

Economic Analysis of Animal Agriculture 2004-2014

NORTH CAROLINA

**A Report for
United Soybean Board**



September 2015



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North Carolina Executive Summary

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

- \$21.1 billion in economic output
- 96,077 jobs
- \$3.8 billion in earnings
- \$1.0 billion in income taxes paid at local, state, and federal levels
- \$142.4 million in the form of property taxes

Plus, from 2004-2014 animal agriculture in North Carolina increased economic output by over \$5.4 billion, boosted household earnings by \$970.0 million, contributed 24,246 additional jobs and paid \$265.1 million in additional tax revenues.

North Carolina's animal agriculture consumed about 2.1 million tons of soybean meal in 2014. This soybean meal was fed primarily to:

- Broilers (932.3 thousand tons)
- Hogs (833.3 thousand tons)
- Turkeys (241.5 thousand tons)

This report examines animal agriculture in North Carolina 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 North Carolina, 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 North Carolina and beyond.

North Carolina Economic Impact of Animal Agriculture

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

- About \$21.1 billion in economic output
- \$3.8 billion in household earnings
- 96,077 jobs
- \$1.0 billion in income taxes

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

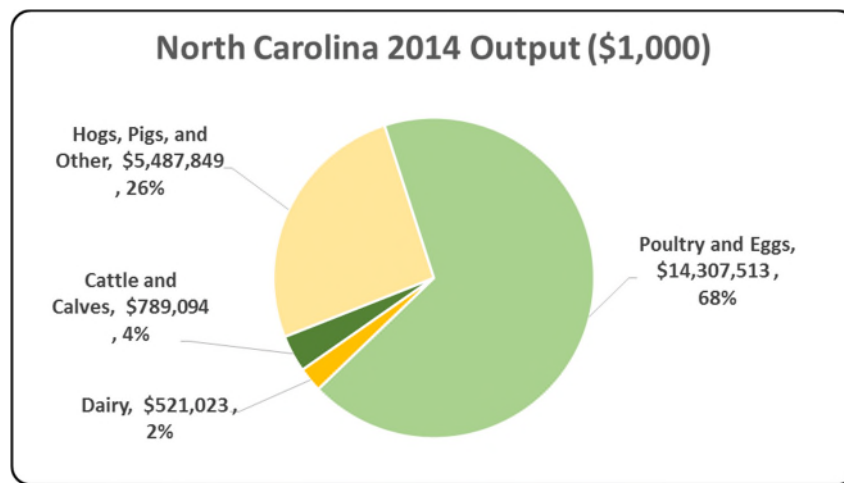
- Increased economic output by \$5.4 billion
- Boosted household earnings by \$970.0 million
- Added 24,246 jobs
- Paid an additional \$265.1 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2014	Change 2004-2014	% Change 2004-2014
Output (\$1,000)	\$ 21,105,479	\$ 5,414,084	34.50%
Earnings (\$1,000)	\$ 3,784,453	\$ 969,961	34.46%
Employment (Jobs)	96,077	24,246	33.75%
Income Taxes Paid (\$1,000)	\$ 1,034,291	\$ 265,090	34.46%
Property Taxes Paid in 2012 (\$1,000)	\$ 142,392		

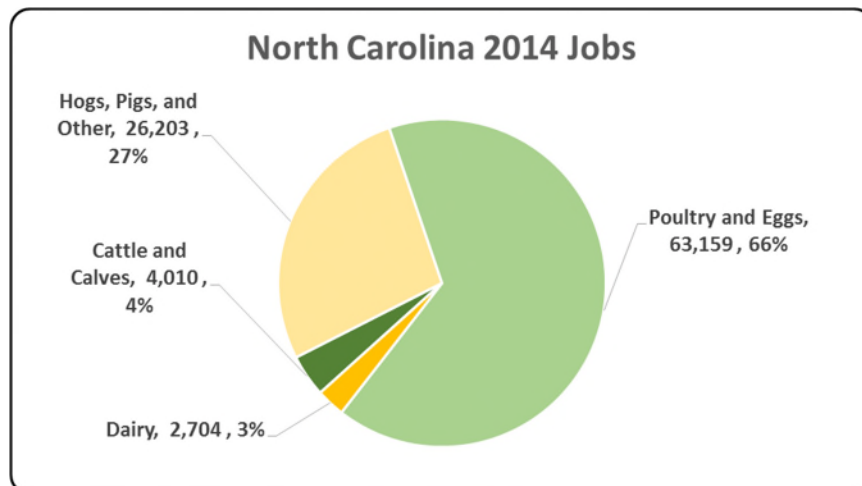
North Carolina Output

“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 North Carolina economy. Animal agriculture’s impact on North Carolina total economic output is about \$21.1 billion.



