

Economic Analysis of Animal Agriculture 2005-2015

MINNESOTA

**A Report for
United Soybean Board**



September 2016



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Minnesota Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Minnesota'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 Minnesota. The success of Minnesota animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Minnesota during 2015 animal agriculture contributed:

- \$16.6 billion in economic output
- 76,575 jobs
- \$3.6 billion in earnings
- \$997.8 million in income taxes paid at local, state, and federal levels
- \$340.7 million in the form of property taxes

Plus, from 2005-2015 animal agriculture in Minnesota has increased economic output by over \$3.9 billion, boosted household earnings by \$834.7 million, contributed 17,493 additional jobs and paid \$228.5 million in additional tax revenues.

Minnesota's animal agriculture consumed almost 1.7 million tons of soybean meal in 2015. This soybean meal was fed primarily to:

- Hogs (945.7 thousand tons)
- Turkeys (347.5 thousand tons)
- Dairy Cows (175.8 thousand tons)

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

Minnesota Economic Impact of Animal Agriculture

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

- About \$16.6 billion in economic output
- \$3.6 billion in household earnings
- 76,575 jobs
- \$997.8 million in income taxes

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

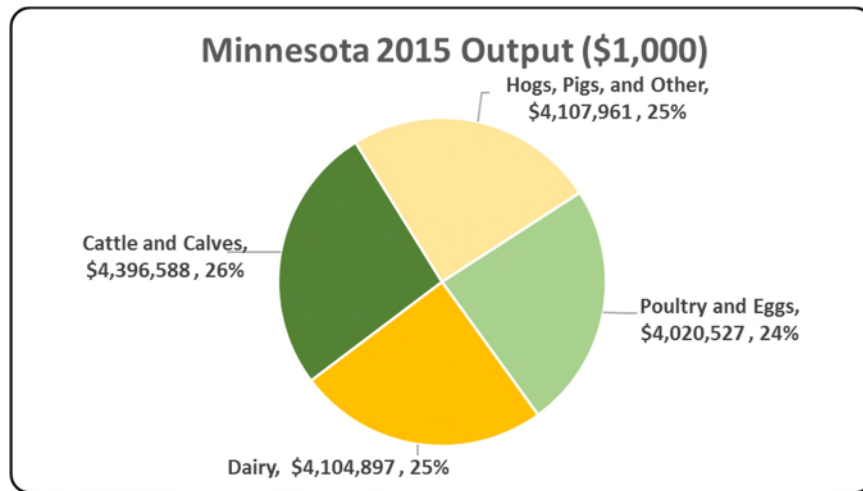
- Increased economic output by \$3.9 billion
- Boosted household earnings by \$834.7 million
- Added 17,493 jobs
- Paid an additional \$228.5 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2015	Change 2005-2015	% Change 2005-2015
Output (\$1,000)	\$ 16,629,973	\$ 3,904,894	30.69%
Earnings (\$1,000)	\$ 3,644,391	\$ 834,711	29.71%
Employment (Jobs)	76,575	17,493	29.61%
Income Taxes Paid (\$1,000)	\$ 997,834	\$ 228,544	29.71%
Property Taxes Paid in 2012 (\$1,000)	\$ 340,686		

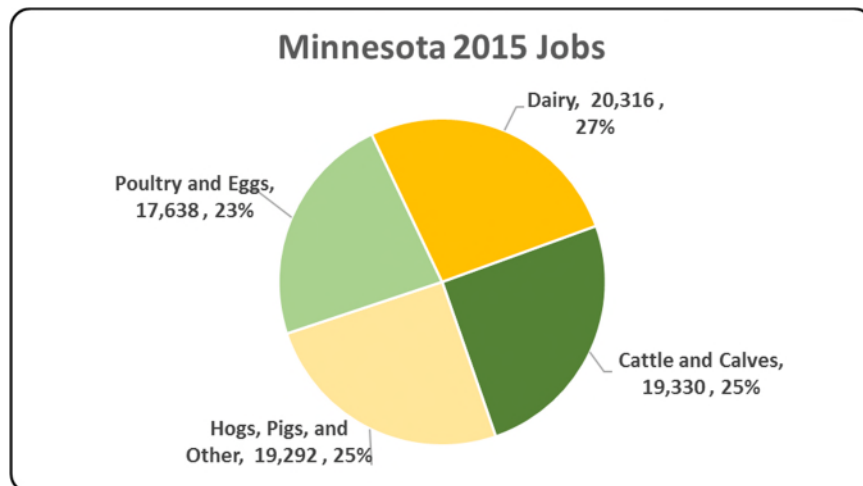
Minnesota Output

“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 Minnesota economy. Animal agriculture’s impact on Minnesota total economic output is about \$16.6 billion.



