

Economic Analysis of Animal Agriculture 2006-2016

KANSAS

**A Report for
United Soybean Board**



September 2017



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Kansas Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Kansas 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 success in the State of Kansas. The success of Kansas animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Kansas during 2016 animal ag contributed:

- \$13.9 billion in economic output
- 55,574 jobs
- \$2.7 billion in earnings
- \$641.8 million in income taxes paid at local, state, and federal levels
- \$227.6 million in the form of property taxes

Plus, from 2006-2016 animal agriculture in Kansas has increased economic output by over \$3.1 billion, boosted household earnings by \$615.8 million, contributed 12,430 additional jobs and paid \$143.8 million in additional tax revenues.

Kansas's animal agriculture consumed about 228.4 thousand tons of soybean meal in 2016. This soybean meal was fed primarily to:

- Hogs (133.3 thousand tons)
- Dairy Cows (43.1 thousand tons)
- Beef Cows (23.3 thousand tons)

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

Kansas Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Kansas's economy. In 2016, Kansas's animal agriculture contributed the following to the economy:

- About \$13.9 billion in economic output
- \$2.7 billion in household earnings
- 55,574 jobs
- \$641.8 million in income taxes

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

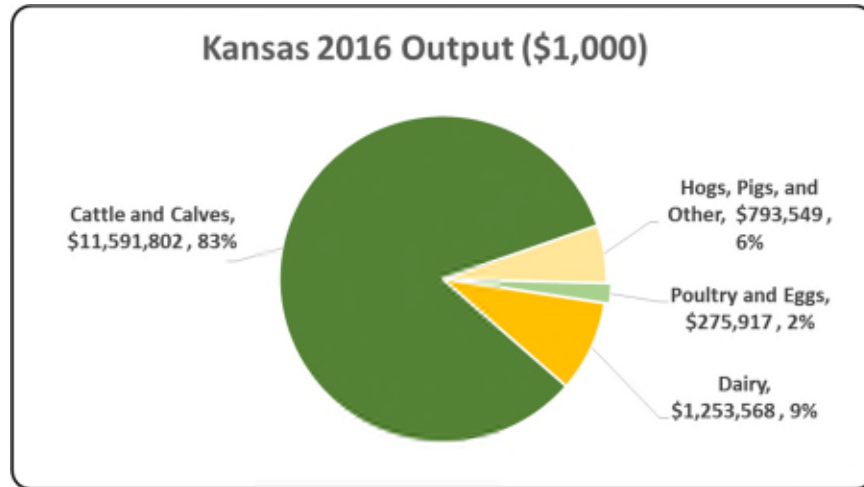
- Increased economic output by \$3.1 billion
- Boosted household earnings by \$615.8 million
- Added 12,430 jobs
- Paid an additional \$143.8 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2016	Change 2006-2016	% Change 2006-2016
Output (\$1,000)	\$ 13,914,837	\$ 3,120,502	28.91%
Earnings (\$1,000)	\$ 2,748,716	\$ 615,826	28.87%
Employment (Jobs)	55,574	12,430	28.81%
Income Taxes Paid (\$1,000)	\$ 641,825	\$ 143,795	28.87%
Property Taxes Paid in 2012 (\$1,000)	\$ 227,644		

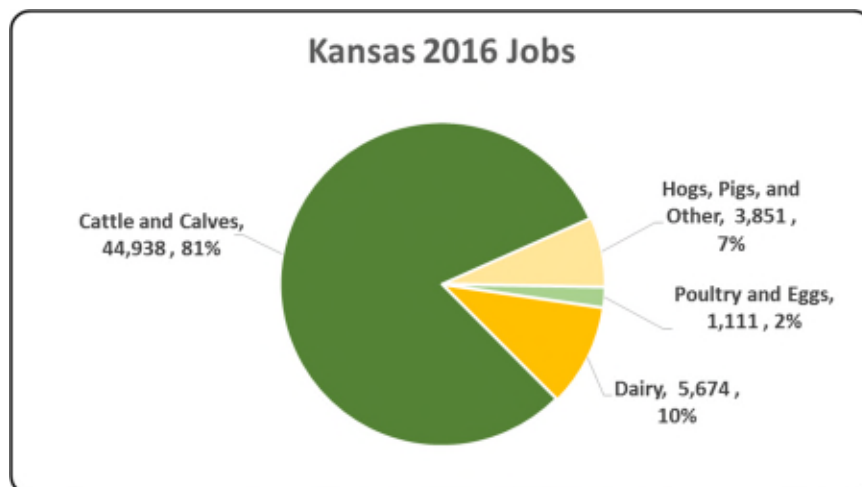
Kansas Output

“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 table illustrates the impact of animal agriculture to the Kansas economy. Animal agriculture’s impact on Kansas total economic output is about \$13.9 billion.



