Calves	360,769	408,242	565,746	689,655	
	Hogs and Pigs	363,586	322,687	571,685	788,761	
	Poultry and Eggs	575,438	604,808	883,301	946,592	
	Milk and Other Dairy Products	505,128	551,877	861,632	938,266	
	Aquaculture	1,788	3,338	6,582	3,875	
	Other (calculated)	66,720	67,702	71,544	51,921	
	Total	1,873,429	1,958,654	2,960,490	3,419,070	
Input Purchases	Livestock and poultry purchased	(Farms)	18,692	19,791	16,523	19,332
		\$1,000	267,858	269,910	538,127	473,494
	Breeding livestock purchased	(Farms)	n/a	9,275	7,668	9,355
		\$1,000	n/a	37,335	78,925	102,128
	Other livestock and poultry purchased	(Farms)	n/a	13,139	11,055	12,880
		\$1,000	n/a	232,575	459,202	371,366
	Feed purchased	(Farms)	31,975	40,506	34,423	38,782
	\$1,000	713,397	648,768	959,439	1,521,609	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2015 Animal Agriculture	Cattle and Calves	\$ 1,427,996	\$ 289,721	8,930	\$ 70,805
	Hogs, Pigs, and Other	\$ 1,150,100	\$ 264,827	7,159	\$ 64,721
	Poultry and Eggs	\$ 4,737,566	\$ 1,024,075	25,643	\$ 250,274
	Dairy	\$ 2,300,601	\$ 520,334	14,340	\$ 127,165
	Total	\$ 9,616,263	\$ 2,098,957	56,072	\$ 512,964
Change from 2005 to 2015	Cattle and Calves	\$ 529,004	\$ 107,328	3,308	\$ 26,230
	Hogs, Pigs, and Other	\$ 254,307	\$ 58,558	1,583	\$ 14,311
	Poultry and Eggs	\$ 3,228,219	\$ 697,814	17,474	\$ 170,539
	Dairy	\$ 172,628	\$ 39,044	1,076	\$ 9,542
	Total	\$ 4,184,157	\$ 902,743	23,441	\$ 220,621
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.003	\$ 0.406	12.5	
	Hogs, Pigs, and Other	\$ 1.813	\$ 0.417	11.3	
	Poultry and Eggs	\$ 2.918	\$ 0.631	15.8	
	Dairy	\$ 2.340	\$ 0.529	14.6	
Tax Rates	Federal effective income tax rate				12.7%
	Federal Social Security tax rate				7.7%
	State Effective Rate				4.1%
	Total				24.4%

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.