

Economic Analysis of Animal Agriculture 2004-2014

KENTUCKY

**A Report for
United Soybean Board**



September 2015



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Kentucky Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Kentucky'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 Kentucky. The success of Kentucky animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the state of Kentucky during 2014 animal agriculture contributed:

- \$7.7 billion in economic output
- 38,850 jobs
- \$1.3 billion in earnings
- \$339.3 million in income taxes paid at local, state, and federal levels
- \$113.7 million in the form of property taxes

Plus, from 2004-2014 animal agriculture in Kentucky increased economic output by over \$1.6 billion, boosted household earnings by \$267.4 million, contributed 7,951 additional jobs and paid \$69.9 million in additional tax revenues.

Kentucky's animal agriculture consumed about 467.4 thousand tons of soybean meal in 2014. This soybean meal was fed primarily to:

- Broilers (362.9 thousand tons)
- Hogs (39.7 thousand tons)
- Dairy Cows (18.0 thousand tons)

This report examines animal agriculture in Kentucky 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 Kentucky, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Kentucky and beyond.

Kentucky Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Kentucky's economy. In 2014, Kentucky's animal agriculture contributed the following to the economy:

- About \$7.7 billion in economic output
- \$1.3 billion in household earnings
- 38,850 jobs
- \$339.3 million in income taxes

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

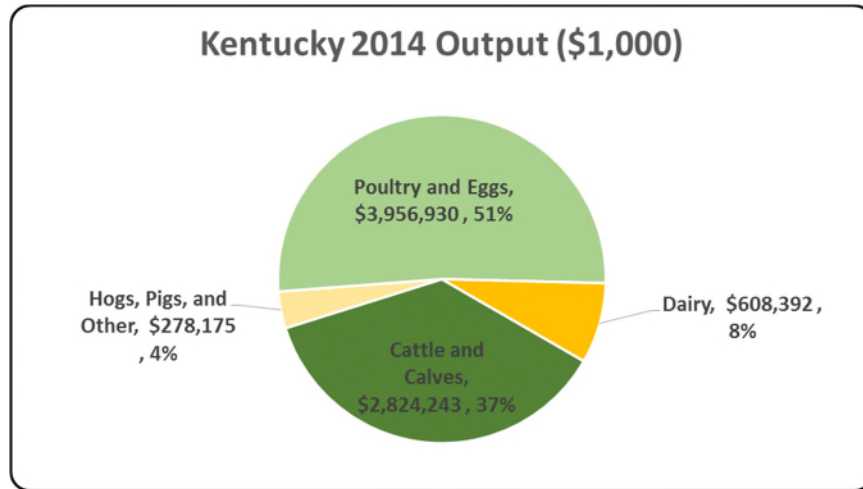
- Increased economic output by \$1.6 billion
- Boosted household earnings by \$267.4 million
- Added 7,951 jobs
- Paid an additional \$69.9 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2014	Change 2004-2014	% Change 2004-2014
Output (\$1,000)	\$ 7,667,739	\$ 1,594,978	26.26%
Earnings (\$1,000)	\$ 1,298,513	\$ 267,395	25.93%
Employment (Jobs)	38,850	7,951	25.73%
Income Taxes Paid (\$1,000)	\$ 339,302	\$ 69,870	25.93%
Property Taxes Paid in 2012 (\$1,000)	\$ 113,653		

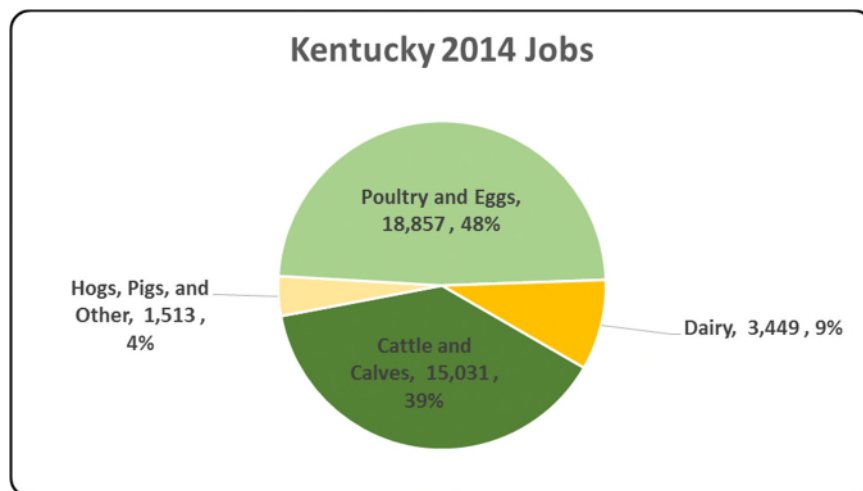
Kentucky Output

“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 Kentucky economy. Animal agriculture’s impact on Kentucky total economic output is about \$7.7 billion.