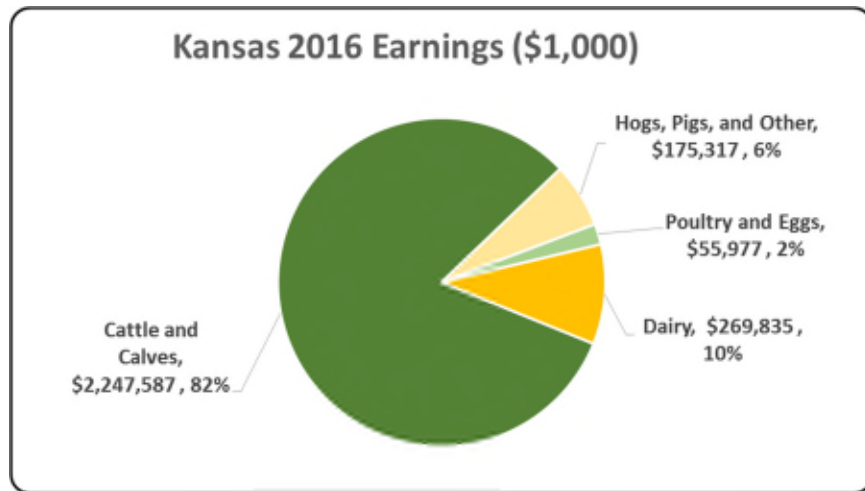
Kansas Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Kansas in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Kansas total jobs, contributing 55,574 jobs within and outside of animal agriculture.



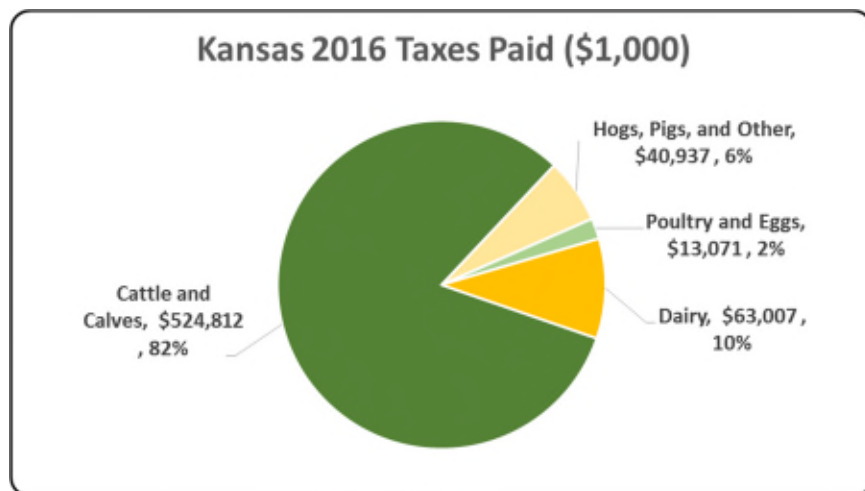
Kansas Earnings

Earnings includes wages and salaries plus proprietors' income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Kansas economy in terms of earnings. Kansas's animal agriculture contributed about \$2.7 billion to household earnings in 2016.