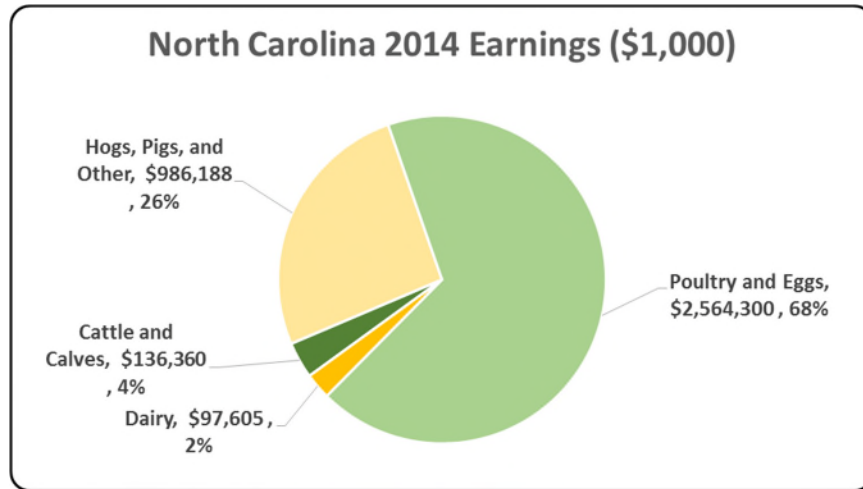
North Carolina Jobs

“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 North Carolina in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to North Carolina total jobs, contributing 96,077 jobs within and outside of animal agriculture.



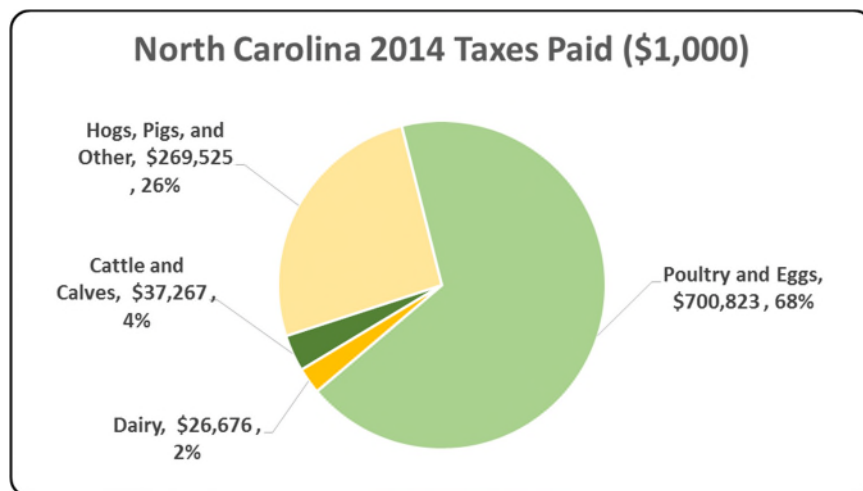
North Carolina Earnings

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 North Carolina economy in terms of earnings. North Carolina's animal agriculture contributed about \$3.8 billion to household earnings in 2014.



North Carolina Taxes Paid by Animal Agriculture

North Carolina's animal agriculture is also a significant source of tax revenue. In 2014, the state's animal agriculture industry paid about \$1.0 billion in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$142.4 million in property taxes paid by all of North Carolina agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



