

Economic Analysis of Animal Agriculture 2005-2015

SOUTH DAKOTA

A Report for
United Soybean Board



September 2016



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South Dakota Executive Summary

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

- \$7.8 billion in economic output
- 34,216 jobs
- \$1.6 billion in earnings
- \$333.8 million in income taxes paid at local, state, and federal levels
- \$197.1 million in the form of property taxes

Plus, from 2005-2015 animal agriculture in South Dakota has increased economic output by over \$1.9 billion, boosted household earnings by \$405.0 million, contributed 8,485 additional jobs and paid \$82.3 million in additional tax revenues.

South Dakota's animal agriculture consumed almost 331.6 thousand tons of soybean meal in 2015. This soybean meal was fed primarily to:

- Hogs (217.4 thousand tons)
- Beef Cows (39.5 thousand tons)
- Turkeys (36.4 thousand tons)

This report examines animal agriculture in South Dakota 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 South Dakota, 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 South Dakota and beyond.

South Dakota Economic Impact of Animal Agriculture

Animal agriculture is an integral part of South Dakota’s economy. In 2015, South Dakota’s animal agriculture contributed the following to the economy:

- About \$7.8 billion in economic output
- \$1.6 billion in household earnings
- 34,216 jobs
- \$333.8 million in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade South Dakota’s animal agriculture has:

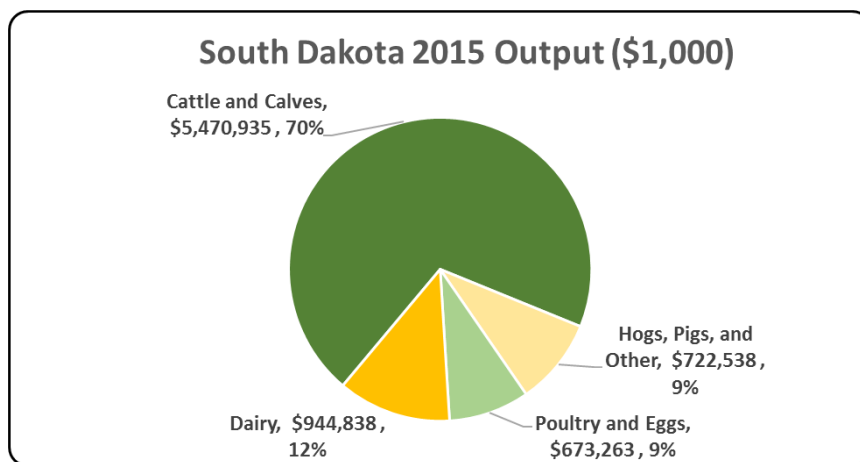
- Increased economic output by \$1.9 billion
- Boosted household earnings by \$405.0 million
- Added 8,485 jobs
- Paid an additional \$82.3 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2015	Change 2005-2015	% Change 2005-2015
Output (\$1,000)	\$ 7,811,575	\$ 1,927,073	32.75%
Earnings (\$1,000)	\$ 1,642,027	\$ 405,012	32.74%
Employment (Jobs)	34,216	8,485	32.97%
Income Taxes Paid (\$1,000)	\$ 333,824	\$ 82,339	32.74%
Property Taxes Paid in 2012 (\$1,000)	\$ 197,123		

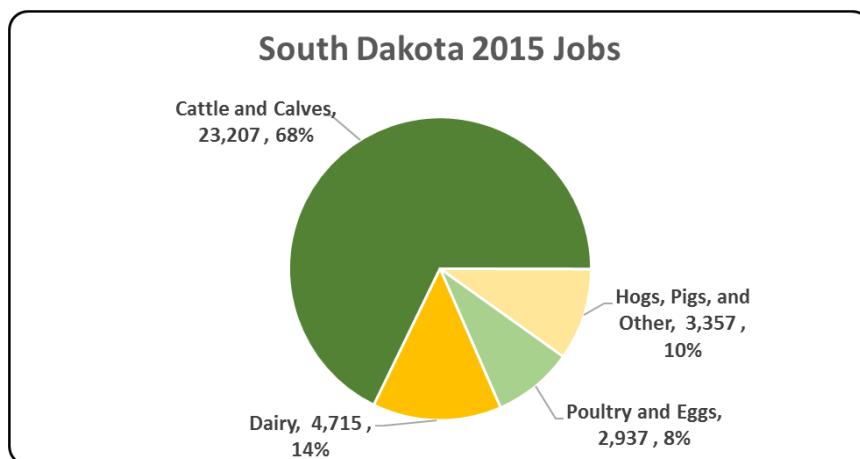
South Dakota Output

“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 South Dakota economy. Animal agriculture’s impact on South Dakota total economic output is about \$7.8 billion.