Kansas Taxes Paid by Animal Agriculture

Kansas's animal agriculture is also a significant source of tax revenue. In 2016, the state's animal agriculture industry paid about \$641.8 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$227.6 million in property taxes paid by all of Kansas agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



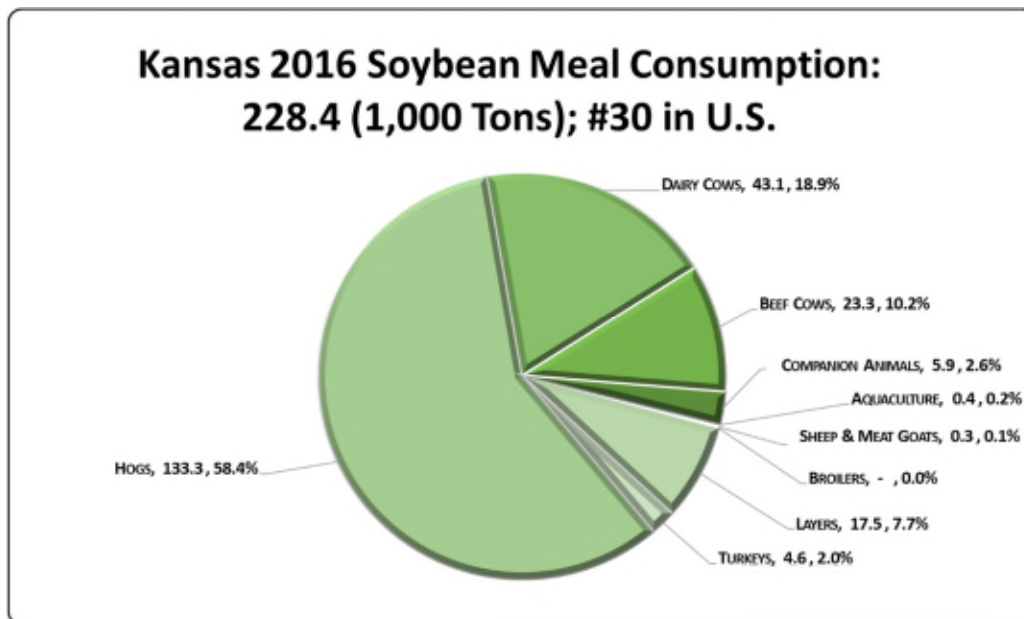
Kansas Animal Agriculture Soybean Meal Consumption

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 2015-16 soybean marketing year by up to sixteen specific animal species has been estimated.

Kansas's animal agriculture consumed about 228.4 thousand tons of soybean meal in 2016, placing the state as #30 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Kansas consumed 181.0 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (133.3 thousand tons)
- Dairy Cows (43.1 thousand tons)
- Beef Cows (23.3 thousand tons)

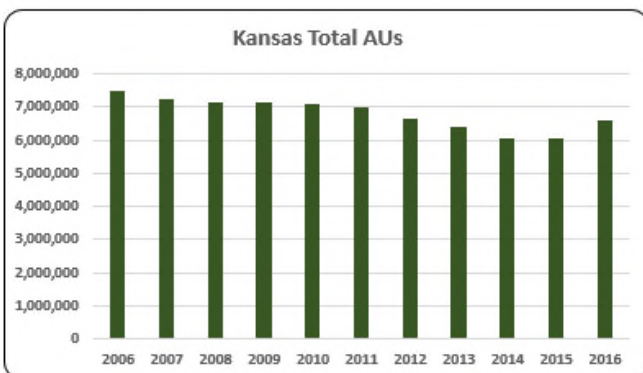
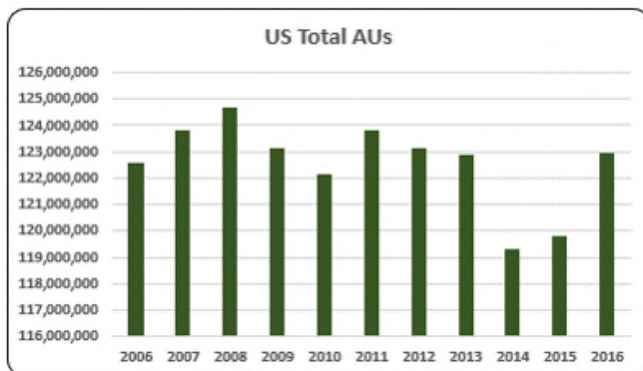


