

Economic Analysis of Animal Agriculture 2005-2015

VIRGINIA

**A Report for
United Soybean Board**



September 2016



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Virginia Executive Summary

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

- \$4.7 billion in economic output
- 21,744 jobs
- \$971.1 million in earnings
- \$253.3 million in income taxes paid at local, state, and federal levels
- \$110.2 million in the form of property taxes

Plus, from 2005-2015 animal agriculture in Virginia has increased economic output by over \$717.8 million, boosted household earnings by \$144.8 million, contributed 3,200 additional jobs and paid \$37.8 million in additional tax revenues.

Virginia's animal agriculture consumed almost 522.4 thousand tons of soybean meal in 2015. This soybean meal was fed primarily to:

- Broilers (308.8 thousand tons)
- Turkeys (144.1 thousand tons)
- Dairy Cows (25.4 thousand tons)

This report examines animal agriculture in Virginia 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 Virginia, many opportunities and challenges will arise. It is expected that animal agriculture will continue to be a contributor to the economic well-being of the people of Virginia and beyond.

Virginia Economic Impact of Animal Agriculture

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

- About \$4.7 billion in economic output
- \$971.1 million in household earnings
- 21,744 jobs
- \$253.3 million in income taxes

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

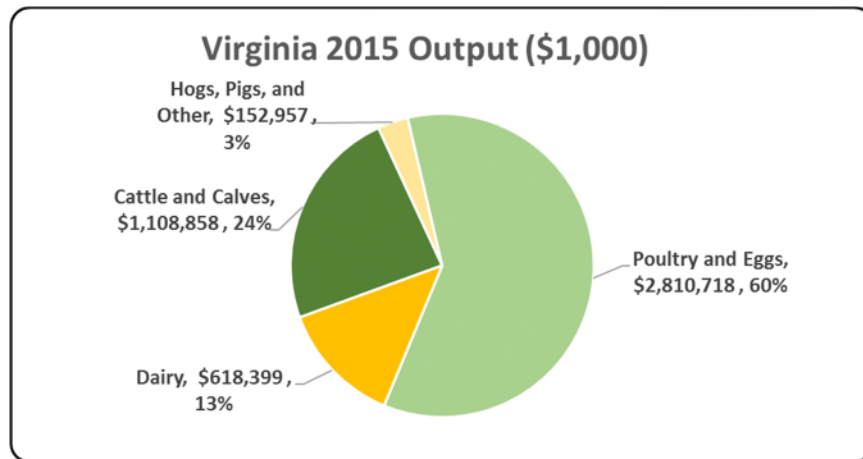
- Increased economic output by \$717.8 million
- Boosted household earnings by \$144.8 million
- Added 3,200 jobs
- Paid an additional \$37.8 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2015	Change 2005-2015	% Change 2005-2015
Output (\$1,000)	\$ 4,690,931	\$ 717,836	18.07%
Earnings (\$1,000)	\$ 971,055	\$ 144,803	17.53%
Employment (Jobs)	21,744	3,200	17.26%
Income Taxes Paid (\$1,000)	\$ 253,251	\$ 37,765	17.53%
Property Taxes Paid in 2012 (\$1,000)	\$ 110,161		

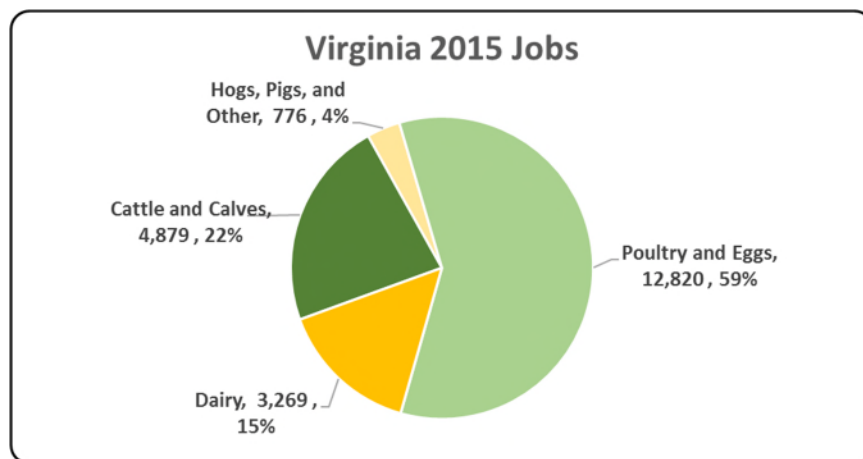
Virginia Output

“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 Virginia economy. Animal agriculture’s impact on Virginia total economic output is about \$4.7 billion.