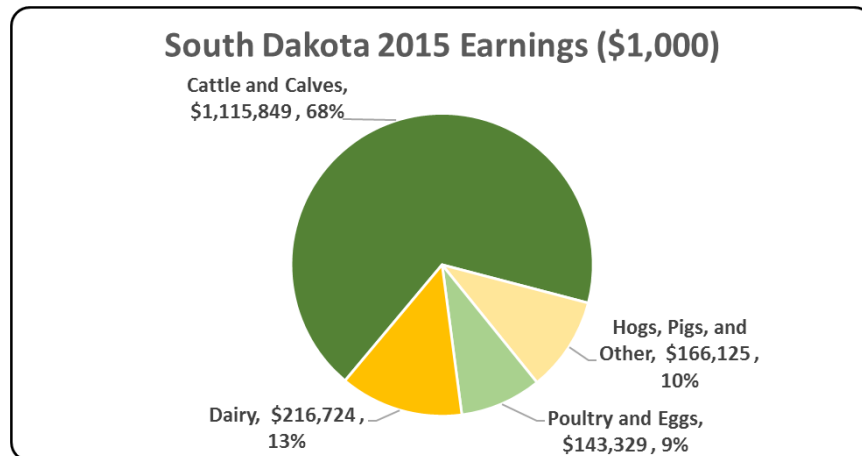
South Dakota Jobs

“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 South Dakota in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to South Dakota total jobs, contributing 36,307 jobs within and outside of animal agriculture.



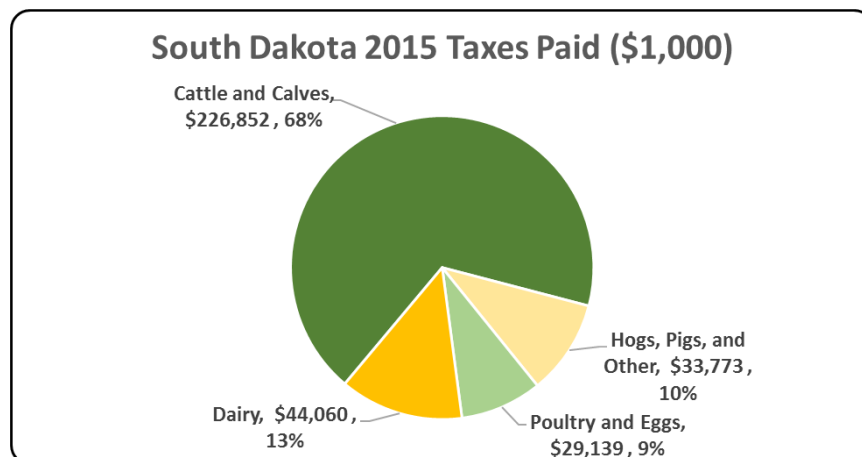
South Dakota Earnings

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 South Dakota economy in terms of earnings. South Dakota’s animal agriculture contributed about \$1.6 billion to household earnings in 2015.



South Dakota Taxes Paid by Animal Agriculture

South Dakota’s animal agriculture is also a significant source of tax revenue. In 2015, the state’s animal agriculture industry paid about \$333.8 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$197.1 million in property taxes paid by all of South Dakota agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