Kansas Animal Unit (AU) Trends

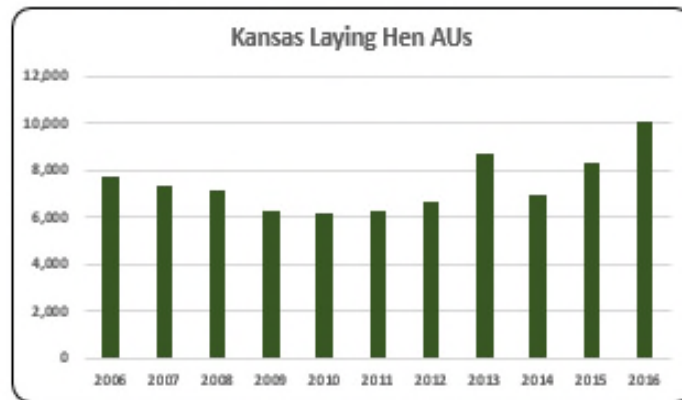
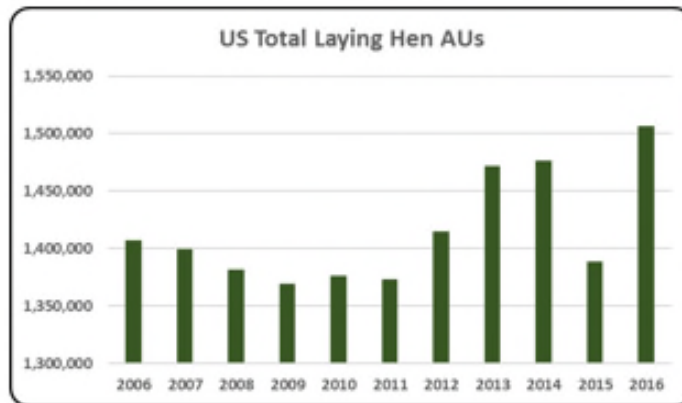
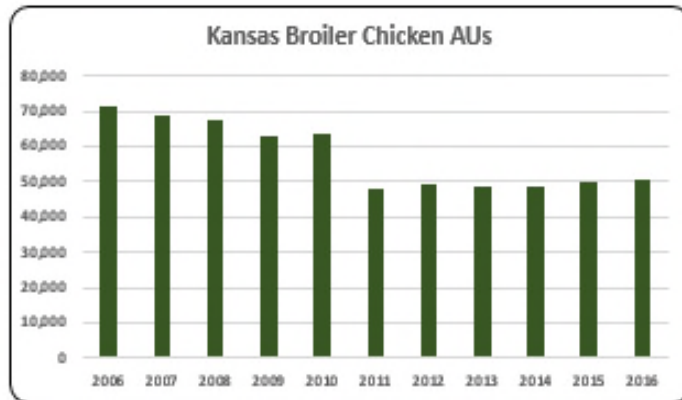
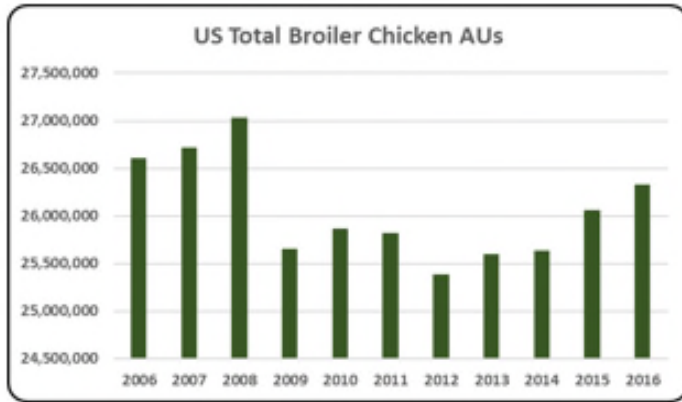
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Kansas. Due to this reality, using a single year as a measure of the presence and strength of a sector can be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

