North Carolina Economic Analysis of Animal Agriculture: 2012-2022

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Prepared For:

UNITED SOYBEAN BOARD™

Prepared By:

Decision Innovation Solutions

Contents

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North Carolina Executive Summary

The use of SBM as a key feed ingredient is an important part of North Carolina 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 the State of 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 2022 animal agriculture contributed:

- $33.1 billion in economic output
- 142,062 jobs
- $7.2 billion in earnings
- $1.8 billion in income taxes paid at local, state, and federal levels
- $157.4 million in the form of property taxes

North Carolina's animal agriculture consumed more than 3.1 million tons of SBM in 2022. This SBM was fed primarily to:

- Broilers (2.0 million tons)
- Hogs (705.7 thousand tons)
- Turkeys (273.0 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.

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North Carolina Economic Impact of Animal Agriculture

Animal agriculture is an important part of North Carolina's economy. In 2022, North Carolina's animal agriculture contributed the following to the economy:

- About $33.1 billion in economic output
- $7.2 billion in household earnings
- 142,062 jobs
- $1.8 billion in income taxes

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

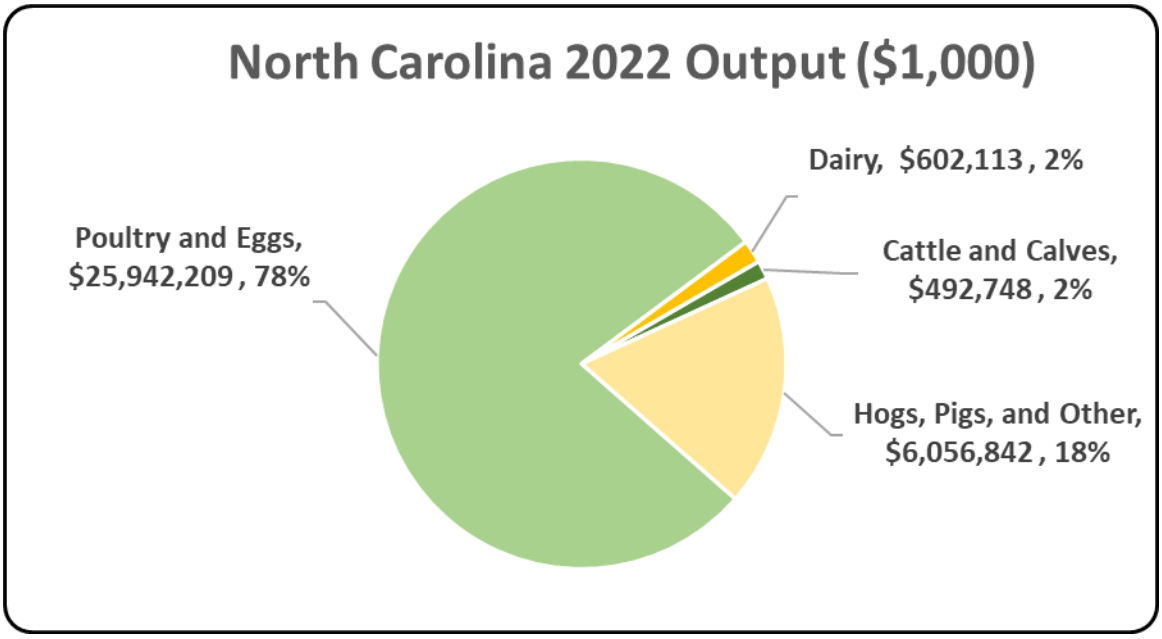
- Increased economic output by $9.7 billion
- Boosted household earnings by $2.0 billion
- Added 37,546 jobs
- Paid $515.6 million more in income taxes

Below is a table which demonstrates this decade of change.