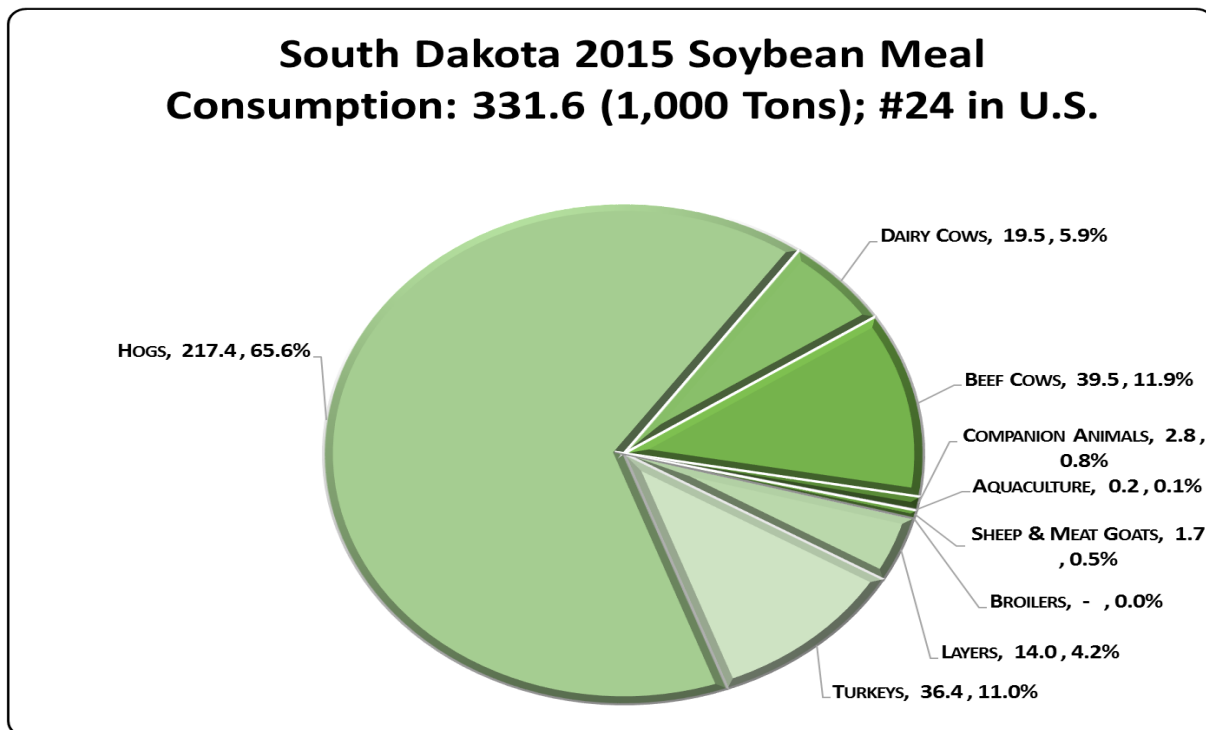
South Dakota Animal Agriculture Soybean Meal Consumption

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.

South Dakota’s animal agriculture consumed almost 331.6 thousand tons of soybean meal in 2015, placing the state as #24 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 (217.4 thousand tons)
- Beef Cows (39.5 thousand tons)
- Turkeys (36.4 thousand tons)

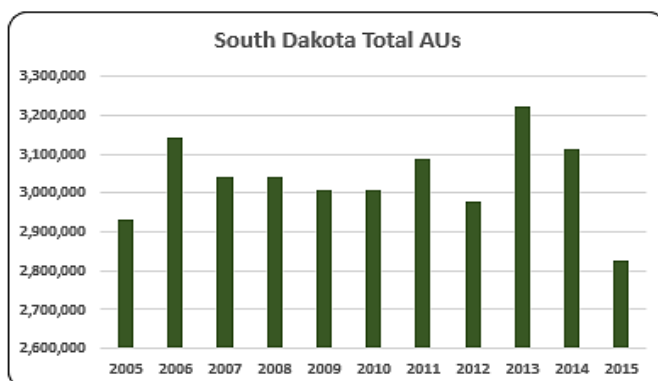
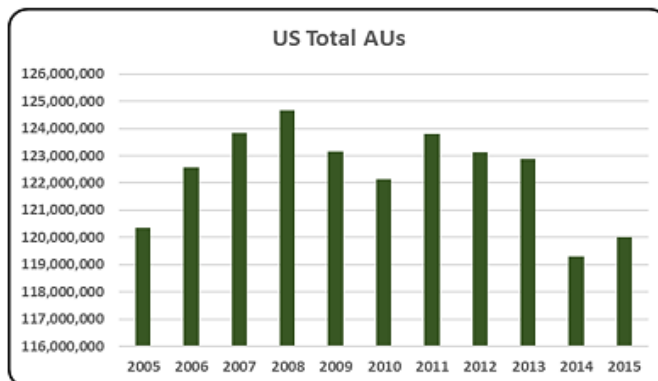