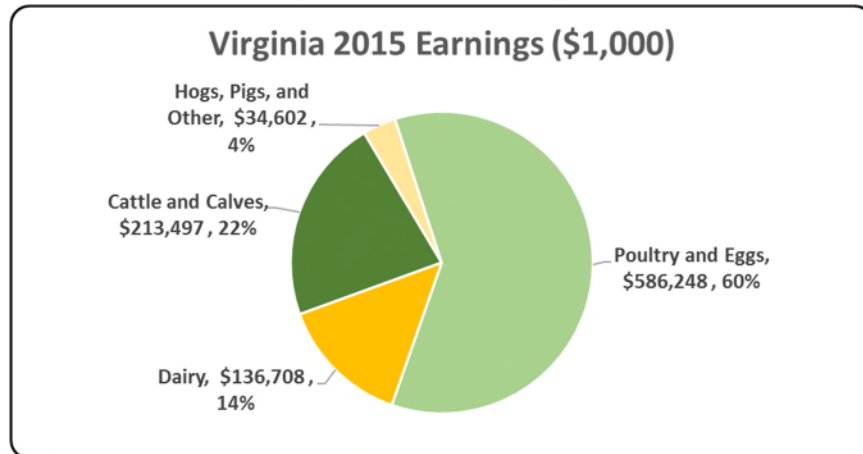
Virginia Jobs

“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 Virginia in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Virginia total jobs, contributing 21,744 jobs within and outside of animal agriculture.



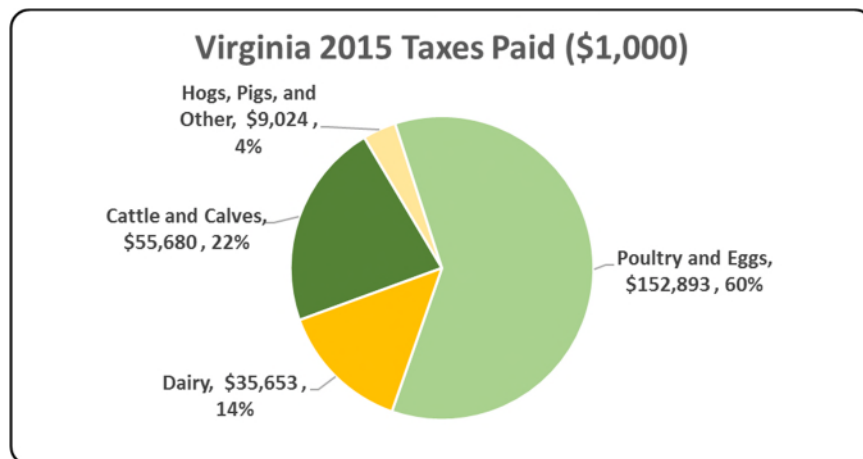
Virginia Earnings

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 Virginia economy in terms of earnings. Virginia’s animal agriculture contributed about \$971.1 million to household earnings in 2015.



Virginia Taxes Paid by Animal Agriculture

Virginia’s animal agriculture is also a significant source of tax revenue. In 2015, the state’s animal agriculture industry paid about \$253.3 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$110.2 million in property taxes paid by all of Virginia agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