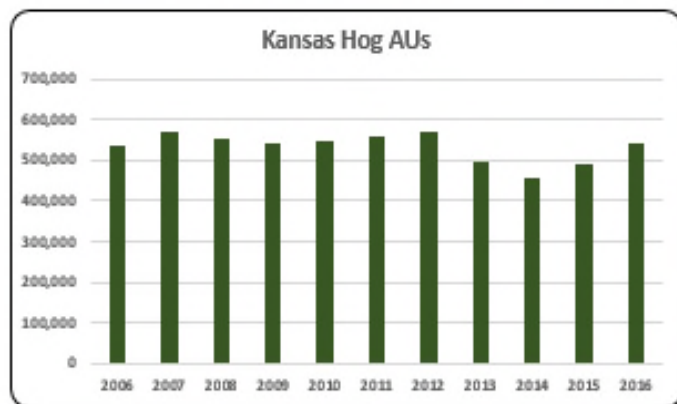
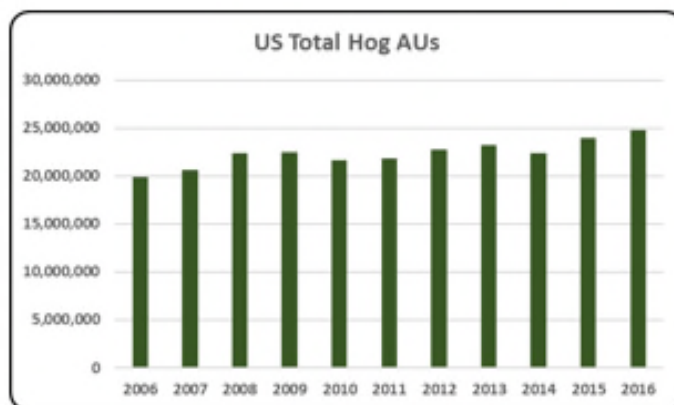
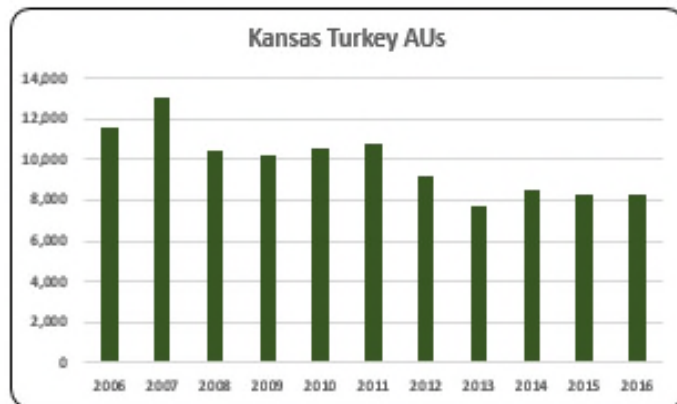
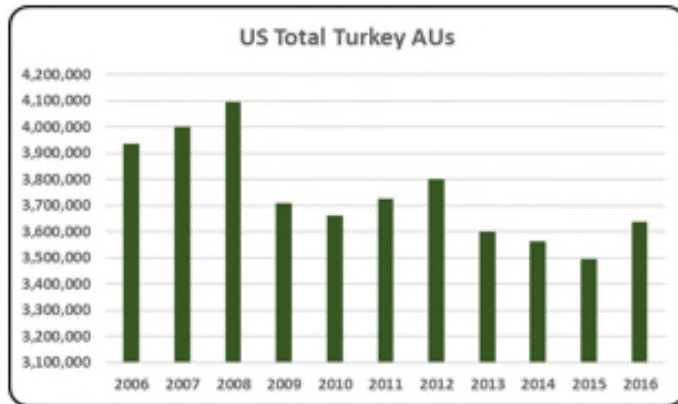
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Kansas, the largest three segments of animal agriculture in terms of AUs during 2016 were: Beef Cows (5,773,050 AUs), Hogs (540,600 AUs), and Dairy Cows (198,800 AUs). Total animal units in Kansas during 2016 were 6,581,078 AUs.