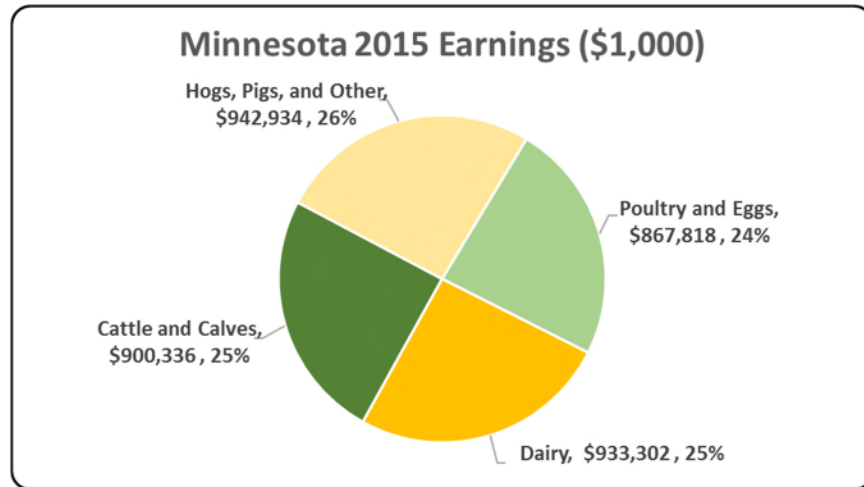
Minnesota Jobs

“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 Minnesota in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Minnesota total jobs, contributing 76,575 jobs within and outside of animal agriculture



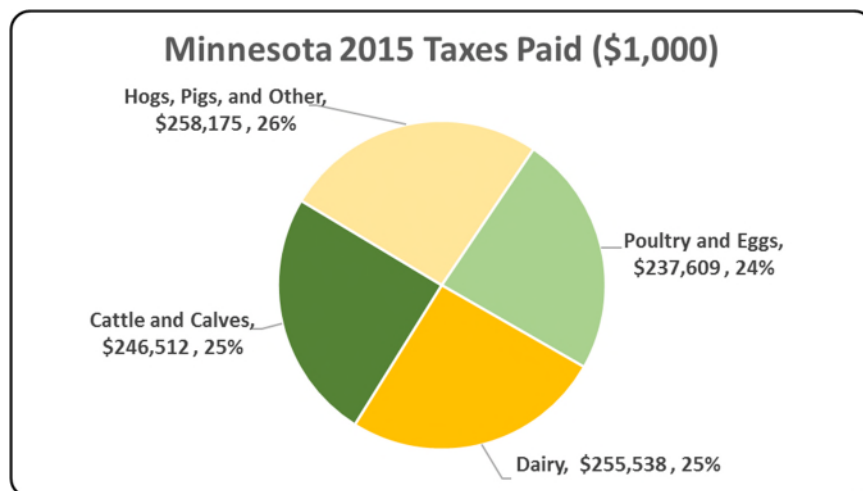
Minnesota Earnings

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 Minnesota economy in terms of earnings. Minnesota’s animal agriculture contributed about \$3.6 billion to household earnings in 2015.



Minnesota Taxes Paid by Animal Agriculture

Minnesota’s animal agriculture is also a significant source of tax revenue. In 2015, the state’s animal agriculture industry paid about \$997.8 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$340.7 million in property taxes paid by all of Minnesota agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