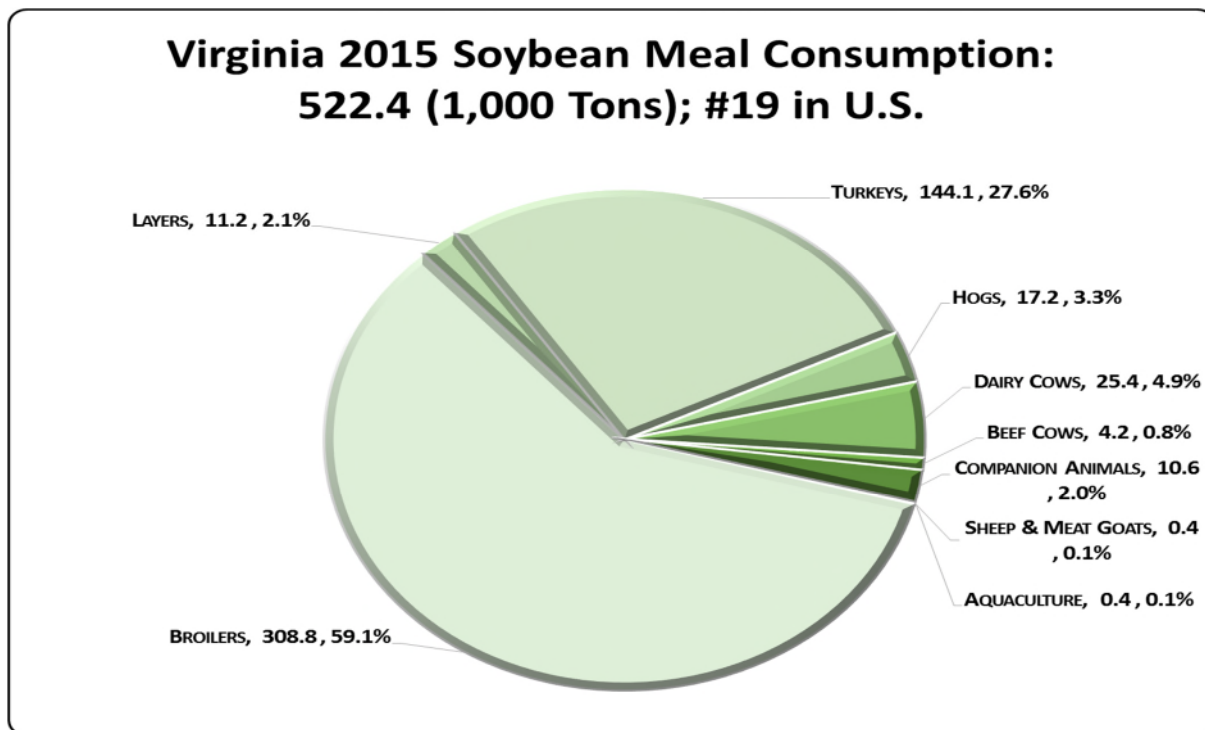
Virginia Animal Agriculture Soybean Meal Consumption

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.

Virginia's animal agriculture consumed almost 522.4 thousand tons of soybean meal in 2015, placing the state as #19 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 (308.8 thousand tons)
- Turkeys (144.1 thousand tons)
- Dairy Cows (25.4 thousand tons)

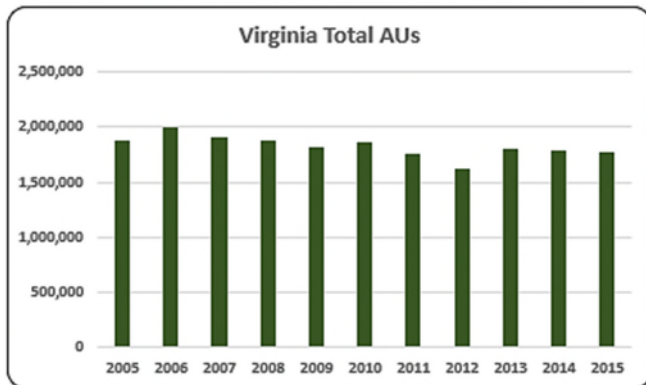
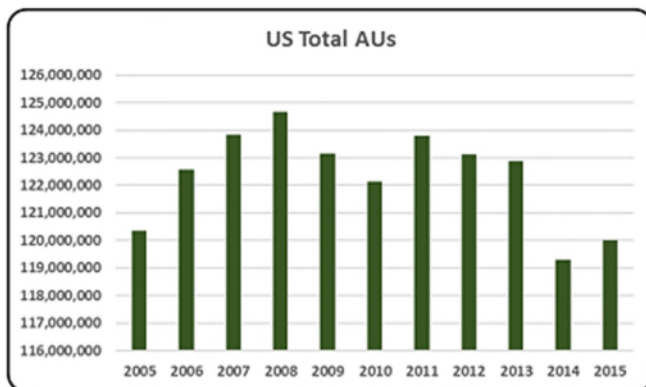