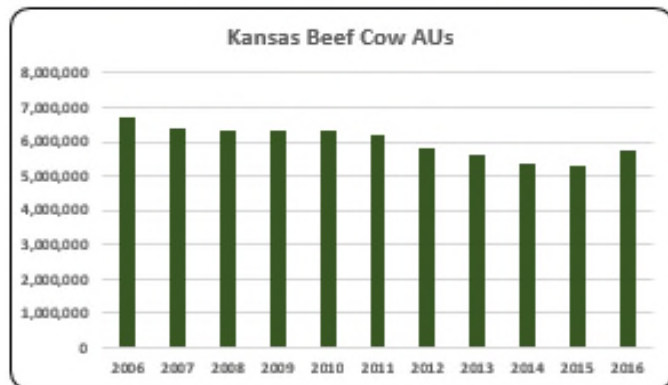
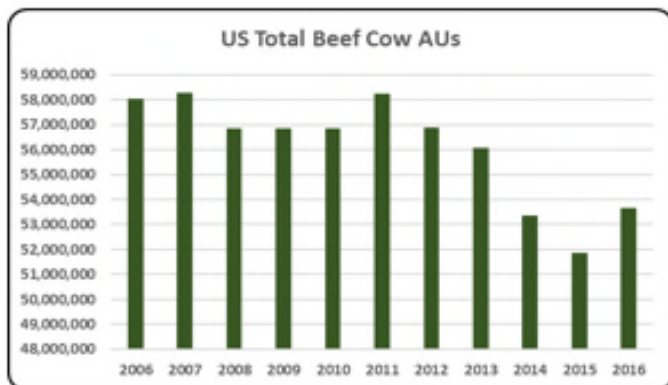
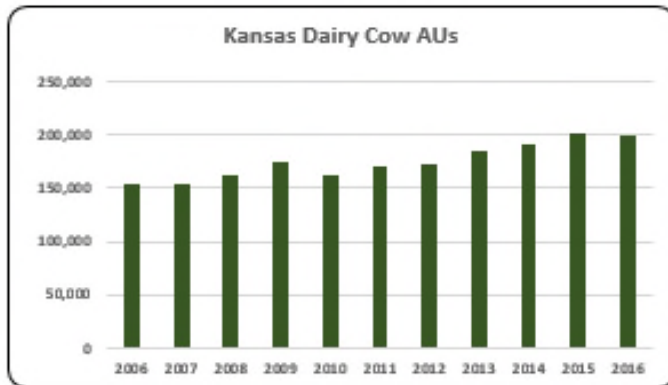
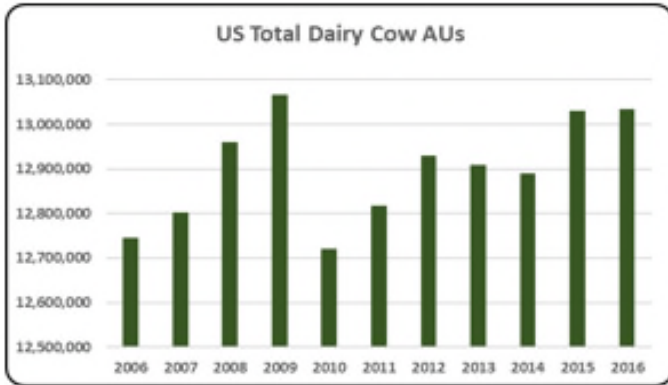
- U.S. total AUs have exhibited a downward trend since 2006, on average. From 2014-15 AUs were at all-time lows, a downward trend that began in 2011. From 2006-16 total U.S. AUs peaked in 2008. In 2016 total AUs showed an increase due to an increase in beef cow numbers.
- There were on average 6.8 million AUs in Kansas from 2006 to 2016. AUs have been declining during the past decade, however from 2015 to 2016 AUs increased 8.3% to 6.6 million in 2016.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average from 2006 to 2016, broiler chicken AUs were about 26.3 million. In 2016, broiler AUs rebounded 2.8% from the low AUs numbers in 2013 (a 730 thousand AU increase).
- Broiler numbers in Kansas have been shrunk since the beginning of the decade by 29% to 50,254 AUs in 2016.
- On average, the layer AUs during 2006-2016 were 1.4 million. In 2016, layer AUs were 1.5 million, up 7.8% from 2015. This drastic increase in 2016 was due to the recovery of major egg laying states from the avian influenza outbreak.
- On average there were 7,416 layer AUs in the state in the 2006 to 2016 decade.



- In 2016 turkey AUs were at 3.6 million, up 3.8% from the lowest year (2015) of the decade. Minnesota is the highest producing state in the country with nearly one-fourth of production. The cause of recent turkey AU lows are due, in part, to past outbreaks of avian influenza. However, numbers are rising.
- Despite the decreasing trend in turkey AUs in Kansas, last year turkey AUs were at 8,274.
- On average from 2006 to 2016, hog AUs were about 22.3 million. Hog AUs increased 16.7% to 24.8 million AUs compared to the decade low in 2006 (20.6 million AUs). Hog AUs have increased 300 thousand units per year since 2006.
- Hog AUs in 2016 (540,600) represent about 8.2% of all AUs present in the state. Hog AUs have rebounded since the 2013 decrease.