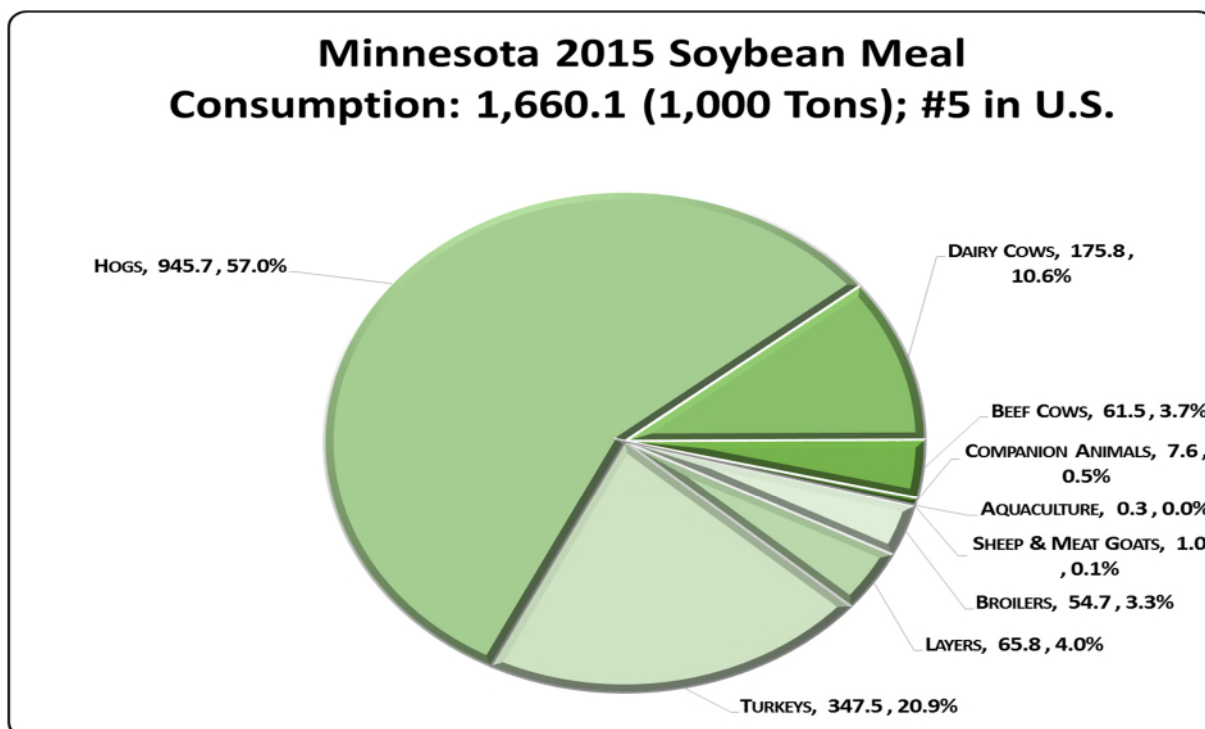
Minnesota Animal Agriculture Soybean Meal Consumption

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.

Minnesota's animal agriculture consumed almost 1.6 million tons of soybean meal in 2015, placing the state as #5 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 (945.7 thousand tons)
- Turkeys (347.5 thousand tons)
- Dairy Cows (175.8 thousand tons)

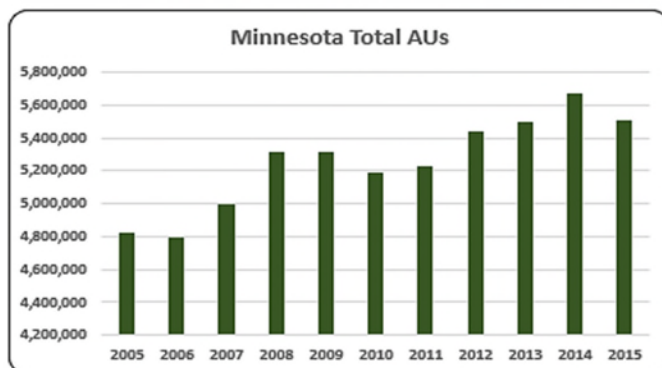
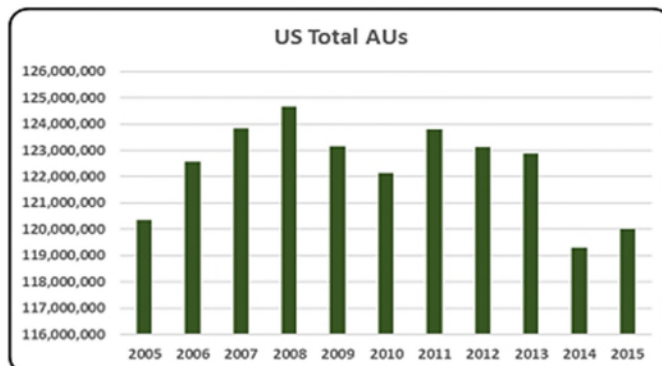