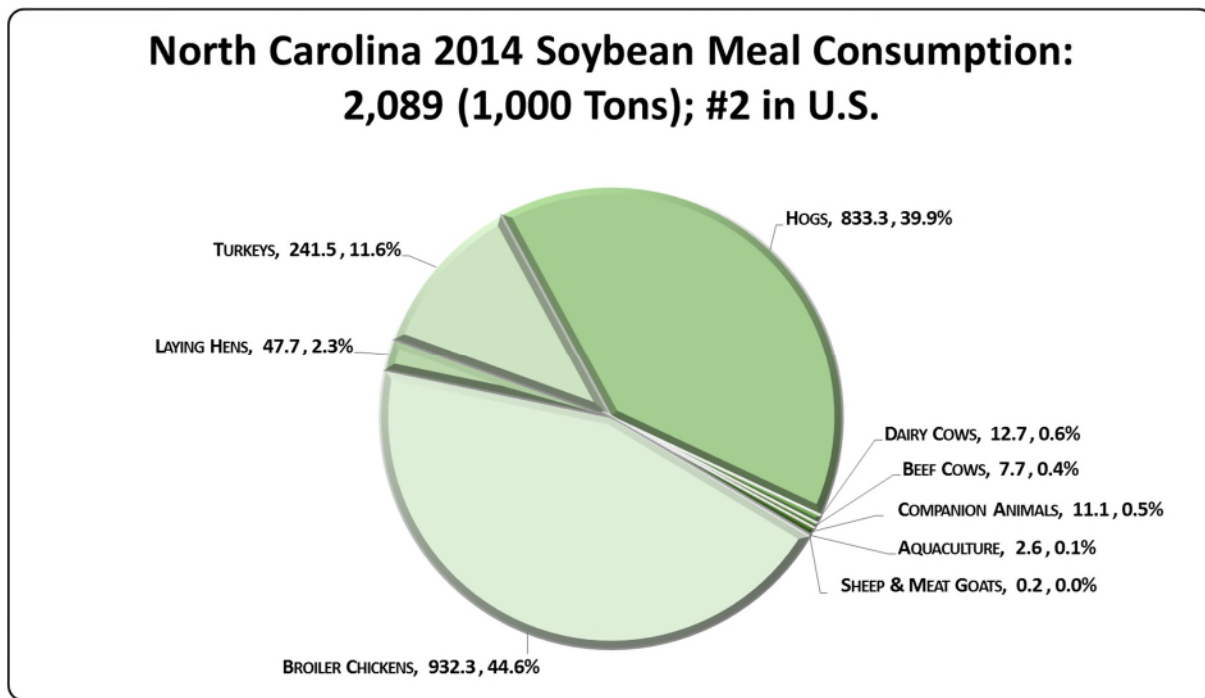
North Carolina Animal Agriculture Soybean Meal Consumption

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.

North Carolina's animal agriculture consumed almost 2,089.0 thousand tons of soybean meal in 2014, placing the state as #2 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 (932.3 thousand tons)
- Hogs (833.3 thousand tons)
- Turkeys (241.5 thousand tons)

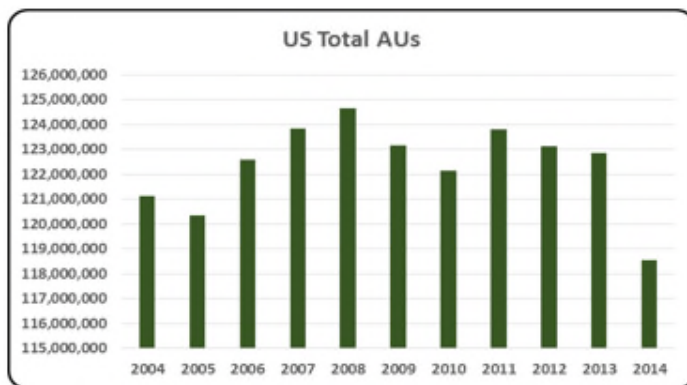


North Carolina Animal Unit (AU) Trends

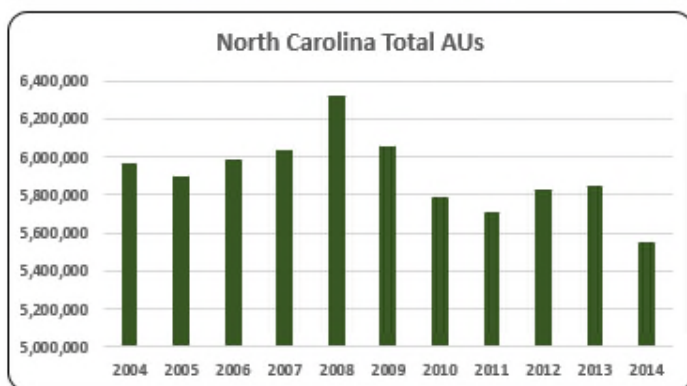
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of North Carolina. Due to this reality, using a single year as a measure of the presence and strength of a sector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