- From 2006 to 2016 dairy cow AUs averaged 12.9 million. In 2016, dairy cow AUs (13.0 million) again reached near the 2009 high of 13.1 million AUs. Milk supplies have steadily risen in the last decade.

- Kansas' dairy cow numbers have shown consistent growth during this decade with an increase from 154,000 dairy cow AUs in 2006 to 198,800 dairy cow AUs in 2016.

- From 2006 to 2016 beef cow AUs averaged 56.1 million. In 2016 beef cow AUs increased 3% from 2015 to 53.7 million. As many states begin to recover from the past years of drought.

- About 87.7% of all AUs in Kansas were beef cow AUs in 2016. Beef cow AUs have declined over the past decade in part due to long term drought.

Kansas Additional Information and Methodology

Animal agriculture is an important part of Kansas'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 2006-2016 time period
- Soybean meal usage by animal species during the 2015/16 soybean marketing year
- Animal Unit (AU) trends from 2006-2016

Given the long-term presence of animal agriculture in Kansas, of interest is the degree to which the industry impacts the Kansas economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Kansas 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 Kansas'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 2006-2016 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 Kansas which have occurred. As shown in this state report, Kansas 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 Kansas. 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 2015-16 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.

Kansas 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 Kansas’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 Kansas, \$1.77 to \$2.56 million in total economic activity, \$0.39 to \$0.52 in household wages and 9 to 11 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.526	\$ 0.490	9.8
	Hogs, Pigs, and Other	\$ 1.768	\$ 0.391	8.6
	Poultry and Eggs	\$ 2.560	\$ 0.519	10.3
	Dairy	\$ 2.354	\$ 0.507	10.7

Appendix

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Animal Units (AUs)	Beef Cattle AUs	6,725,475	6,419,475	6,323,475	6,323,475	6,323,475	6,192,150	5,832,150	5,628,150	5,340,150	5,279,850	5,773,050
	Hog and Pig AUs	535,350	569,550	555,450	544,200	546,750	558,000	572,250	497,250	458,400	489,600	540,600
	Broiler AUs	71,110	68,819	67,745	62,987	63,835	48,100	49,072	48,901	48,623	49,878	50,254
	Turkey AUs	11,587	13,003	10,394	10,181	10,605	10,794	9,214	7,686	8,485	8,302	8,274
	Egg Layer AUs	7,770	7,334	7,124	6,231	6,190	6,226	6,700	8,675	6,912	8,317	10,100
	Dairy AUs	154,000	154,000	161,000	175,000	162,400	170,800	172,200	184,800	190,400	200,200	198,800
	Total Animal Units	7,505,292	7,232,181	7,125,189	7,122,075	7,113,254	6,986,070	6,641,586	6,375,462	6,052,971	6,036,148	6,581,078
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 2,971,488	\$ 3,328,059	\$ 3,320,511	\$ 2,964,814	\$ 3,444,301	\$ 4,224,540	\$ 4,216,036	\$ 4,167,701	\$ 4,613,606	\$ 4,711,927	\$ 4,589,722
	Hogs and Pigs (\$1,000)	\$ 341,113	\$ 361,160	\$ 350,741	\$ 325,010	\$ 438,565	\$ 599,038	\$ 568,278	\$ 567,739	\$ 606,292	\$ 474,241	\$ 441,356
	Broilers (\$1,000)	\$ 46,607	\$ 53,110	\$ 54,260	\$ 46,814	\$ 48,922	\$ 42,831	\$ 48,896	\$ 59,579	\$ 62,503	\$ 54,528	\$ 46,960
	Turkeys (\$1,000)	\$ 11,982	\$ 14,795	\$ 12,764	\$ 11,625	\$ 14,628	\$ 16,270	\$ 15,091	\$ 11,949	\$ 13,460	\$ 14,351	\$ 13,649
	Eggs (\$1,000)	\$ 20,959	\$ 34,403	\$ 41,461	\$ 29,509	\$ 32,393	\$ 35,517	\$ 39,831	\$ 45,001	\$ 72,032	\$ 120,082	\$ 47,184
	Milk (\$1,000)	\$ 297,815	\$ 422,091	\$ 456,435	\$ 348,320	\$ 431,981	\$ 542,850	\$ 519,080	\$ 592,264	\$ 747,360	\$ 536,744	\$ 532,640
	Other	\$ 5,656	\$ 5,960	\$ 5,319	\$ 5,820	\$ 6,375	\$ 6,121	\$ 7,291	\$ 6,214	\$ 7,122	\$ 7,676	\$ 7,484
	Sheep and Lambs (\$1,000)	\$ 5,285	\$ 5,560	\$ 4,891	\$ 5,363	\$ 5,889	\$ 5,607	\$ 6,747	\$ 5,642	\$ 6,522	\$ 7,047	\$ 6,826
	Aquaculture (\$1,000)	\$ 371	\$ 400	\$ 428	\$ 457	\$ 486	\$ 515	\$ 543	\$ 572	\$ 601	\$ 630	\$ 658
	Total (\$1,000)	\$ 3,695,620	\$ 4,219,577	\$ 4,241,491	\$ 3,731,913	\$ 4,417,166	\$ 5,467,167	\$ 5,414,502	\$ 5,450,447	\$ 6,122,376	\$ 5,919,549	\$ 5,678,995