Virginia Animal Unit (AU) Trends

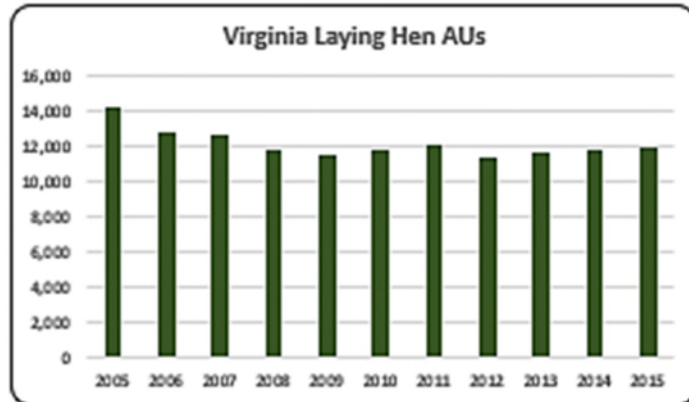
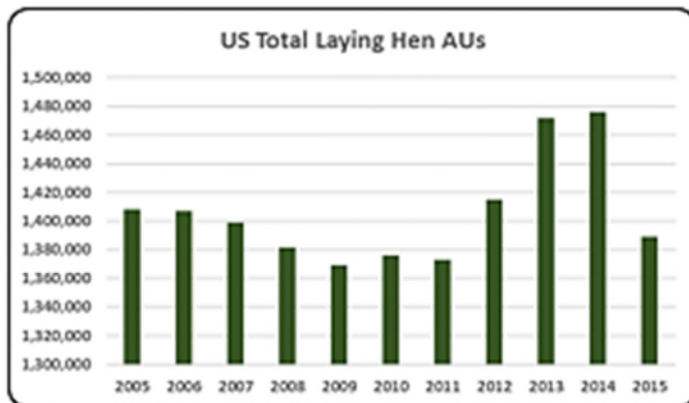
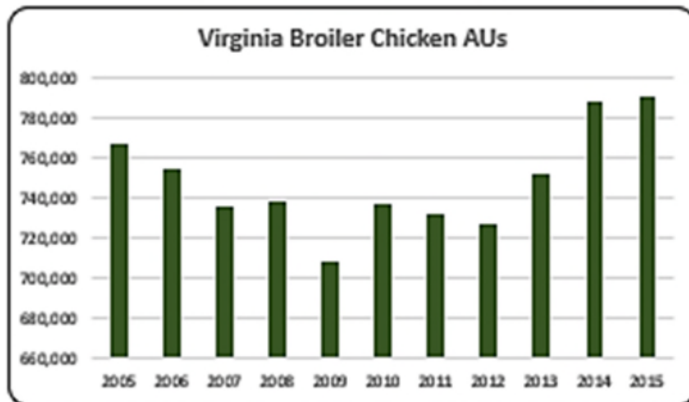
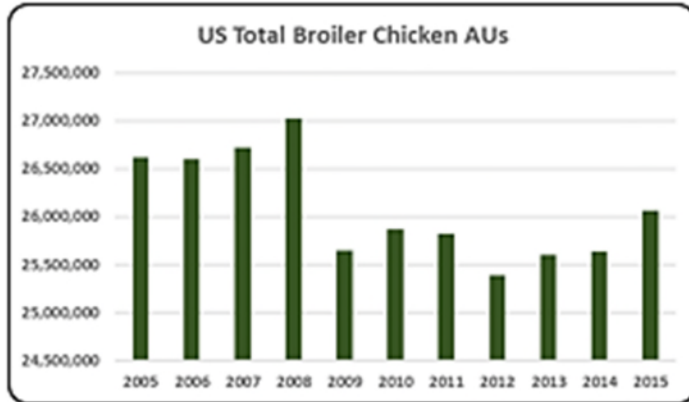
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Virginia. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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 Virginia and to give perspective on Virginia’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 Virginia, the largest three segments of animal agriculture in terms of AUs during 2015 were: Broilers (789,866 AUs), Beef Cows (530,475 AUs), and Turkeys (252,777 AUs). Total animal units in Virginia during 2015 were 1.8 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.
- Virginia animal inventory in 2015 was 1.8 million AUs which makes up 1.52% of all AUs in the country.