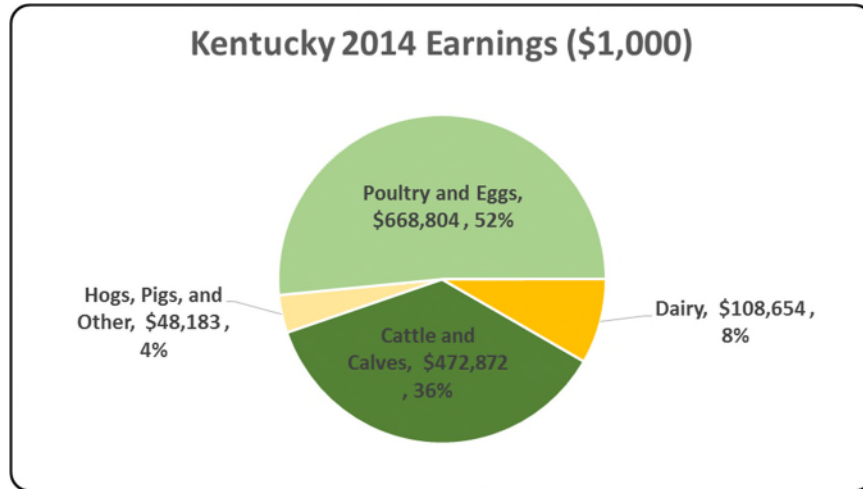
Kentucky Jobs

“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 Kentucky in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Kentucky total jobs, contributing 38,850 jobs within and outside of animal agriculture.



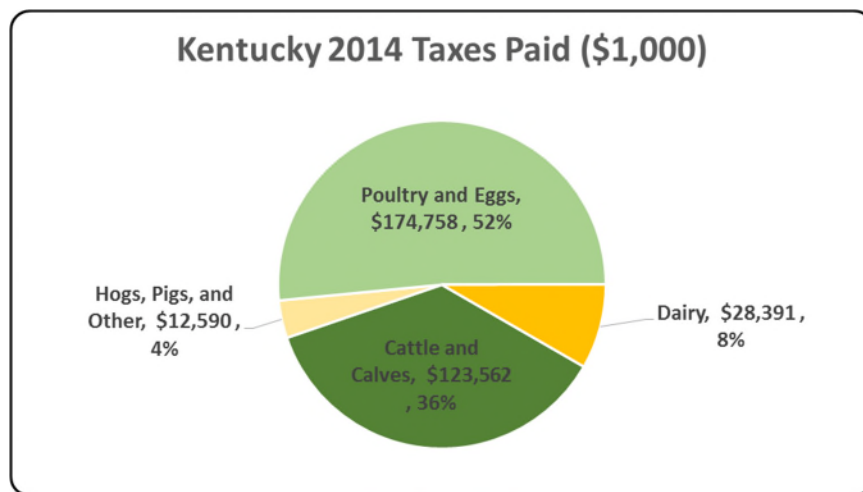
Kentucky Earnings

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 Kentucky economy in terms of earnings. Kentucky's animal agriculture contributed about \$1.3 billion to household earnings in 2014.



Kentucky Taxes Paid by Animal Agriculture

Kentucky's animal agriculture is also a significant source of tax revenue. In 2014, the state's animal agriculture industry paid about \$339.3 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$113.7 million in property taxes paid by all of Kentucky agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