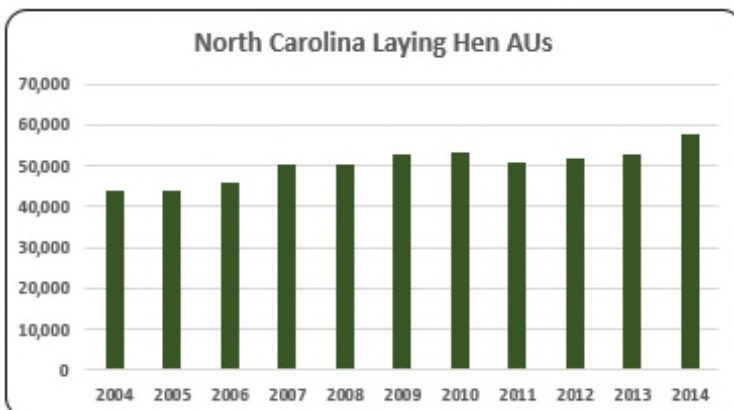
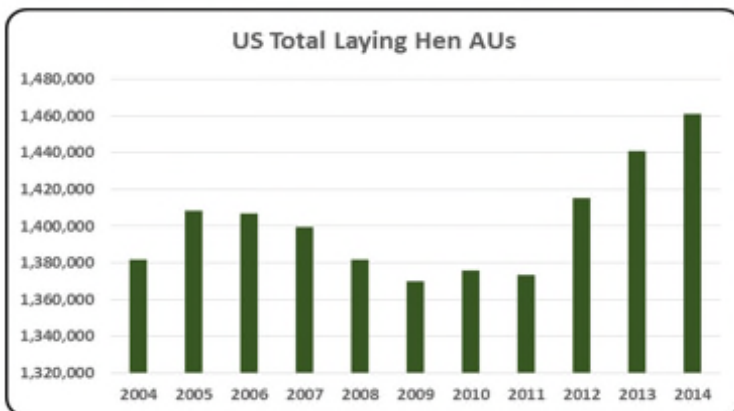
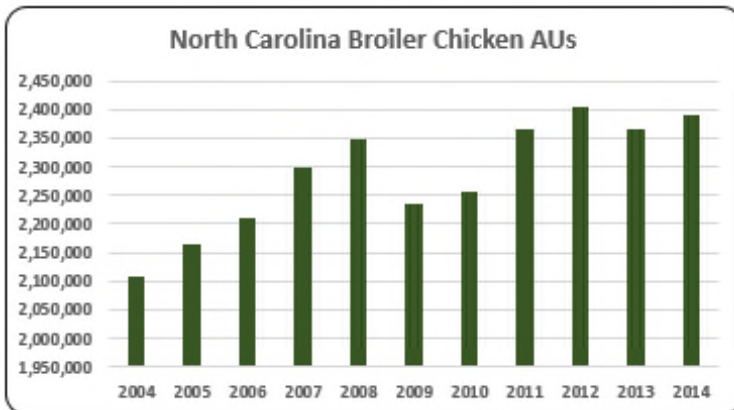
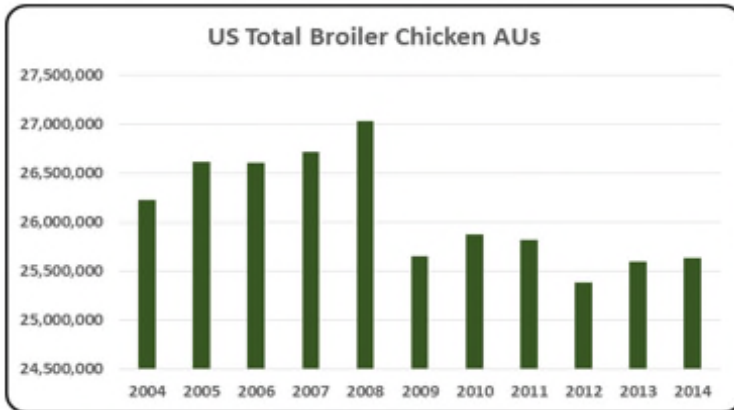
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In North Carolina, the largest three segments of animal agriculture in terms of AUs during 2014 were: Broilers (2,390.0 thousand AUs), Hogs (2,296.2 thousand AUs), and Turkeys (427.4 thousand AUs). Total animal units in North Carolina during 2014 were 5,551.9 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.