Minnesota Animal Unit (AU) Trends

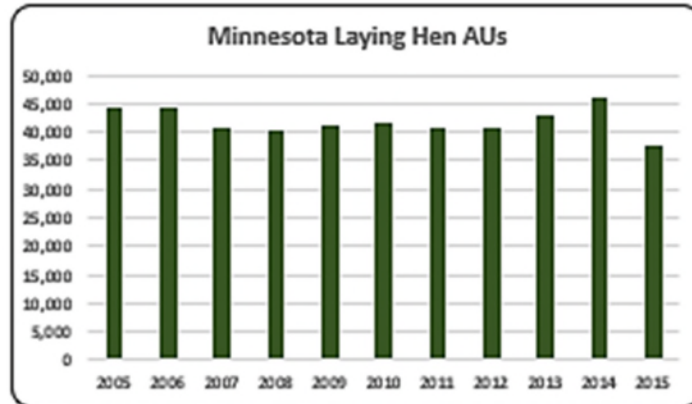
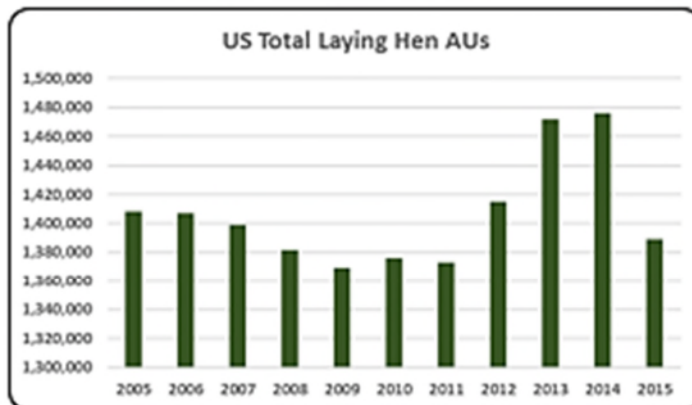
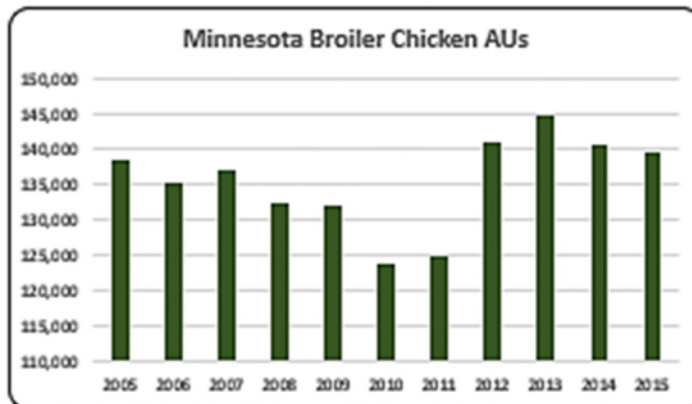
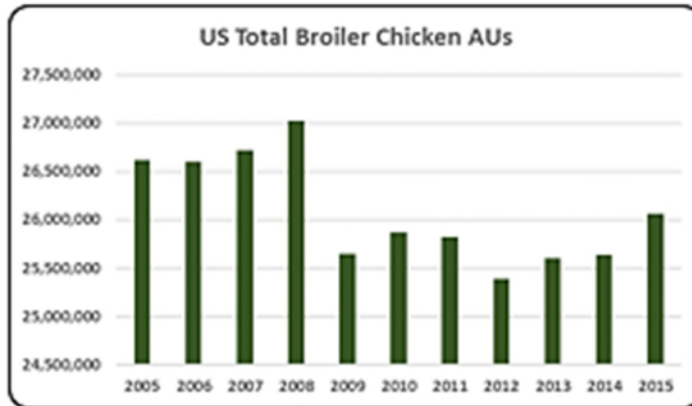
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Minnesota. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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 Minnesota and to give perspective on Minnesota'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 Minnesota, the largest three segments of animal agriculture in terms of AUs during 2015 were: Hogs (2.9 million AUs), Beef Cows (1.2 million AUs), and Dairy Cows (644,000 AUs). Total animal units in Minnesota during 2015 were 5.5 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.
- At the national level, Minnesota is the number one turkey producer. The overall animal production in Minnesota was positive during the decade. There were 5.5 million AUs in the state in 2015.