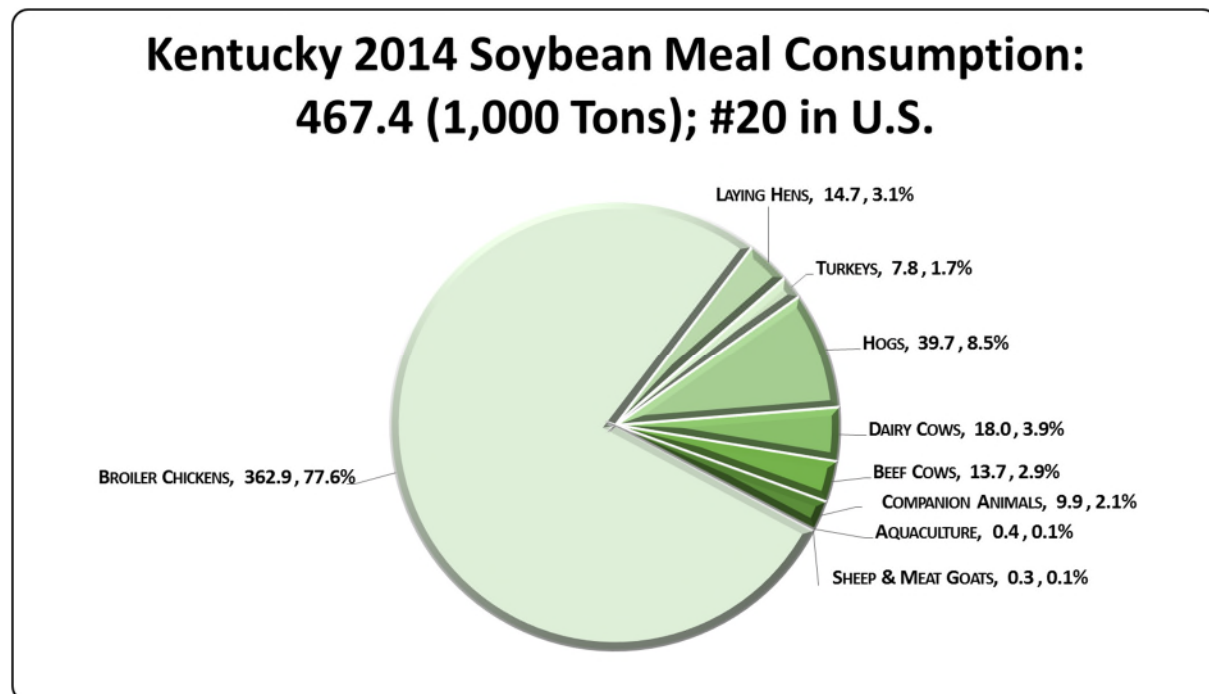
Kentucky Animal Agriculture Soybean Meal Consumption

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 2013-14 soybean marketing year by up to sixteen specific animal species has been estimated.

Kentucky’s animal agriculture consumed almost 467.4 thousand tons of soybean meal in 2014, placing the state as #20 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:

- Broilers (362.9 thousand tons)
- Hogs (39.7 thousand tons)
- Dairy Cows (18.0 thousand tons)

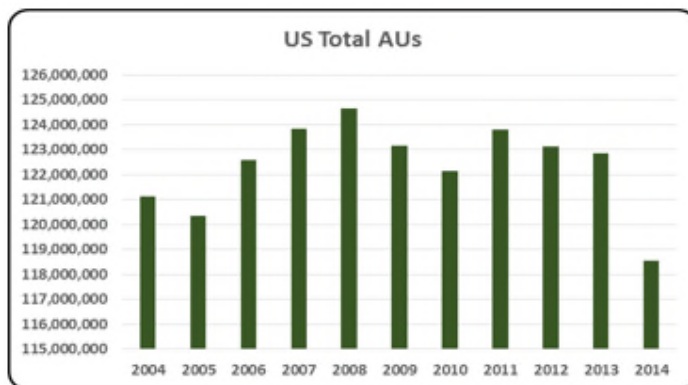


Kentucky Animal Unit (AU) Trends

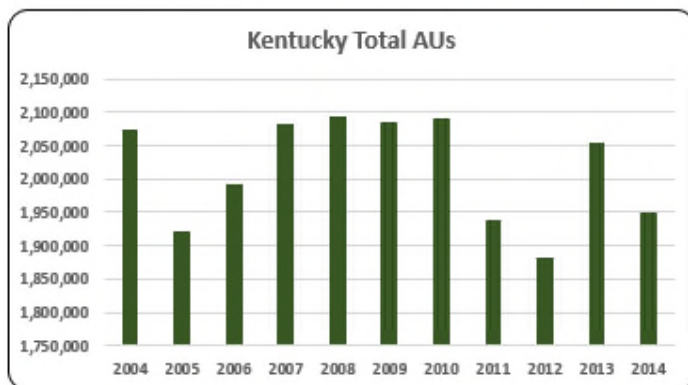
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Kentucky. Due to this reality, using a single year as a measure of the presence and strength of a sector can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