South Dakota Animal Unit (AU) Trends

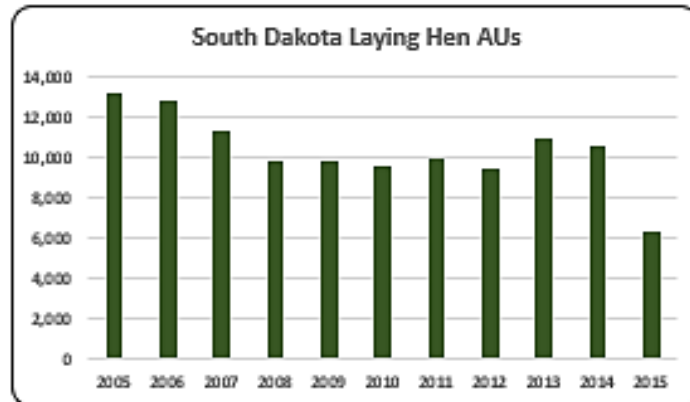
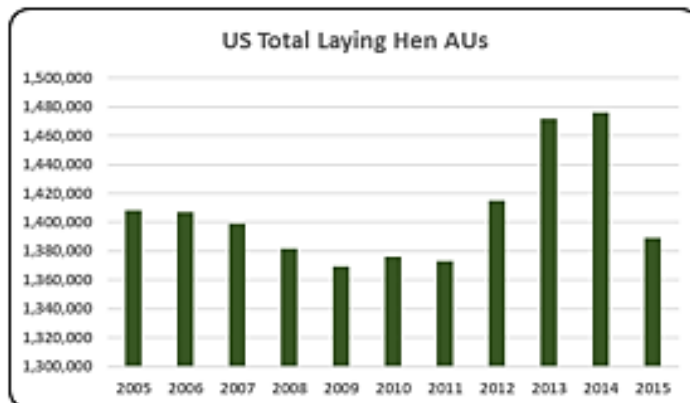
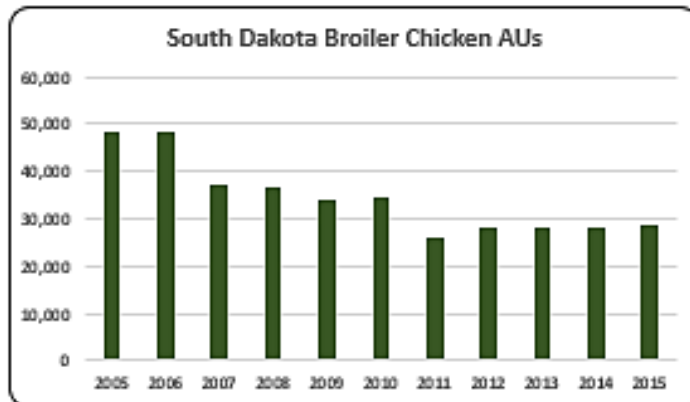
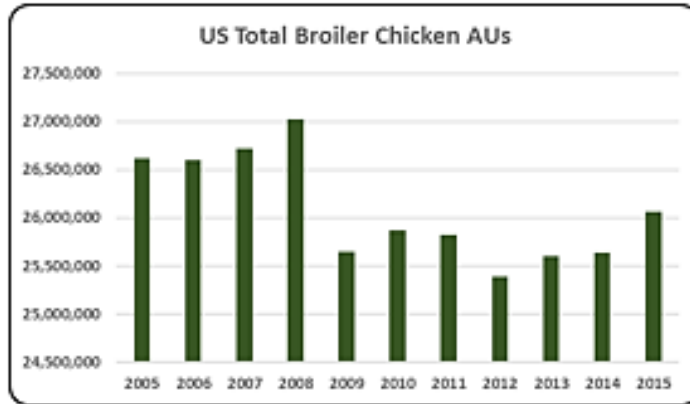
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of South Dakota. Due to this reality, using a single year as a measure of the presence and strength of a sector 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 South Dakota and to give perspective on South Dakota'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 South Dakota, the largest three segments of animal agriculture in terms of AUs during 2015 were: Beef Cows (1.95 million AUs), Hogs (638,550 AUs), and Dairy Cows (138,600 AUs). Total animal units in South Dakota during 2015 were 2.8 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.
- There were 2.8 million AUs in South Dakota in 2015. In 2013 there was a record animal production of 3.2 million AUs. Overall animal numbers decreased 4% from 2005 to 2015.