Measure		2022		Change 2012-2022	% Change 2012-2022
Output ($1,000)	$	33,093,912	$	9,659,882	41.22%
Earnings ($1,000)	$	7,198,225	$	2,026,049	39.17%
Employment (Jobs)		142,062		37,546	35.92%
Income Taxes Paid ($1,000)	$	1,831,948	$	515,630	39.17%
Property Taxes Paid in 2017 ($1,000)	$	157,354			

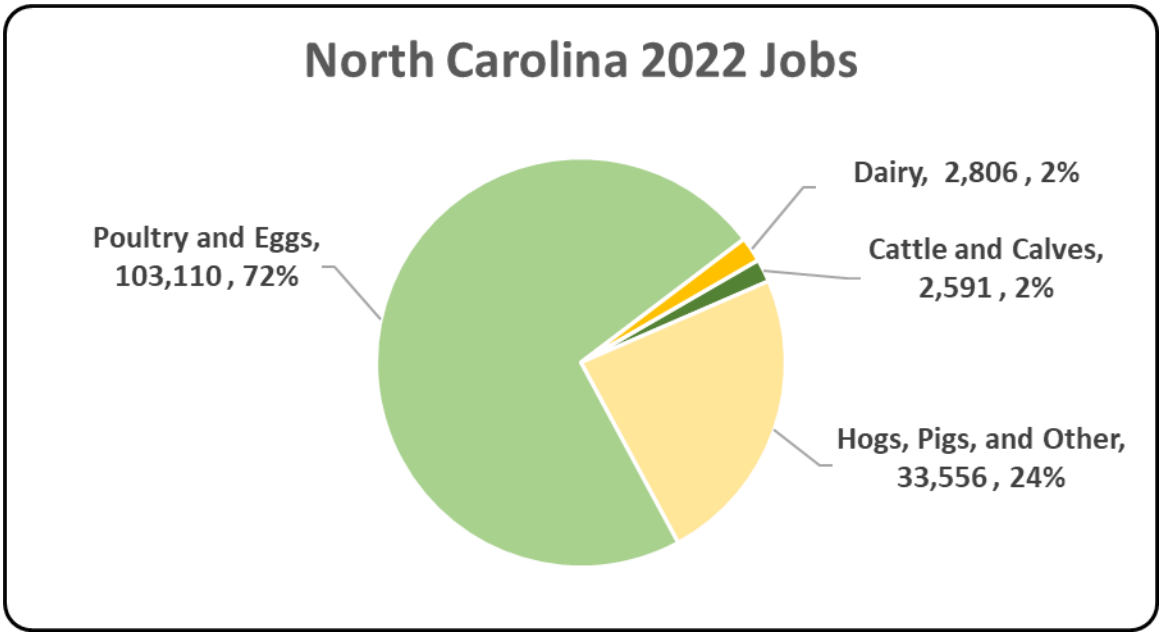
North Carolina Output

"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 figure illustrates the impact of animal agriculture to the North Carolina economy. Animal agriculture's impact on North Carolina total economic output is about $33.1 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 figure illustrates the contribution to North Carolina in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to North Carolina total jobs, contributing 142,062 jobs within and outside of animal agriculture.