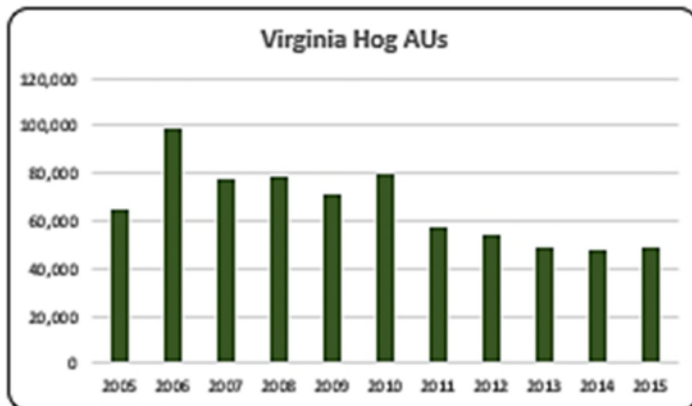
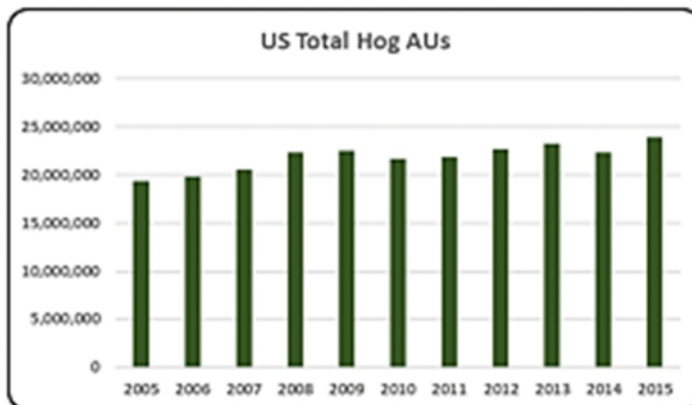
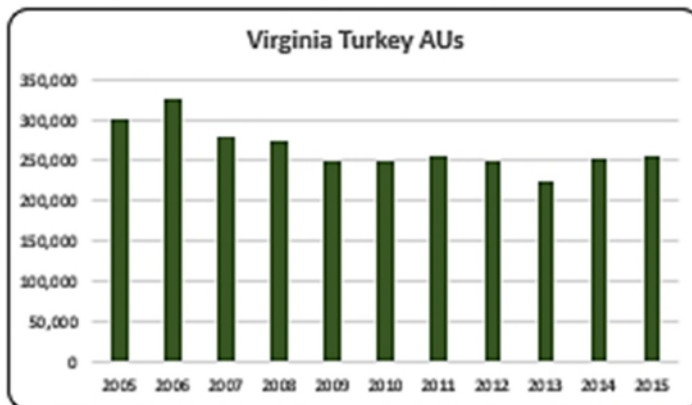
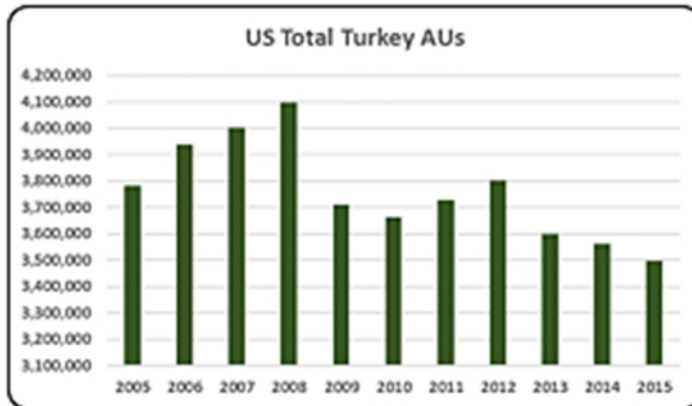


- U.S. broiler production is clustered in a number of states, with Georgia being the largest producer. On average from 2005 to 2015, broiler chicken AUs were about 26.0 million. In 2015, AUs rebounded 3% from the low AUs numbers in 2012 (25.4 million AUs).