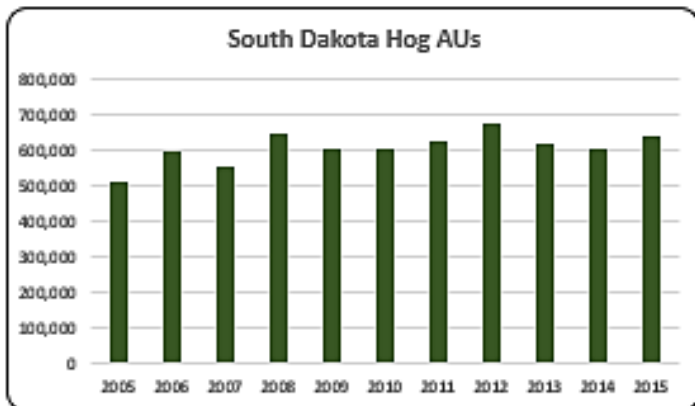
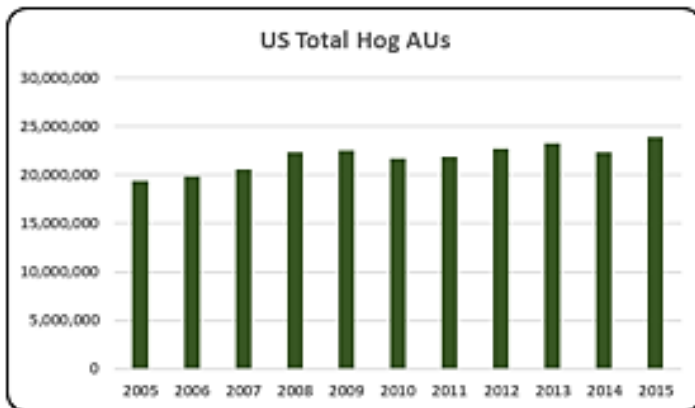
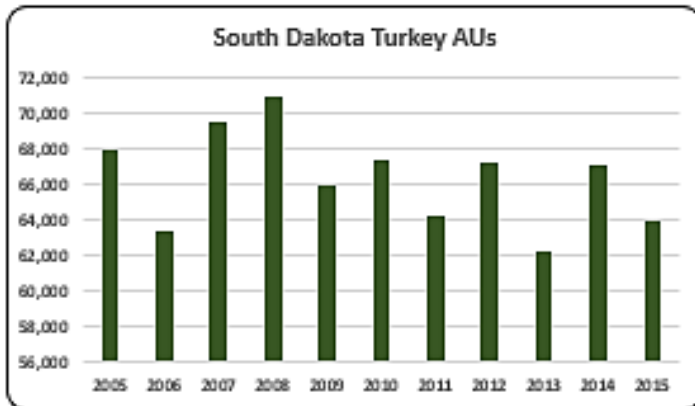
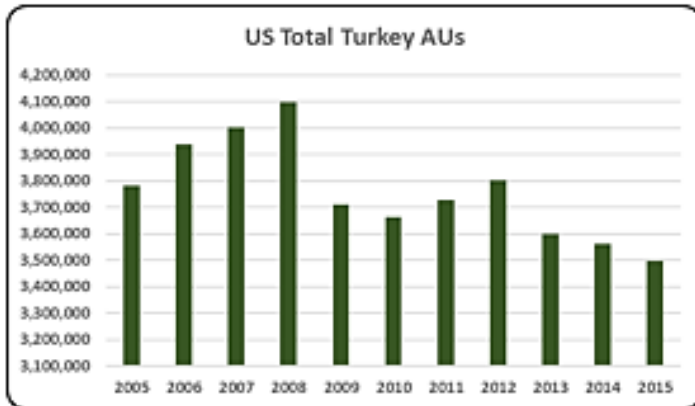


- U.S. broiler production is clustered in a number of states, with Georgia being the largest producer. On average from 2005 to 2015, broiler chicken AUs were about 26.0 million. In 2015, AUs rebounded 3% from the low AUs numbers in 2012 (25.4 million AUs).