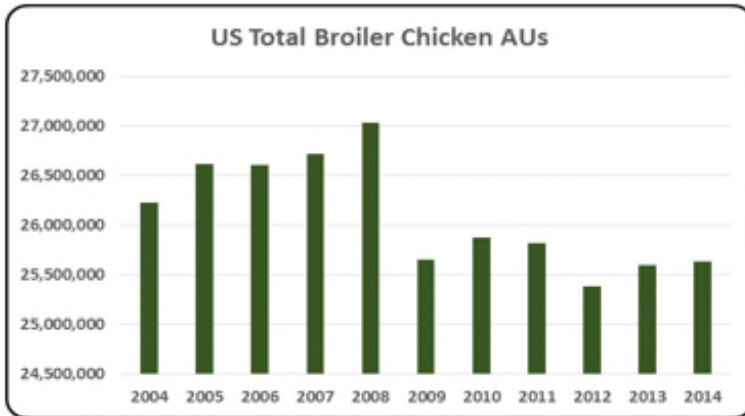
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Kentucky, the largest three segments of animal agriculture in terms of AUs during 2014 were: Broilers (925.7 thousand AUs), Beef Cows (801.3 thousand AUs), and Hogs (102.9 thousand AUs). Total animal units in Kentucky during 2014 were 1,950.4 thousand AUs.



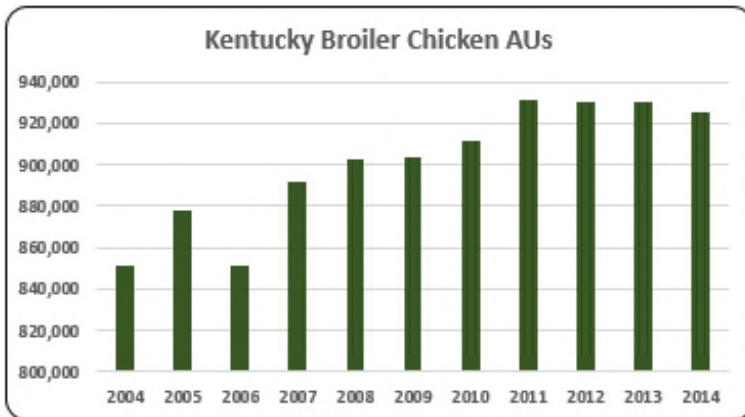
- Overall U.S. total AUs have varied from 2004 to 2014. In 2014 AUs were at an all-time low reflecting, in part, the impact of severe weather on cattle production in some parts of country. During the 2004-14 time period, total AUs in the nation peaked in 2008.



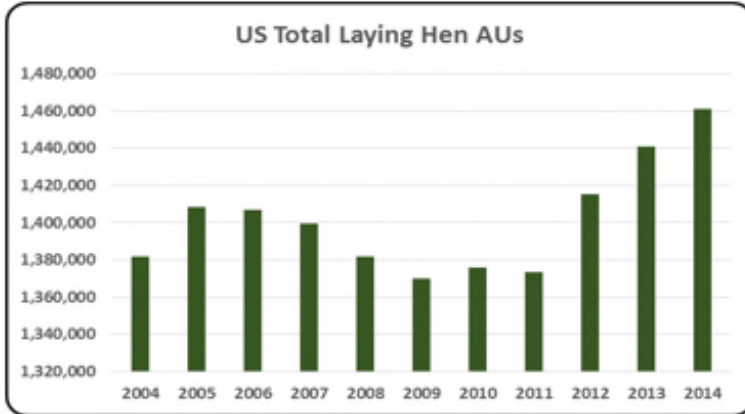
- The total number of AUs in Kentucky in 2014 was 1,950.4 thousand. Animal production has fallen with a decrease in AUs of about 6.0% throughout the decade.



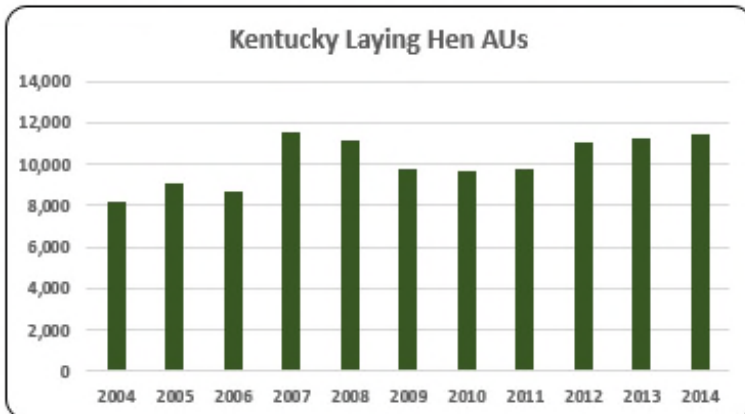
- U.S. broiler production is clustered in a number of states, with Georgia being the largest producer. On average from 2004 to 2014, broiler chicken AUs were about 26.1 million. In 2014, AUs rebounded 1% from the low AUs numbers in 2012 (25.4 million AUs).