- About 4.7% of all AUs in the U.S. were in North Carolina in 2014. 2008 was a record year for animal production in North Carolina with 6,317.5 thousand whereas 2014 was a low year with 5,551.9 thousand AUs.

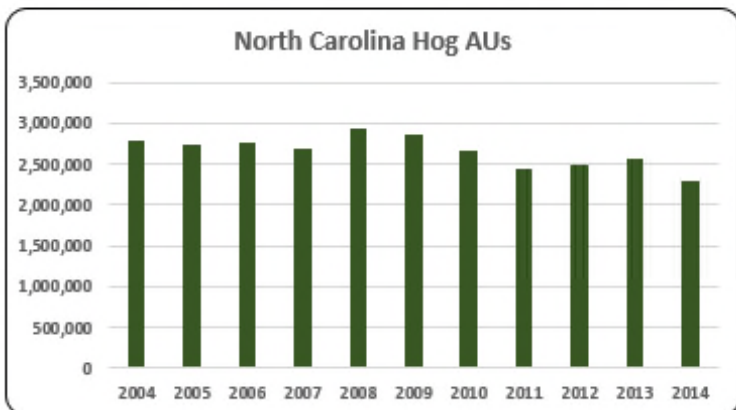
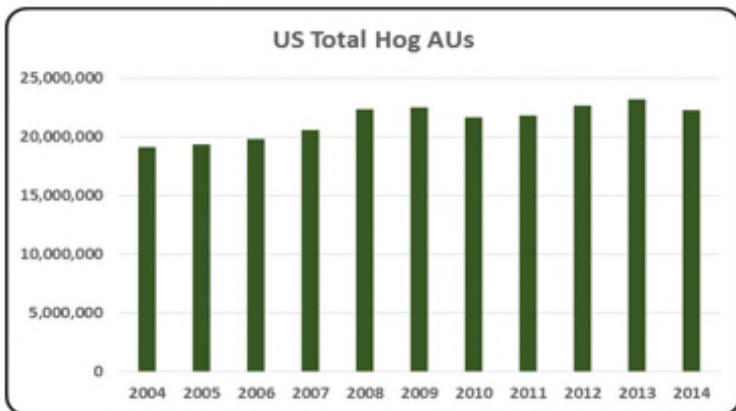
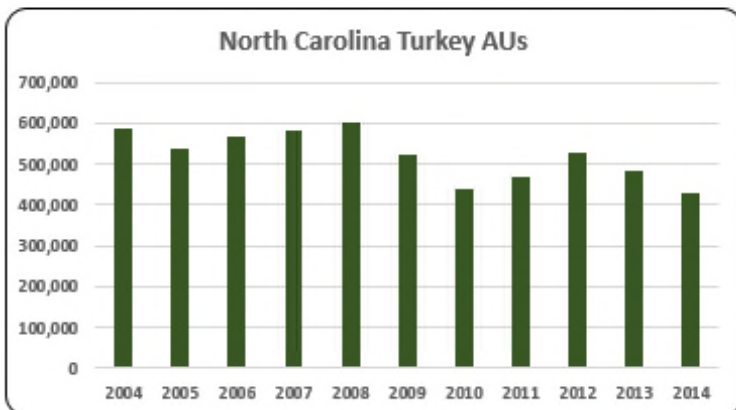
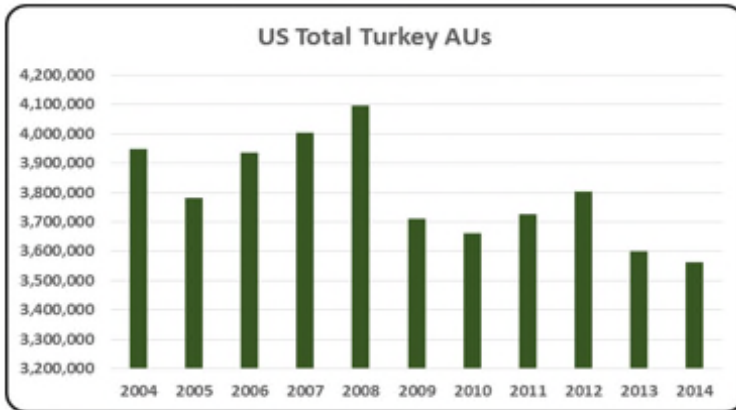


- U.S. broiler production is clustered in a number of states, with Georgia being the largest producer. On average from 2004 to 2014, broiler chicken AUs were about 26.1 million. In 2014, AUs rebounded 1% from the low AUs numbers in 2012 (25.4 million AUs).