- There were 48,511 broiler AUs in 2005 in contrast to 28,740 broiler AUs in 2015. Broiler production declined 41% between those years.

- 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.

- Layer production was the smallest animal production in South Dakota during the last decade. There were 6,350 layer AUs in 2015 declining 52% compared to 2005 (13,200 AUs).

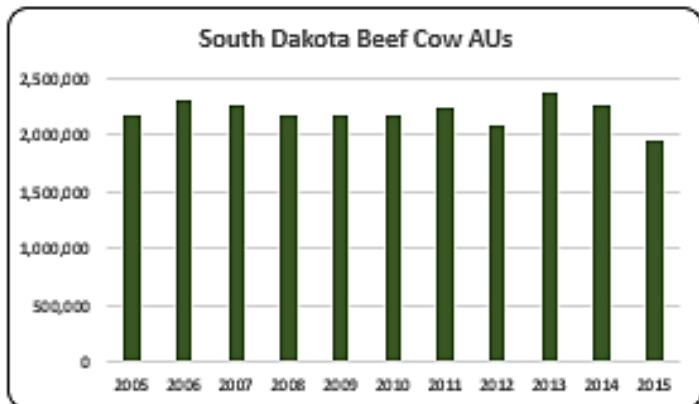
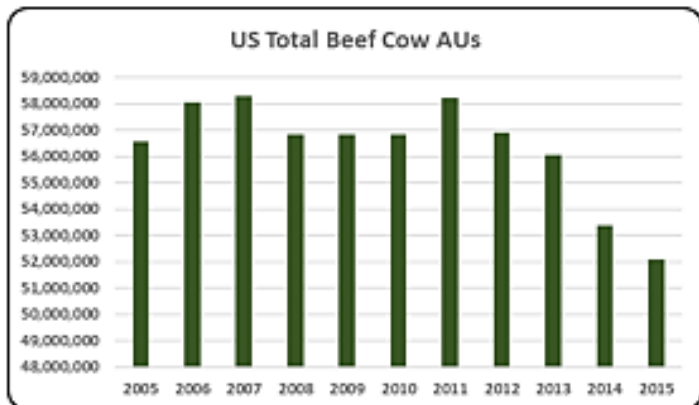
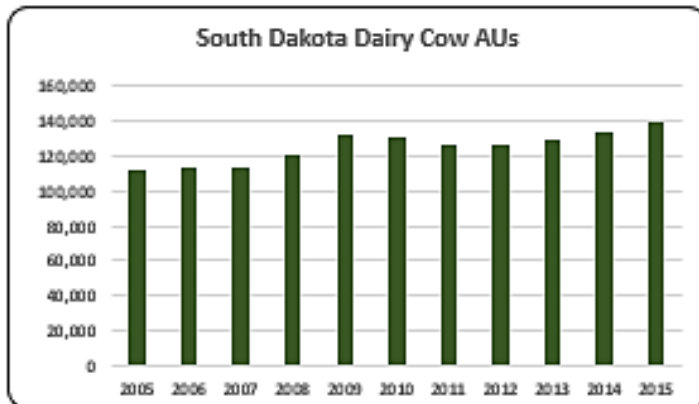
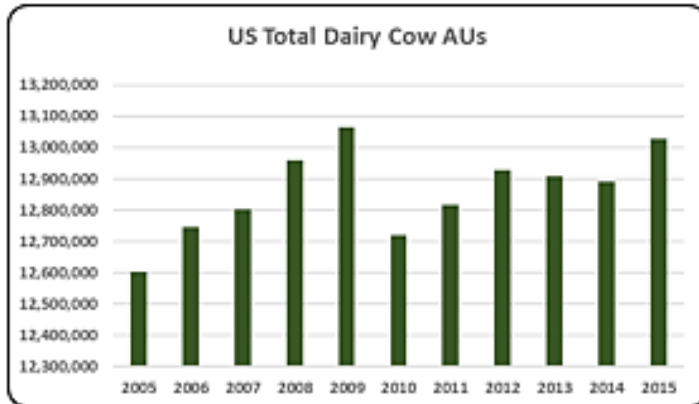


- In 2015 turkey AUs were the lowest of the decade at 3.5 million, decreasing 15% compared to 2008 (4.1 million turkey AUs) the largest turkey AUs of the decade. The most recent contributor to this decline has been avian influenza.