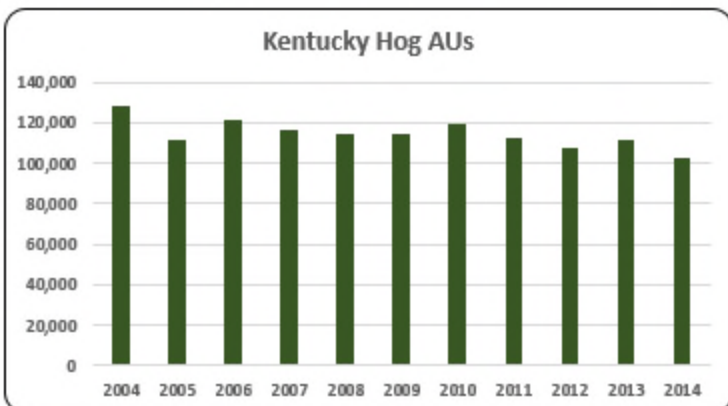
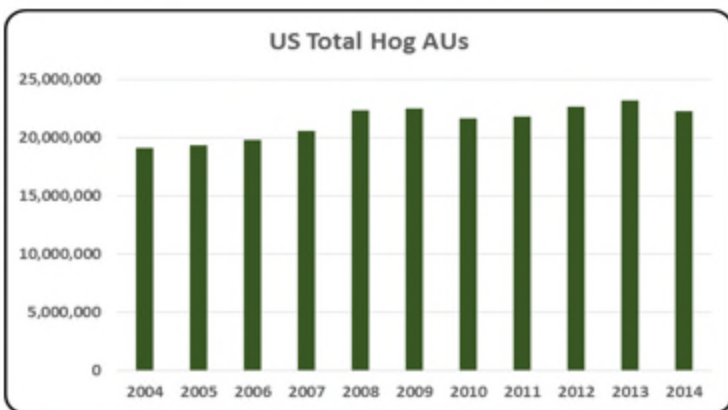
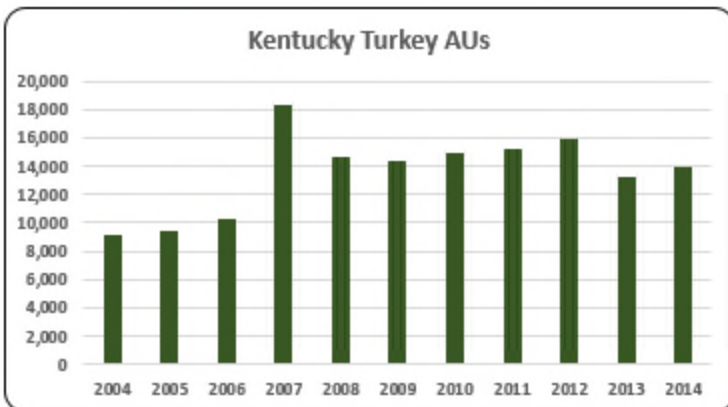
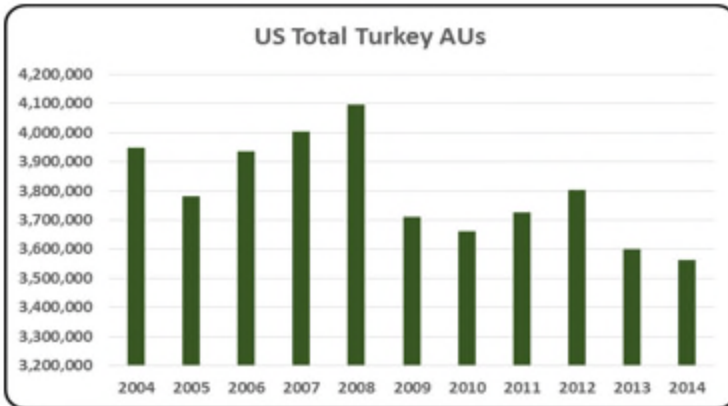
- There were 925,704 broiler AUs in 2014 and even though there was a small decline from the previous year, broiler production in Kentucky increased 8.7% since 2004.