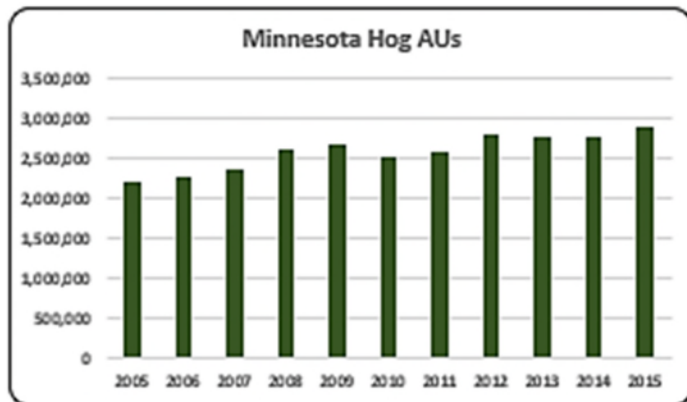
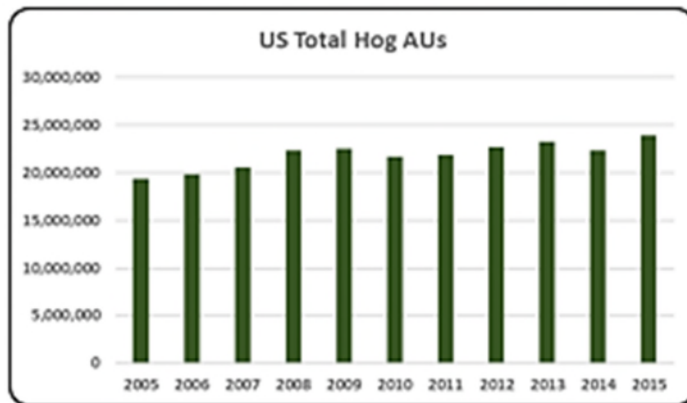
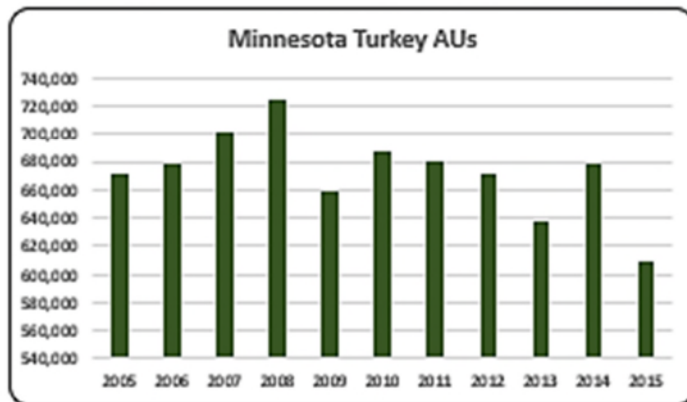
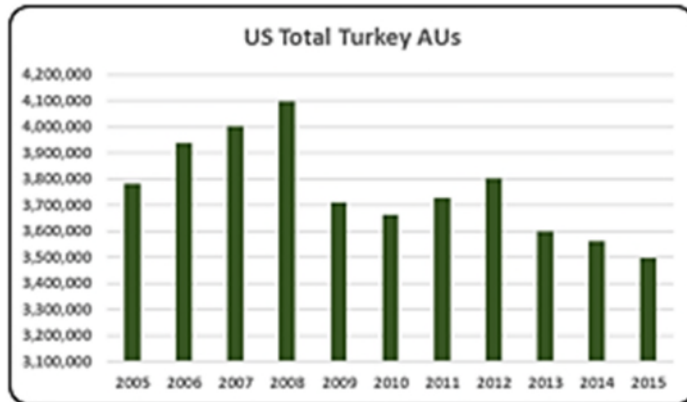


- U.S. broiler production is clustered in a number of states, with Georgia being the largest producer. On average from 2005 to 2015, broiler chicken AUs were about 26.0 million. In 2015, AUs rebounded 3% from the low AUs numbers in 2012 (25.4 million AUs).