- Turkey production fluctuated throughout the decade from a high in 2008 (70,956 turkey AUs) to a low in 2013 (62,276 turkey AUs). Turkey production average for the decade was 66,325 AUs.

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

- Hog production in 2015 (638,550 hog AUs) represented 22.58% of animal production in South Dakota. Hog production in 2015 increased 25% relative to the level in 2005 (512,625 hog AUs).



- 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.

- There were 138,600 dairy cow AUs in 2015. Production in 2015 increased 4% compared to 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 cow production was the most important animal production in South Dakota accounting for 69.02% (1.95 million beef cow AUs) of all South Dakota AUs in 2015.

South Dakota Additional Information and Methodology

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

South Dakota 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 South Dakota’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 South Dakota, \$1.66 to \$2.67 million in total economic activity, \$0.38 to \$0.57 in household wages and 8 to 12 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.288	\$ 0.467	9.7
	Hogs, Pigs, and Other	\$ 1.665	\$ 0.383	7.7
	Poultry and Eggs	\$ 2.671	\$ 0.569	11.7
	Dairy	\$ 2.165	\$ 0.497	10.8

Appendix

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Animal Units (AUs)	Beef Cattle AUs	2,176,500	2,313,600	2,256,450	2,160,900	2,160,900	2,160,900	2,234,850	2,076,300	2,373,600	2,269,950	1,951,800
	Hog and Pig AUs	512,625	592,575	551,700	644,250	604,500	605,850	627,000	671,700	618,750	603,600	638,550
	Broiler AUs	48,511	48,184	37,023	36,445	33,886	34,341	25,877	28,276	28,177	28,017	28,740
	Turkey AUs	67,856	63,347	69,456	70,956	65,939	67,292	64,270	67,196	62,276	67,043	63,938
	Egg Layer AUs	13,200	12,784	11,236	9,820	9,744	9,544	9,936	9,419	10,931	10,602	6,350
	Dairy AUs	112,000	113,400	113,400	120,400	131,600	130,200	126,000	126,000	128,800	133,000	138,600
	Total Animal Units	2,930,693	3,143,890	3,039,265	3,042,772	3,006,569	3,008,127	3,087,932	2,978,891	3,222,535	3,112,211	2,827,979
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,518,470	\$ 1,488,334	\$ 1,409,731	\$ 1,400,531	\$ 1,317,554	\$ 1,569,641	\$ 1,749,748	\$ 1,952,711	\$ 1,938,119	\$ 2,538,536	\$ 2,390,934
	Hogs and Pigs (\$1,000)	\$ 331,308	\$ 347,125	\$ 320,577	\$ 348,707	\$ 292,574	\$ 417,399	\$ 529,653	\$ 532,239	\$ 503,056	\$ 537,480	\$ 413,253
	Broilers (\$1,000)	\$ 40,766	\$ 31,581	\$ 28,572	\$ 29,190	\$ 25,185	\$ 26,319	\$ 23,042	\$ 28,174	\$ 34,330	\$ 36,015	\$ 31,420
	Turkeys (\$1,000)	\$ 50,449	\$ 60,841	\$ 73,481	\$ 89,363	\$ 78,259	\$ 109,925	\$ 121,768	\$ 134,005	\$ 111,111	\$ 137,870	\$ 147,065
	Eggs (\$1,000)	\$ 20,460	\$ 26,312	\$ 51,420	\$ 55,752	\$ 37,936	\$ 37,696	\$ 44,110	\$ 44,576	\$ 57,804	\$ 63,348	\$ 73,589
	Milk (\$1,000)	\$ 219,861	\$ 197,155	\$ 313,431	\$ 343,036	\$ 261,096	\$ 310,860	\$ 387,711	\$ 393,600	\$ 424,830	\$ 521,170	\$ 436,415
	Other	\$ 29,128	\$ 23,384	\$ 24,973	\$ 22,382	\$ 21,161	\$ 27,345	\$ 22,911	\$ 22,392	\$ 21,873	\$ 21,353	\$ 20,834
	Sheep and Lambs (\$1,000)	\$ 28,644	\$ 22,806	\$ 24,302	\$ 21,617	\$ 20,302	\$ 26,393	\$ 21,865	\$ 21,253	\$ 20,640	\$ 20,027	\$ 19,414
	Aquaculture (\$1,000)	\$ 484	\$ 578	\$ 671	\$ 765	\$ 859	\$ 952	\$ 1,046	\$ 1,139	\$ 1,233	\$ 1,327	\$ 1,420
	Total (\$1,000)	\$ 2,210,442	\$ 2,174,732	\$ 2,222,185	\$ 2,288,961	\$ 2,033,764	\$ 2,499,185	\$ 2,878,943	\$ 3,107,698	\$ 3,091,122	\$ 3,855,772	\$ 3,513,510