- Broiler production was the largest animal production in Virginia. In 2015, 44.8% (789,866 broiler AUs) of all AUs were concentrated in broiler production. Broiler production in 2015 was record high increasing 3% throughout the decade.

- 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.

- Less than 1% (11,870 layer AUs) of all AUs in Virginia were in layer production in 2015. Layer production in 2015 dropped 16% relative to 2005 (14,120 layer AUs).

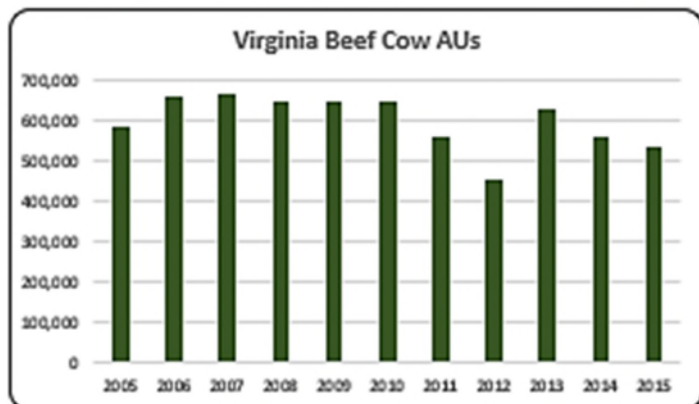
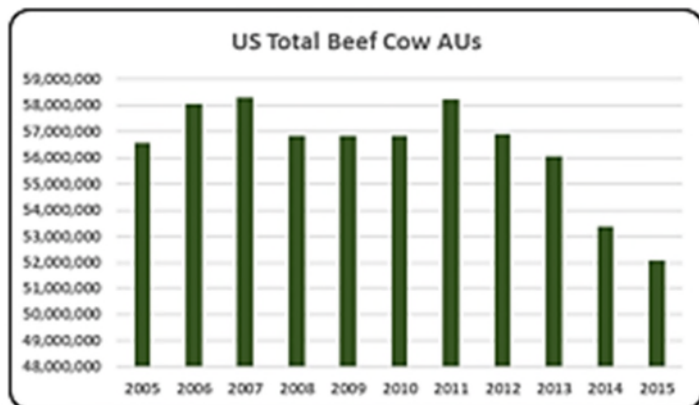
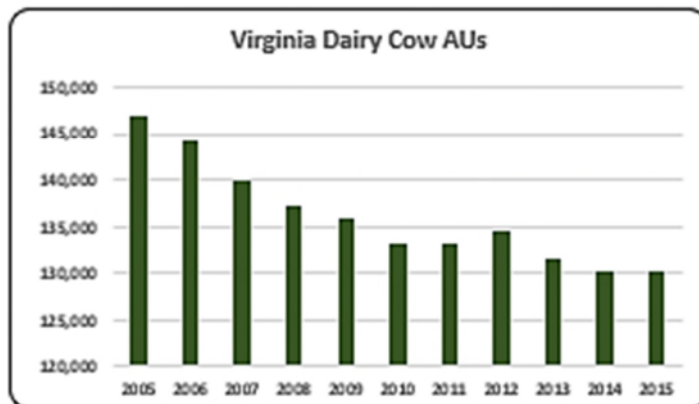
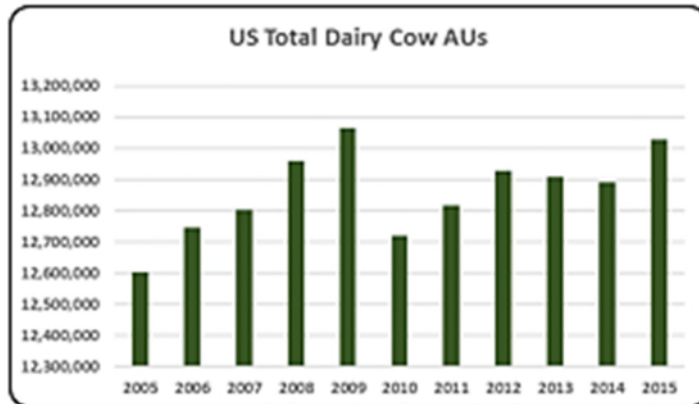