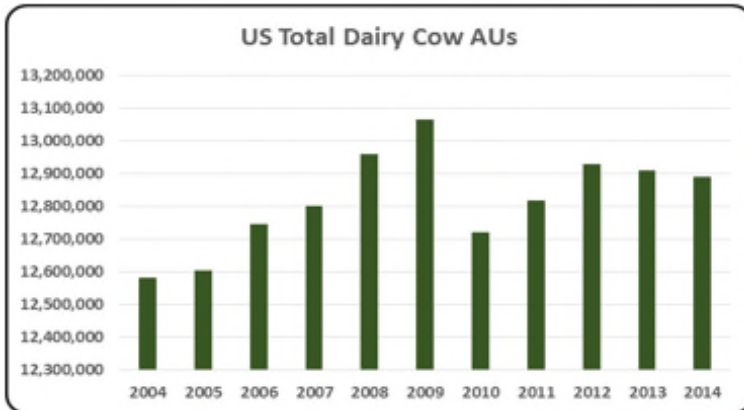
- On average, the layer AUs during 2004-2014 were 1.4 million. In 2014 layer AUs were 1.5 million, up 7% from the lowest number in 2009 (1.4 million AUs).



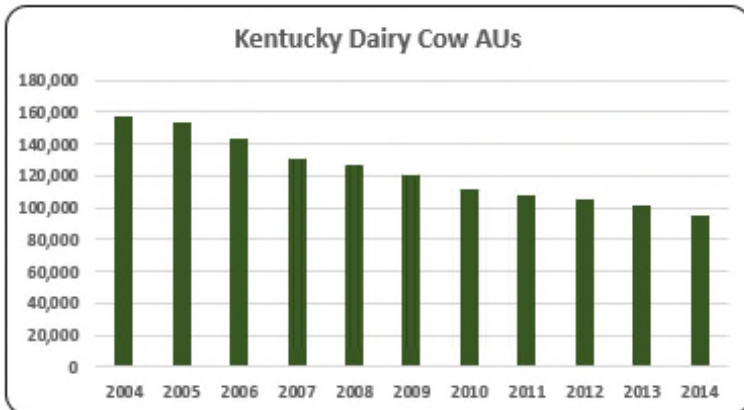
- The layer production has expanded 40% since the beginning of the decade. Layer AUs in 2014 were 11,430 compared to 8,191 in 2004.



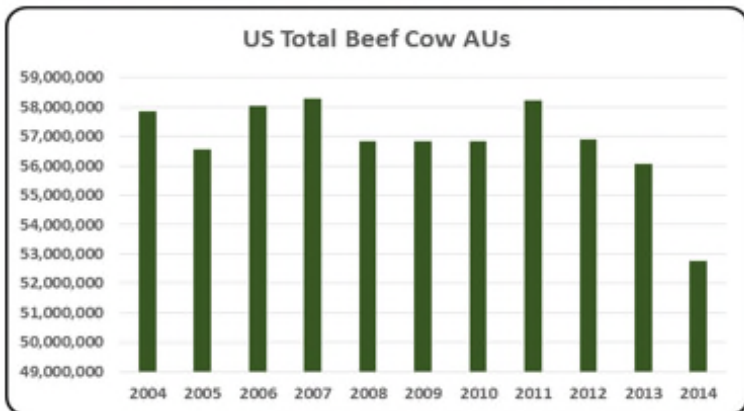
- From 2004 to 2014, the U.S. accounted for 50% of the world’s turkey production. However, in 2014 turkey AUs were the lowest of the decade at 3.5 million, decreasing 13% compared to 2008 (4.1 million turkey AUs) the largest turkey AUs of the decade.
- For the most part the turkey production in Kentucky has expanded during the decade growing 51% from 9,189 turkey AUs in 2004 to 13,882 turkey AUs in 2014.
- On average from 2004 to 2014, hog AUs were about 21.4 million. In 2013 hog AUs reached a high of 23.2 million AUs as prices of main feed ingredients, particularly corn, decreased to pre-2010 price levels. Hog AUs in 2014 decreased 4.4% to 22.3 million AUs year-over-year, primarily due to the porcine epidemic diarrhea virus (PEDv) outbreak. Despite the fluctuation in AUs, the pork supply was relatively stable.
- Hog AUs dropped 7% year-over-year and 20% from the numbers in 2004 (128,550). There were a total of 102,900 hog AUs in 2014.