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,957	10,702	9,031	8,288
	Cattle feedlots (112112)	977	1,463	794	646
	Dairy cattle and milk production (11212)	932	662	348	276
	Hog and pig farming (1122)	868	493	313	223
	Poultry and egg production (1123)	89	125	274	186
	Sheep and goat farming (1124)	751	710	706	690
	Animal aquaculture and other animal production (1125,1129)	1,135	2,076	2,094	2,809
Value of Sales (\$1,000)	Cattle and Calves	1,333,193	1,693,838	2,307,618	2,968,996
	Hogs and Pigs	282,598	withheld	381,360	446,756
	Poultry and Eggs	73,683	70,820	140,798	182,076
	Milk and Other Dairy Products	167,213	156,498	279,765	374,490
	Aquaculture	996	withheld	3,108	2,498
	Other (calculated)	62,009	337,559	74,304	98,859
	Total	1,919,692	2,258,715	3,186,953	4,073,675
Input Purchases	Livestock and poultry purchased	(Farms) 12,882	11,307	10,196	11,987
		\$1,000 452,194	580,920	881,582	978,174
	Breeding livestock purchased	(Farms) <i>n/a</i>	8,111	7,637	8,959
		\$1,000 <i>n/a</i>	64,732	160,850	205,411
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	5,317	4,644	5,537
		\$1,000 <i>n/a</i>	516,188	720,732	772,763
Feed purchased	(Farms) 19,837	19,389	15,462	18,795	
	\$1,000 369,705	433,345	617,725	1,282,133	

	2015 Animal Agriculture				
	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2015 Animal Agriculture	Cattle and Calves	\$ 5,470,935	\$ 1,115,849	23,207	\$ 226,852
	Hogs, Pigs, and Other	\$ 722,538	\$ 166,125	3,357	\$ 33,773
	Poultry and Eggs	\$ 673,263	\$ 143,329	2,937	\$ 29,139
	Dairy	\$ 944,838	\$ 216,724	4,715	\$ 44,060
	Total	\$ 7,811,575	\$ 1,642,027	34,216	\$ 333,824
Change from 2005 to 2015	Cattle and Calves	\$ 1,254,189	\$ 255,804	5,320	\$ 52,005
	Hogs, Pigs, and Other	\$ (5,559)	\$ (1,278)	(26)	\$ (260)
	Poultry and Eggs	\$ 311,279	\$ 66,267	1,358	\$ 13,472
	Dairy	\$ 367,164	\$ 84,219	1,832	\$ 17,122
	Total	\$ 1,927,073	\$ 405,012	8,485	\$ 82,339
	RIMS II Multipliers				
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 2.288	\$ 0.467	9.7	
	Hogs, Pigs, and Other	\$ 1.665	\$ 0.383	7.7	
	Poultry and Eggs	\$ 2.671	\$ 0.569	11.7	
	Dairy	\$ 2.165	\$ 0.497	10.8	
Tax Rates	Federal effective income tax rate			12.7%	
	Federal Social Security tax rate			7.7%	
	State Effective Rate			0.0%	
	Total			20.3%	

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.