- In 2015 turkey AUs were the lowest of the decade at 3.5 million, decreasing 15% compared to 2008 (4.1 million turkey AUs) the largest turkey AUs of the decade. The most recent contributor to this decline has been avian influenza.

- There were 264,204 turkey AUs, on average, between 2005 and 2015. 2015 turkey production (252,777 turkey AUs) shrank 16% compared to 2005 turkey production (301,584 turkey 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 decreased 25% between 2005 (64,350 hog AUs) and 2015 (48,525 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 136,055 dairy cow AUs, on average, from 2005 to 2015. Dairy cow production dropped 11% from 2005 to 2015.
- 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 largest animal production in Virginia between 2005 and 2015. In Virginia 30.1% of all animal production was concentrated in beef cows in 2015 (530,475 beef cow AUs).

Virginia Additional Information and Methodology

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

Virginia 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 Virginia’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 Virginia, \$1.49 to \$2.18 million in total economic activity, \$0.31 to \$0.46 in household wages and 7 to 10 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.624	\$ 0.313	7.1
	Hogs, Pigs, and Other	\$ 1.494	\$ 0.338	7.6
	Poultry and Eggs	\$ 2.183	\$ 0.455	10.0
	Dairy	\$ 1.800	\$ 0.398	9.5

Appendix

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Animal Units (AUs)	Beef Cattle AUs	585,300	655,500	661,350	644,400	644,400	644,400	561,000	451,200	625,950	559,200	530,475
	Hog and Pig AUs	64,350	98,400	77,550	78,300	71,250	79,500	57,300	54,450	48,900	47,775	48,525
	Broiler AUs	766,974	754,697	735,854	738,032	708,532	736,879	732,504	727,400	751,713	787,450	789,866
	Turkey AUs	301,584	324,277	279,336	271,748	249,104	248,687	255,619	248,332	224,485	250,293	252,777
	Egg Layer AUs	14,120	12,736	12,652	11,832	11,428	11,804	12,088	11,346	11,595	11,785	11,870
	Dairy AUs	147,000	144,200	140,000	137,200	135,800	133,000	133,000	134,400	131,600	130,200	130,200
	Total Animal Units	1,879,328	1,989,810	1,906,741	1,881,512	1,820,514	1,854,270	1,751,511	1,627,128	1,794,242	1,786,702	1,763,713
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 432,434	\$ 394,723	\$ 405,442	\$ 340,907	\$ 343,919	\$ 364,945	\$ 432,521	\$ 515,665	\$ 483,683	\$ 679,914	\$ 682,752
	Hogs and Pigs (\$1,000)	\$ 55,390	\$ 62,215	\$ 58,155	\$ 57,464	\$ 48,814	\$ 60,325	\$ 48,919	\$ 40,495	\$ 44,822	\$ 46,300	\$ 34,591
	Broilers (\$1,000)	\$ 570,825	\$ 479,592	\$ 559,430	\$ 575,690	\$ 550,228	\$ 622,792	\$ 593,074	\$ 653,400	\$ 819,754	\$ 917,917	\$ 791,775
	Turkeys (\$1,000)	\$ 228,654	\$ 258,232	\$ 248,734	\$ 272,187	\$ 205,169	\$ 267,044	\$ 301,829	\$ 306,576	\$ 253,984	\$ 325,861	\$ 373,376
	Eggs (\$1,000)	\$ 67,421	\$ 66,769	\$ 78,991	\$ 77,103	\$ 66,223	\$ 77,640	\$ 88,362	\$ 91,531	\$ 99,390	\$ 114,471	\$ 122,456
	Milk (\$1,000)	\$ 294,360	\$ 267,421	\$ 373,389	\$ 372,816	\$ 265,608	\$ 333,486	\$ 397,089	\$ 359,216	\$ 398,918	\$ 480,330	\$ 343,574
	Other	\$ 44,541	\$ 46,425	\$ 48,771	\$ 51,196	\$ 53,699	\$ 56,165	\$ 58,369	\$ 60,723	\$ 63,076	\$ 65,430	\$ 67,783
	Sheep and Lambs (\$1,000)	\$ 3,602	\$ 3,646	\$ 4,152	\$ 4,737	\$ 5,400	\$ 6,027	\$ 6,391	\$ 6,905	\$ 7,418	\$ 7,932	\$ 8,445
	Aquaculture (\$1,000)	\$ 40,939	\$ 42,779	\$ 44,619	\$ 46,459	\$ 48,299	\$ 50,138	\$ 51,978	\$ 53,818	\$ 55,658	\$ 57,498	\$ 59,338
	Total (\$1,000)	\$ 1,693,625	\$ 1,575,377	\$ 1,772,911	\$ 1,747,362	\$ 1,533,660	\$ 1,782,398	\$ 1,920,163	\$ 2,027,605	\$ 2,163,627	\$ 2,630,223	\$ 2,416,307