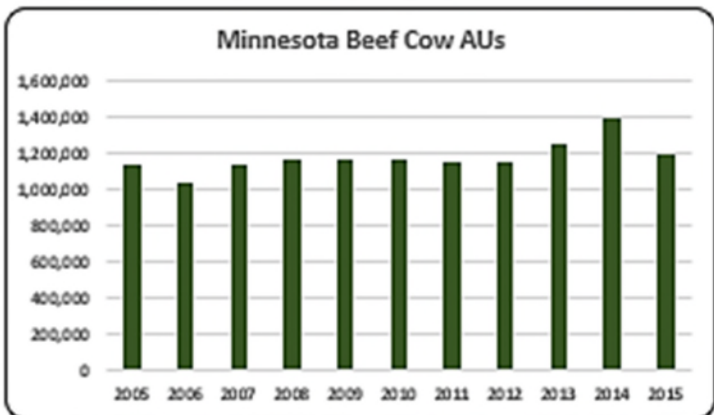
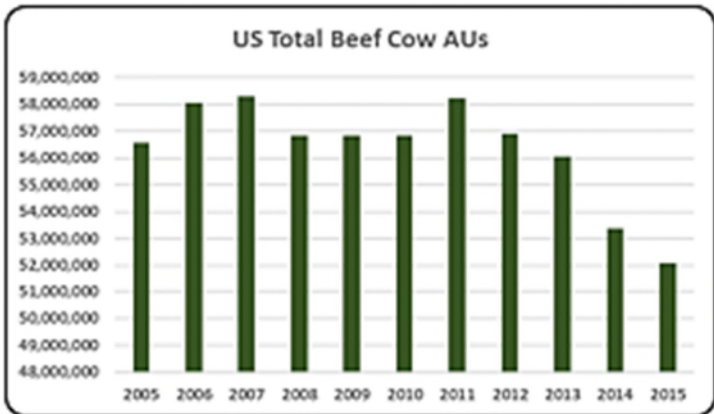
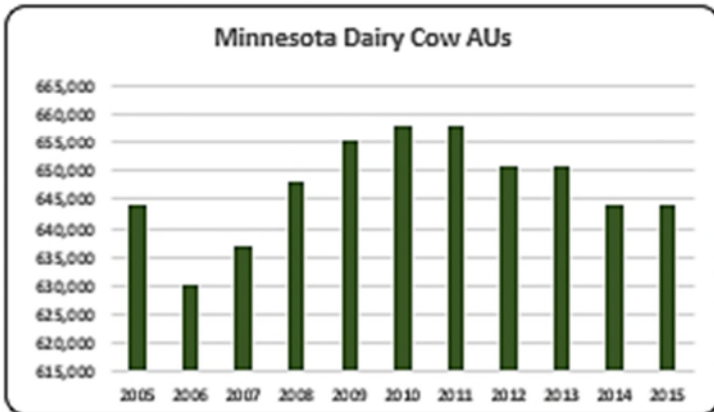
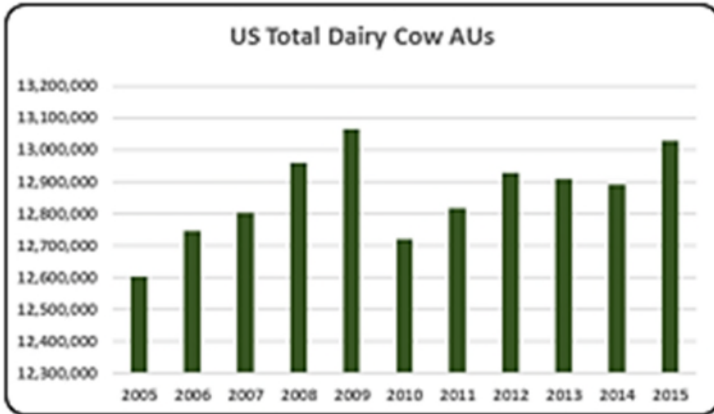
- Broiler numbers decreased about 1% from the previous year to 139,459 broiler AUs in 2015. Broiler AUs averaged 135,382 from 2005 to 2015.