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	19,839	20,314	18,708	15,991	
	Cattle feedlots (112112)	1,331	1,506	894	492	
	Dairy cattle and milk production (11212)	764	608	523	398	
	Hog and pig farming (1122)	1,098	634	618	348	
	Poultry and egg production (1123)	256	299	691	385	
	Sheep and goat farming (1124)	437	497	782	946	
	Animal aquaculture and other animal production (1125,1129)	1,894	3,110	3,493	3,484	
Value of Sales (\$1,000)	Cattle and Calves	5,437,006	5,715,204	8,542,872	10,153,087	
	Hogs and Pigs	297,492	297,505	506,448	697,020	
	Poultry and Eggs	48,014	withheld	69,807	88,403	
	Milk and Other Dairy Products	155,047	248,542	376,511	482,765	
	Aquaculture	withheld	745	2,228	4,997	
	Other (calculated)	23,063	65,801	28,105	33,581	
	Total	5,960,622	6,327,797	9,525,971	11,459,853	
Input Purchases	Livestock and poultry purchased	(Farms)	19,518	16,103	15,145	16,190
		\$1,000	2,687,621	3,554,091	5,192,954	5,440,898
	Breeding livestock purchased	(Farms)	<i>n/a</i>	9,506	9,558	10,480
		\$1,000	<i>n/a</i>	60,943	150,517	206,584
	Other livestock and poultry purchased	(Farms)	<i>n/a</i>	8,750	7,797	8,352
		\$1,000	<i>n/a</i>	3,493,148	5,042,438	5,234,314
	Feed purchased	(Farms)	32,955	33,531	29,672	32,131
	\$1,000	1,506,407	1,410,837	2,237,287	4,207,051	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2016 Animal Agriculture	Cattle and Calves	\$ 11,591,802	\$ 2,247,587	44,938	\$ 524,812
	Hogs, Pigs, and Other	\$ 793,549	\$ 175,317	3,851	\$ 40,937
	Poultry and Eggs	\$ 275,917	\$ 55,977	1,111	\$ 13,071
	Dairy	\$ 1,253,568	\$ 269,835	5,674	\$ 63,007
	Total	\$ 13,914,837	\$ 2,748,716	55,574	\$ 641,825
Change from 2006 to 2016	Cattle and Calves	\$ 2,613,128	\$ 506,671	10,130	\$ 118,308
	Hogs, Pigs, and Other	\$ 60,057	\$ 13,268	291	\$ 3,098
	Poultry and Eggs	\$ 32,310	\$ 6,555	130	\$ 1,531
	Dairy	\$ 415,008	\$ 89,332	1,878	\$ 20,859
	Total	\$ 3,120,502	\$ 615,826	12,430	\$ 143,795
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.526	\$ 0.490	9.8	
	Hogs, Pigs, and Other	\$ 1.768	\$ 0.391	8.6	
	Poultry and Eggs	\$ 2.560	\$ 0.519	10.3	
	Dairy	\$ 2.354	\$ 0.507	10.7	
Tax Rates	Federal effective income tax rate			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			3.7%	
	Total			23.4%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.