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	20,369	20,967	20,923	18,149	
	Cattle feedlots (112112)	788	1,618	778	373	
	Dairy cattle and milk production (11212)	1,152	1,109	934	691	
	Hog and pig farming (1122)	254	202	375	323	
	Poultry and egg production (1123)	1,252	1,392	1,798	1,668	
	Sheep and goat farming (1124)	588	912	1,512	1,564	
	Animal aquaculture and other animal production (1125,1129)	2,513	5,391	5,973	6,217	
Value of Sales (\$1,000)	Cattle and Calves	412,012	471,703	574,506	707,976	
	Hogs and Pigs	78,077	72,213	56,960	67,702	
	Poultry and Eggs	761,380	750,035	971,851	1,161,564	
	Milk and Other Dairy Products	277,119	275,402	330,344	347,204	
	Aquaculture	24,629	19,945	53,032	54,665	
	Other (calculated)	n/a	6,782	61,194	22,023	
	Total	1,553,217	1,596,080	2,047,887	2,361,134	
Input Purchases	Livestock and poultry purchased	(Farms)	12,700	13,434	11,487	13,722
		\$1,000	208,871	277,272	323,214	424,722
	Breeding livestock purchased	(Farms)	n/a	6,974	6,167	7,395
		\$1,000	n/a	27,806	38,777	57,220
	Other livestock and poultry purchased	(Farms)	n/a	8,182	6,815	8,369
		\$1,000	n/a	249,466	284,437	367,502
	Feed purchased	(Farms)	23,331	31,374	29,233	32,768
		\$1,000	649,741	507,692	727,195	1,067,299

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2015 Animal Agriculture	Cattle and Calves	\$ 1,108,858	\$ 213,497	4,879	\$ 55,680
	Hogs, Pigs, and Other	\$ 152,957	\$ 34,602	776	\$ 9,024
	Poultry and Eggs	\$ 2,810,718	\$ 586,248	12,820	\$ 152,893
	Dairy	\$ 618,399	\$ 136,708	3,269	\$ 35,653
	Total	\$ 4,690,931	\$ 971,055	21,744	\$ 253,251
Change from 2005 to 2015	Cattle and Calves	\$ 256,523	\$ 49,390	1,129	\$ 12,881
	Hogs, Pigs, and Other	\$ (28,243)	\$ (6,389)	(143)	\$ (1,666)
	Poultry and Eggs	\$ 514,146	\$ 107,238	2,345	\$ 27,968
	Dairy	\$ (24,591)	\$ (5,436)	(130)	\$ (1,418)
	Total	\$ 717,836	\$ 144,803	3,200	\$ 37,765
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 1.624	\$ 0.313	7.1	
	Hogs, Pigs, and Other	\$ 1.494	\$ 0.338	7.6	
	Poultry and Eggs	\$ 2.183	\$ 0.455	10.0	
	Dairy	\$ 1.800	\$ 0.398	9.5	
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.