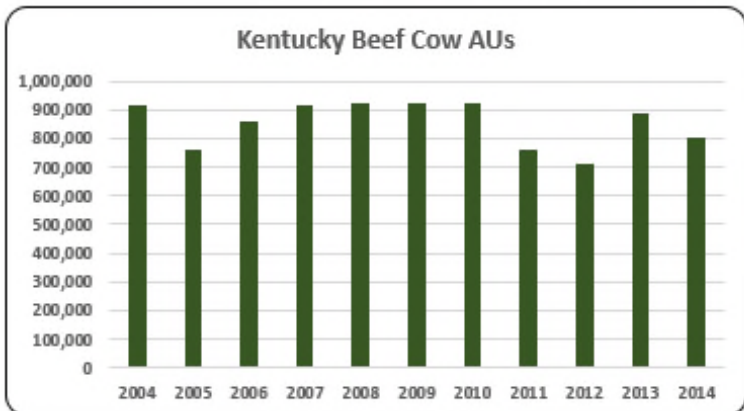
- From 2004 to 2014 dairy cow AUs averaged 12.8 million. In 2014, dairy cow AUs (12.9 million) remained about the same as the previous year but still below the high of 13.1 million AUs, the level in 2009. Despite the fluctuation in AUs, milk supplied has steadily risen.



- Kentucky’s dairy cow production has been consistently declining from 156,800 dairy cow AUs in 2004 to 95,200 dairy cow AUs in 2014, showing a 39% reduction during the decade.



- From 2004 to 2014 beef cow AUs averaged 56.8 million. In 2014 beef cow AUs decreased to 52.8 million, the lowest of the decade. States that raise a large number of cattle and calves like Texas and Oklahoma were plagued with drought conditions during 2014.



- Forty one percent (801,300) of all AUs in the state of Kentucky were beef cow AUs. Beef cow production diminished in 2011 to 762,150 beef AUs. In 2014 beef cow AUs remained 13% below 2010 levels

Kentucky Additional Information and Methodology

Animal agriculture is an important part of Kentucky'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 2004-2014 time period
- Soybean meal usage by animal species during the 2013/14 soybean marketing year
- Animal Unit (AU) trends from 2004-2014

Given the long-term presence of animal agriculture in Kentucky, of interest is the degree to which the industry impacts the Kentucky economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Kentucky 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 Kentucky'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 2004-2014 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 Kentucky which have occurred. As shown in this state report, Kentucky 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 Kentucky. 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 2013-14 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.

Kentucky 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 Kentucky'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 Kentucky, \$2.081 to \$3.094 million in total economic activity, \$0.360 to \$0.523 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	\$ 2.9349	\$ 0.4914	15.6
	Hogs, Pigs, and Other	\$ 2.0807	\$ 0.3604	11.3
	Poultry and Eggs	\$ 3.0937	\$ 0.5229	14.7
	Dairy	\$ 2.3534	\$ 0.4203	13.3

Appendix

		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Animal Units (AUs)	Beef Cattle AUs	919,050	759,600	857,700	914,250	923,700	923,700	923,700	762,150	712,500	887,550	801,300
	Hog and Pig AUs	128,550	111,000	121,650	116,400	114,300	114,000	119,550	112,650	107,250	111,150	102,900
	Broiler AUs	851,361	877,468	851,318	892,024	902,564	903,320	911,682	931,403	930,291	930,248	925,704
	Turkey AUs	9,189	9,424	10,240	18,330	14,651	14,352	14,949	15,215	15,935	13,292	13,882
	Egg Layer AUs	8,191	9,021	8,705	11,496	11,168	9,768	9,703	9,761	11,079	11,251	11,430
	Dairy AUs	156,800	154,000	142,800	130,200	127,400	120,400	112,000	107,800	105,000	100,800	95,200
	Total Animal Units	2,073,141	1,920,513	1,992,412	2,082,700	2,093,783	2,085,540	2,091,584	1,938,979	1,882,055	2,054,291	1,950,417
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 554,972	\$ 610,926	\$ 657,078	\$ 570,235	\$ 507,540	\$ 476,884	\$ 563,075	\$ 585,804	\$ 736,272	\$ 670,516	\$ 962,296
	Hogs and Pigs (\$1,000)	\$ 97,373	\$ 81,092	\$ 79,987	\$ 83,889	\$ 76,419	\$ 66,990	\$ 101,443	\$ 115,178	\$ 105,609	\$ 115,851	\$ 128,686
	Broilers (\$1,000)	\$ 690,932	\$ 704,297	\$ 572,220	\$ 717,326	\$ 760,334	\$ 757,615	\$ 806,338	\$ 782,595	\$ 866,600	\$ 1,014,479	\$ 1,098,698
	Turkeys (\$1,000)	\$ 8,526	\$ 9,041	\$ 10,685	\$ 21,139	\$ 19,789	\$ 13,271	\$ 17,780	\$ 19,941	\$ 23,110	\$ 15,219	\$ 25,481
	Eggs (\$1,000)	\$ 88,099	\$ 72,568	\$ 73,156	\$ 120,075	\$ 130,387	\$ 110,285	\$ 101,530	\$ 115,438	\$ 116,170	\$ 131,969	\$ 154,849
	Milk (\$1,000)	\$ 241,740	\$ 221,454	\$ 182,420	\$ 252,500	\$ 242,000	\$ 168,072	\$ 206,208	\$ 235,440	\$ 221,760	\$ 230,050	\$ 258,516
	Other	\$ 4,279	\$ 4,461	\$ 4,236	\$ 4,504	\$ 4,532	\$ 4,612	\$ 4,775	\$ 4,784	\$ 4,858	\$ 4,933	\$ 5,007
	Sheep and Lambs (\$1,000)	\$ 1,882	\$ 2,120	\$ 1,951	\$ 2,275	\$ 2,359	\$ 2,495	\$ 2,714	\$ 2,779	\$ 2,909	\$ 3,040	\$ 3,170
	Aquaculture (\$1,000)	\$ 2,397	\$ 2,341	\$ 2,285	\$ 2,229	\$ 2,173	\$ 2,117	\$ 2,061	\$ 2,005	\$ 1,949	\$ 1,893	\$ 1,837
	Total (\$1,000)	\$ 1,685,921	\$ 1,703,839	\$ 1,579,782	\$ 1,769,668	\$ 1,741,001	\$ 1,597,729	\$ 1,801,149	\$ 1,859,180	\$ 2,074,379	\$ 2,183,016	\$ 2,633,533