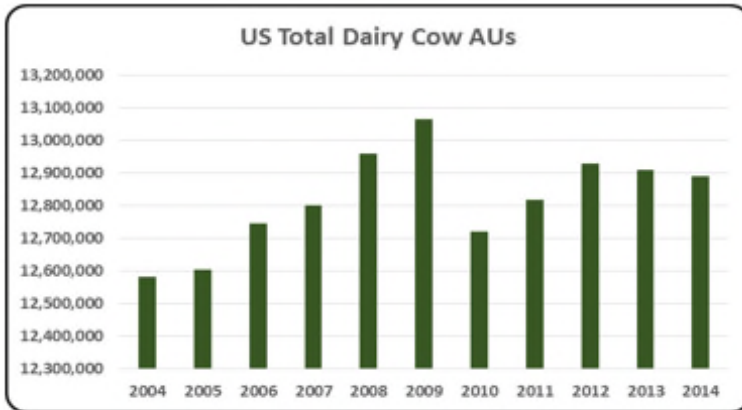
- Forty three percent (2,390.0 thousand) of all AUs in 2014 were from broiler production in 2014. There was an upward trend in the broiler industry during the last decade and broiler production increased 13.4% from 2004 to 2014.

- 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).

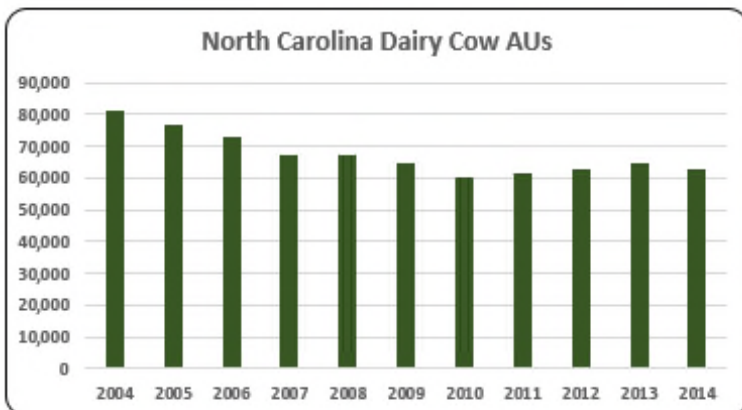
- Only 1.0% (57,581) of all AUs in North Carolina were in layer production in 2014. The average number of layers during last decade was about 50,295 AUs.



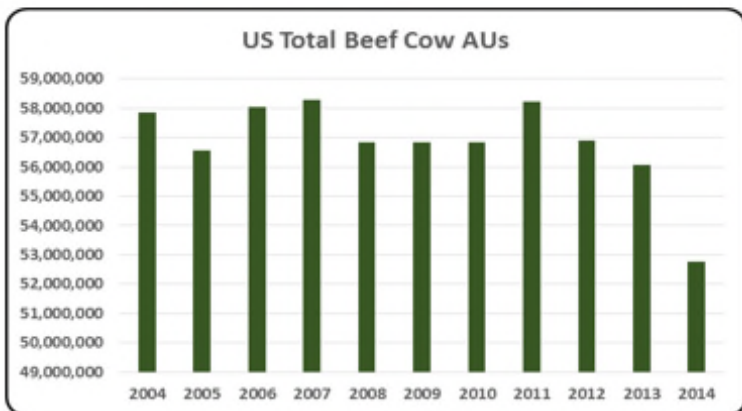
- From 2004 to 2014, the U.S. accounted for 50% of the world’s turkey production. However, in 2014 turkey AUs were the lowest of the decade at 3.5 million, decreasing 13% compared to 2008 (4.1 million turkey AUs) the largest turkey AUs of the decade.
- Turkey production declined almost 12.0% in 2014 year-over-year. North Carolina represented 12.0% of all turkey AUs in the U.S. Overall, turkey AUs decreased 27% during the 2004-2014 period.
- 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 production is the second largest animal production in North Carolina with 41.4% (2,296.2 thousand hog AUs) in 2014. Hog AUs in North Carolina experienced a downward trend during the last decade.