- 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.

- Eggs are Minnesota’s smallest animal sector with 37,639 layer AUs in 2015. Layer numbers have varied during the decade with 2014 (46,224) being a record high. The 2015 decline is due to avian influenza.



- 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.
- There were 609,639 turkey AUs in Minnesota in 2015 representing 17.4% of all turkey AUs in the country. The 2015 decline is due to avian influenza.
- 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.
- About 52% (2.9 million) of Minnesota’s AUs in 2015 came from the hogs. Hog numbers have increased 31% since 2005 and the overall trend during the decade has been positive.



- 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.
- The dairy cow industry in Minnesota contributed 11.7% (644,000) of all animal units in the state in 2015. Dairy cow numbers in 2015 remained the same as the previous year.
- 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.
- Beef was second largest animal sector in the state in 2015 with 1.2 million beef cow AUs. General production during the decade has been steady at an average of 1.17 million AUs.

Minnesota Additional Information and Methodology

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

Minnesota 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 Minnesota'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 Minnesota, \$1.86 to \$3.05 million in total economic activity, \$0.43 to \$0.66 in household wages and 9 to 13 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.619	\$ 0.536	11.5
	Hogs, Pigs, and Other	\$ 1.856	\$ 0.426	8.7
	Poultry and Eggs	\$ 3.052	\$ 0.659	13.4
	Dairy	\$ 2.464	\$ 0.560	12.2

Appendix

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Animal Units (AUs)	Beef Cattle AUs	1,128,000	1,029,900	1,139,700	1,158,300	1,158,300	1,158,300	1,147,500	1,141,500	1,250,100	1,396,500	1,191,450
	Hog and Pig AUs	2,197,050	2,277,900	2,342,100	2,614,500	2,668,350	2,522,700	2,580,600	2,797,800	2,770,950	2,765,250	2,884,950
	Broiler AUs	138,191	135,209	137,053	132,392	131,820	123,892	124,988	140,671	144,872	140,659	139,459
	Turkey AUs	671,025	678,719	702,114	724,661	659,393	687,546	679,217	671,956	637,247	677,876	609,639
	Egg Layer AUs	44,360	44,520	40,928	40,256	41,324	41,796	40,868	40,568	42,994	46,224	37,639
	Dairy AUs	644,000	630,000	637,000	648,200	655,200	658,000	658,000	651,000	651,000	644,000	644,000
	Total Animal Units	4,822,626	4,796,249	4,998,896	5,318,309	5,314,387	5,192,235	5,231,173	5,443,494	5,497,163	5,670,509	5,507,137
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 841,789	\$ 821,333	\$ 886,145	\$ 892,142	\$ 800,217	\$ 957,961	\$ 1,020,618	\$ 1,209,861	\$ 1,287,089	\$ 1,604,194	\$ 1,678,792
	Hogs and Pigs (\$1,000)	\$ 1,570,936	\$ 1,501,906	\$ 1,645,781	\$ 1,757,315	\$ 1,246,087	\$ 1,848,944	\$ 2,296,476	\$ 2,410,425	\$ 2,522,978	\$ 2,784,251	\$ 2,189,747
	Broilers (\$1,000)	\$ 98,814	\$ 82,620	\$ 104,189	\$ 109,480	\$ 112,605	\$ 111,390	\$ 110,757	\$ 135,700	\$ 172,631	\$ 178,870	\$ 149,779
	Turkeys (\$1,000)	\$ 535,369	\$ 563,529	\$ 627,591	\$ 747,031	\$ 552,867	\$ 687,870	\$ 762,359	\$ 810,413	\$ 709,894	\$ 865,827	\$ 800,809
	Eggs (\$1,000)	\$ 90,899	\$ 107,303	\$ 193,219	\$ 237,237	\$ 165,025	\$ 167,922	\$ 185,335	\$ 199,865	\$ 214,011	\$ 266,139	\$ 366,883
	Milk (\$1,000)	\$ 1,262,030	\$ 1,087,970	\$ 1,713,888	\$ 1,677,362	\$ 1,208,546	\$ 1,465,422	\$ 1,822,450	\$ 1,778,308	\$ 1,864,152	\$ 2,263,496	\$ 1,666,016
	Other	\$ 23,195	\$ 20,268	\$ 22,434	\$ 22,458	\$ 20,893	\$ 24,191	\$ 22,927	\$ 23,124	\$ 23,320	\$ 23,517	\$ 23,713
	Sheep and Lambs (\$1,000)	\$ 14,783	\$ 12,205	\$ 14,721	\$ 15,094	\$ 13,879	\$ 17,526	\$ 16,612	\$ 17,158	\$ 17,704	\$ 18,250	\$ 18,796
	Aquaculture (\$1,000)	\$ 8,412	\$ 8,063	\$ 7,713	\$ 7,364	\$ 7,014	\$ 6,665	\$ 6,315	\$ 5,966	\$ 5,616	\$ 5,267	\$ 4,917
	Total (\$1,000)	\$ 4,423,032	\$ 4,184,928	\$ 5,193,247	\$ 5,443,025	\$ 4,106,240	\$ 5,263,700	\$ 6,220,922	\$ 6,567,696	\$ 6,794,076	\$ 7,986,294	\$ 6,875,739