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	24,962	31,035	33,966	30,041	
	Cattle feedlots (112112)	877	1,820	1,073	541	
	Dairy cattle and milk production (11212)	2,010	2,078	1,641	890	
	Hog and pig farming (1122)	588	366	354	262	
	Poultry and egg production (1123)	418	904	1,593	1,603	
	Sheep and goat farming (1124)	269	901	2,038	1,746	
	Animal aquaculture and other animal production (1125,1129)	3,495	7,309	9,351	7,826	
Value of Sales (\$1,000)	Cattle and Calves	570,377	622,855	935,611	1,033,722	
	Hogs and Pigs	119,651	69,722	90,198	122,130	
	Poultry and Eggs	273,284	561,178	978,025	1,107,452	
	Milk and Other Dairy Products	237,734	214,365	250,305	207,602	
	Aquaculture	1,628	2,017	2,683	2,884	
	Other (calculated)	345,173	499,734	1,162,970	134,038	
	Total	1,547,847	1,969,871	3,419,792	2,607,828	
Input Purchases	Livestock and poultry purchased	(Farms)	19,647	21,156	18,470	21,345
		\$1,000	236,935	298,839	523,127	598,201
	Breeding livestock purchased	(Farms)	n/a	13,530	11,737	13,387
		\$1,000	n/a	71,492	171,651	124,223
	Other livestock and poultry purchased	(Farms)	n/a	9,936	9,159	11,237
		\$1,000	n/a	227,347	351,475	473,978
	Feed purchased	(Farms)	39,926	51,368	46,766	50,685
		\$1,000	341,123	443,883	793,669	1,176,273

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2014 Animal Agriculture	Cattle and Calves	\$ 2,824,243	\$ 472,872	15,031	\$ 123,562
	Hogs, Pigs, and Other	\$ 278,175	\$ 48,183	1,513	\$ 12,590
	Poultry and Eggs	\$ 3,956,930	\$ 668,804	18,857	\$ 174,758
	Dairy	\$ 608,392	\$ 108,654	3,449	\$ 28,391
	Total	\$ 7,667,739	\$ 1,298,513	38,850	\$ 339,302
Change from 2004 to 2014	Cattle and Calves	\$ 782,990	\$ 131,099	4,167	\$ 34,256
	Hogs, Pigs, and Other	\$ 13,107	\$ 2,270	71	\$ 593
	Poultry and Eggs	\$ 903,468	\$ 152,705	4,306	\$ 39,902
	Dairy	\$ (104,587)	\$ (18,679)	(593)	\$ (4,881)
	Total	\$ 1,594,978	\$ 267,395	7,951	\$ 69,870
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 2.9349	\$ 0.4914	15.6	
	Hogs, Pigs, and Other	\$ 2.0807	\$ 0.3604	11.3	
	Poultry and Eggs	\$ 3.0937	\$ 0.5229	14.7	
	Dairy	\$ 2.3534	\$ 0.4203	13.3	
Tax Rates	Federal effective income tax rate				12.7%
	Federal Social Security tax rate				7.7%
	State Effective Rate				5.8%
	Total				26.1%

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.