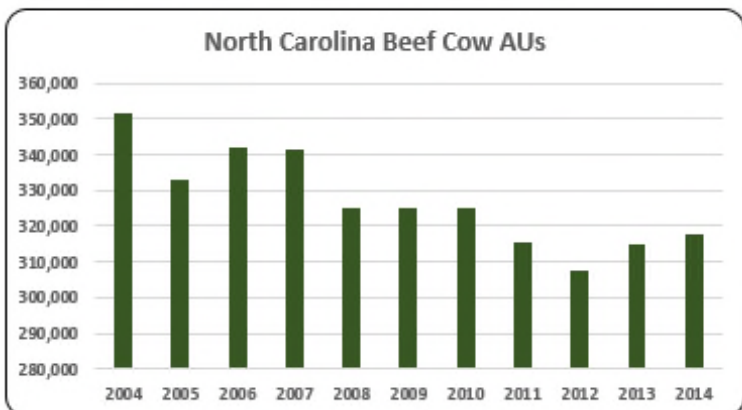
- From 2004 to 2014 dairy cow AUs averaged 12.8 million. In 2014, dairy cow AUs (12.9 million) remained about the same as the previous year but still below the high of 13.1 million AUs, the level in 2009. Despite the fluctuation in AUs, milk supplied has steadily risen.



- The average number of dairy cow AUs in North Carolina was 67,455 from 2004 to 2014. Dairy cow production decreased 22.0% throughout 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. Large producers of cattle and calves such as Texas and Oklahoma were plagued with drought conditions during 2014.



- 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.

North Carolina Additional Information and Methodology

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

North Carolina 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 North Carolina'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 North Carolina, \$1.881 to \$2.814 million in total economic activity, \$0.325 to \$0.504 in household wages and 9 to 12 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.8813	\$ 0.3251	9.6
	Hogs, Pigs, and Other	\$ 1.9048	\$ 0.3423	9.1
	Poultry and Eggs	\$ 2.8143	\$ 0.5044	12.4
	Dairy	\$ 2.1096	\$ 0.3952	10.9

Appendix

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Animal Units (AUs)	Beef Cattle AUs	351,450	333,075	341,850	341,280	325,275	325,275	325,275	315,420	307,575	314,850	317,775
	Hog and Pig AUs	2,794,950	2,739,000	2,753,850	2,696,400	2,923,650	2,855,250	2,650,845	2,446,500	2,480,415	2,562,150	2,296,200
	Broiler AUs	2,108,495	2,165,973	2,209,007	2,297,558	2,347,373	2,235,055	2,255,662	2,364,262	2,403,427	2,364,243	2,390,001
	Turkey AUs	585,000	535,312	565,599	581,320	603,884	520,188	438,859	467,418	525,879	485,177	427,362
	Egg Layer AUs	43,736	43,880	45,988	50,184	50,080	52,744	53,336	50,824	51,918	52,979	57,581
	Dairy AUs	81,200	77,000	72,800	67,200	67,200	64,400	60,200	61,600	63,000	64,400	63,000
	Total Animal Units	5,964,831	5,894,240	5,989,094	6,033,942	6,317,462	6,052,912	5,784,178	5,706,024	5,832,214	5,843,798	5,551,919
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 259,278	\$ 244,253	\$ 219,639	\$ 204,135	\$ 210,118	\$ 205,617	\$ 236,278	\$ 306,298	\$ 316,790	\$ 304,014	\$ 419,441
	Hogs and Pigs (\$1,000)	\$ 2,066,969	\$ 2,088,694	\$ 1,890,022	\$ 1,931,118	\$ 2,115,293	\$ 1,809,998	\$ 2,167,461	\$ 2,471,953	\$ 2,553,214	\$ 2,824,115	\$ 2,854,413
	Broilers (\$1,000)	\$ 2,041,785	\$ 2,231,782	\$ 1,937,734	\$ 2,479,538	\$ 2,526,826	\$ 2,429,960	\$ 2,612,054	\$ 2,564,433	\$ 2,838,600	\$ 3,580,997	\$ 3,849,710
	Turkeys (\$1,000)	\$ 448,812	\$ 485,001	\$ 517,500	\$ 596,596	\$ 652,320	\$ 523,128	\$ 591,090	\$ 702,733	\$ 859,144	\$ 757,435	\$ 733,163
	Eggs (\$1,000)	\$ 239,062	\$ 249,368	\$ 257,627	\$ 328,664	\$ 373,944	\$ 349,371	\$ 327,373	\$ 375,573	\$ 392,549	\$ 431,359	\$ 500,989
	Milk (\$1,000)	\$ 173,032	\$ 165,968	\$ 140,656	\$ 191,568	\$ 191,780	\$ 134,368	\$ 167,138	\$ 207,016	\$ 192,700	\$ 200,090	\$ 246,977
	Other	\$ 25,550	\$ 25,459	\$ 25,468	\$ 25,519	\$ 25,833	\$ 25,843	\$ 26,405	\$ 26,254	\$ 26,386	\$ 26,518	\$ 26,650
	Sheep and Lambs (\$1,000)	\$ 871	\$ 734	\$ 697	\$ 701	\$ 969	\$ 933	\$ 1,449	\$ 1,251	\$ 1,337	\$ 1,423	\$ 1,509
	Aquaculture (\$1,000)	\$ 24,679	\$ 24,725	\$ 24,771	\$ 24,818	\$ 24,864	\$ 24,910	\$ 24,956	\$ 25,003	\$ 25,049	\$ 25,095	\$ 25,141
	Total (\$1,000)	\$ 5,254,488	\$ 5,490,525	\$ 4,988,646	\$ 5,757,138	\$ 6,096,114	\$ 5,478,285	\$ 6,127,799	\$ 6,654,260	\$ 7,179,383	\$ 8,124,528	\$ 8,631,343