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,243	8,917	9,921	8,083	
	Cattle feedlots (112112)	2,507	3,290	2,421	1,048	
	Dairy cattle and milk production (11212)	7,972	5,520	4,385	3,746	
	Hog and pig farming (1122)	3,800	3,051	2,462	1,442	
	Poultry and egg production (1123)	819	978	1,643	1,085	
	Sheep and goat farming (1124)	1,083	1,181	1,310	1,088	
	Animal aquaculture and other animal production (1125,1129)	3,172	6,006	5,105	4,245	
Value of Sales (\$1,000)	Cattle and Calves	737,972	873,074	1,385,740	1,639,634	
	Hogs and Pigs	1,436,247	1,398,234	2,139,877	2,783,049	
	Poultry and Eggs	744,509	750,088	1,045,674	1,230,625	
	Milk and Other Dairy Products	1,111,429	931,754	1,475,929	1,645,911	
	Aquaculture	3,221	8,991	12,492	12,678	
	Other (calculated)	58,910	50,604	71,842	73,874	
	Total	4,092,288	4,012,745	6,131,554	7,385,771	
Input Purchases	Livestock and poultry purchased	(Farms)	22,175	20,375	17,464	18,527
		\$1,000	639,336	836,490	1,304,042	1,301,768
	Breeding livestock purchased	(Farms)	<i>n/a</i>	9,757	8,243	9,241
		\$1,000	<i>n/a</i>	75,727	115,218	163,055
	Other livestock and poultry purchased	(Farms)	<i>n/a</i>	12,945	11,354	11,859
		\$1,000	<i>n/a</i>	760,762	1,188,825	1,138,713
	Feed purchased	(Farms)	35,429	37,871	30,806	32,486
	\$1,000	1,301,623	1,271,172	1,944,488	2,961,840	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2015 Animal Agriculture	Cattle and Calves	\$ 4,396,588	\$ 900,336	19,330	\$ 246,512
	Hogs, Pigs, and Other	\$ 4,107,961	\$ 942,934	19,292	\$ 258,175
	Poultry and Eggs	\$ 4,020,527	\$ 867,818	17,638	\$ 237,609
	Dairy	\$ 4,104,897	\$ 933,302	20,316	\$ 255,538
	Total	\$ 16,629,973	\$ 3,644,391	76,575	\$ 997,834
Change from 2005 to 2015	Cattle and Calves	\$ 1,721,122	\$ 352,453	7,567	\$ 96,502
	Hogs, Pigs, and Other	\$ 517,454	\$ 118,775	2,430	\$ 32,521
	Poultry and Eggs	\$ 1,335,144	\$ 288,187	5,857	\$ 78,906
	Dairy	\$ 331,174	\$ 75,297	1,639	\$ 20,616
	Total	\$ 3,904,894	\$ 834,711	17,493	\$ 228,544
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.619	\$ 0.536	11.5	
	Hogs, Pigs, and Other	\$ 1.856	\$ 0.426	8.7	
	Poultry and Eggs	\$ 3.052	\$ 0.659	13.4	
	Dairy	\$ 2.464	\$ 0.560	12.2	
Tax Rates	Federal effective income tax rate				12.7%
	Federal Social Security tax rate				7.7%
	State Effective Rate				7.1%
	Total				27.4%

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.