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	14,594	16,761	14,413	13,909
	Cattle feedlots (112112)	443	13	3	10
	Dairy cattle and milk production (11212)	612	740	381	263
	Hog and pig farming (1122)	2,017	1,735	1,619	1,170
	Poultry and egg production (1123)	3,564	3,827	4,096	3,404
	Sheep and goat farming (1124)	464	1,004	2,437	1,922
	Animal aquaculture and other animal production (1125,1129)	2,689	5,232	6,290	5,190
Value of Sales (\$1,000)	Cattle and Calves	177,058	185,222	288,801	332,733
	Hogs and Pigs	2,570,376	2,183,646	3,104,731	2,873,988
	Poultry and Eggs	2,254,453	2,382,365	4,087,004	4,837,026
	Milk and Other Dairy Products	180,130	150,406	161,373	179,265
	Aquaculture	11,510	17,669	32,175	23,365
	Other (calculated)	38,180	33,744	33,266	15,340
	Total	5,231,707	4,953,052	7,707,350	8,261,717
Input Purchases	Livestock and poultry purchased (Farms)	11,609	11,972	12,342	12,827
	\$1,000	916,191	1,049,514	1,666,076	1,397,510
	Breeding livestock purchased (Farms)	n/a	5,119	5,004	5,806
	\$1,000	n/a	57,036	131,277	136,342
	Other livestock and poultry purchased (Farms)	n/a	7,997	8,677	8,692
	\$1,000	n/a	992,478	1,534,800	1,261,168
	Feed purchased (Farms)	22,116	30,938	28,263	29,837
\$1,000	2,262,032	1,917,997	3,183,993	4,121,552	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2014 Animal Agriculture	Cattle and Calves	\$ 789,094	\$ 136,360	4,010	\$ 37,267
	Hogs, Pigs, and Other	\$ 5,487,849	\$ 986,188	26,203	\$ 269,525
	Poultry and Eggs	\$ 14,307,513	\$ 2,564,300	63,159	\$ 700,823
	Dairy	\$ 521,023	\$ 97,605	2,704	\$ 26,676
	Total	\$ 21,105,479	\$ 3,784,453	96,077	\$ 1,034,291
Change from 2004 to 2014	Cattle and Calves	\$ 177,792	\$ 30,724	904	\$ 8,397
	Hogs, Pigs, and Other	\$ 492,669	\$ 88,535	2,352	\$ 24,197
	Poultry and Eggs	\$ 4,680,066	\$ 838,797	20,660	\$ 229,243
	Dairy	\$ 63,557	\$ 11,906	330	\$ 3,254
	Total	\$ 5,414,084	\$ 969,961	24,246	\$ 265,090
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 1.8813	\$ 0.3251	9.6	
	Hogs, Pigs, and Other	\$ 1.9048	\$ 0.3423	9.1	
	Poultry and Eggs	\$ 2.8143	\$ 0.5044	12.4	
	Dairy	\$ 2.1096	\$ 0.3952	10.9	
Tax Rates	Federal effective income tax rate			12.7%	
	Federal Social Security tax rate			7.7%	
	State Effective Rate			7.0%	
	Total			27.3%	

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.