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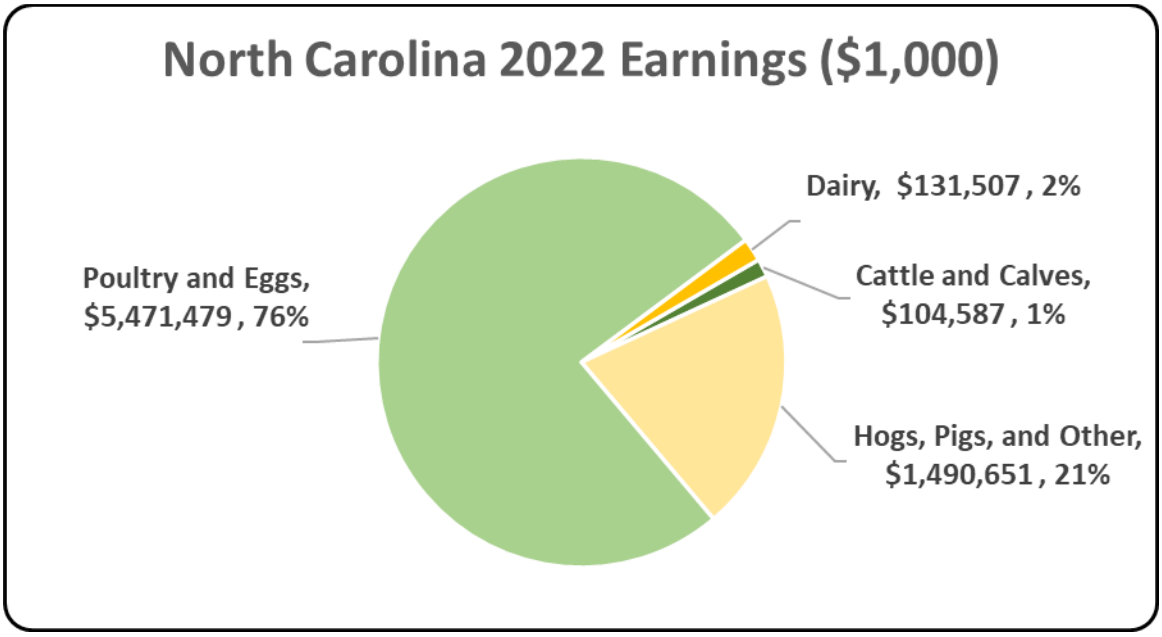
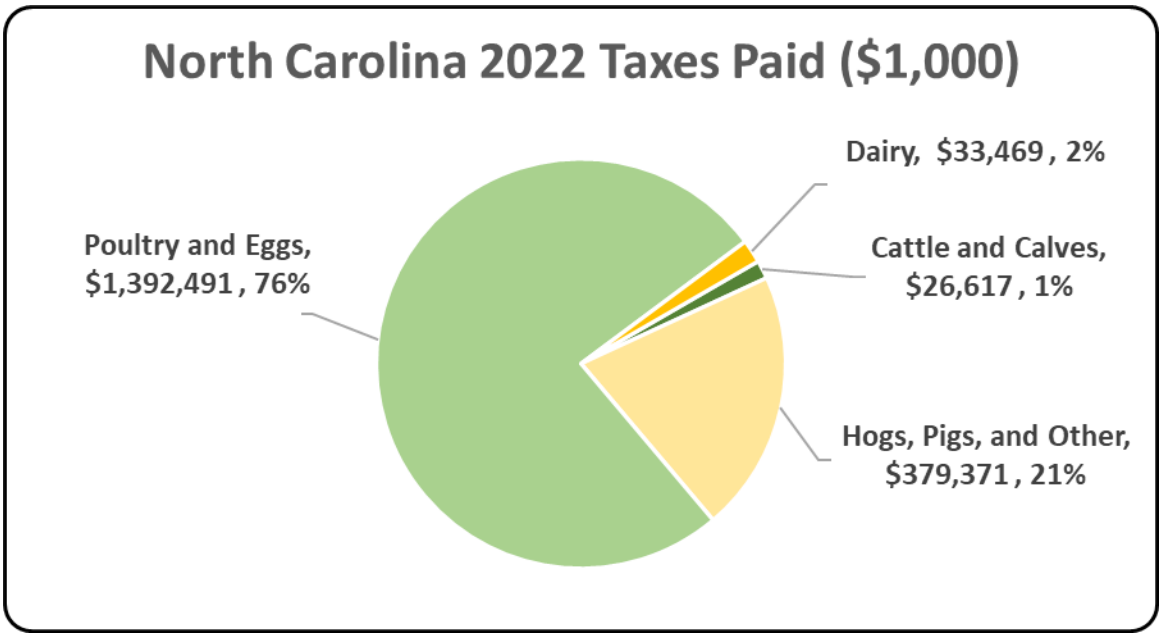
North Carolina Earnings

Earnings includes wages and salaries plus proprietors' income, which is the net earnings of sole-proprietors and partnerships. The figure illustrates the impact of animal agriculture to the North Carolina economy in terms of earnings. North Carolina's animal agriculture contributed about $7.2 billion to household earnings in 2022.



North Carolina Taxes Paid by Animal Agriculture

North Carolina's animal agriculture is also a significant source of tax revenue. In 2022, the state's animal agriculture industry paid about $1.8 billion in income taxes at local, state, and federal levels. The 2017 Census of Agriculture estimated $157.4 million in property taxes paid by all of North Carolina agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



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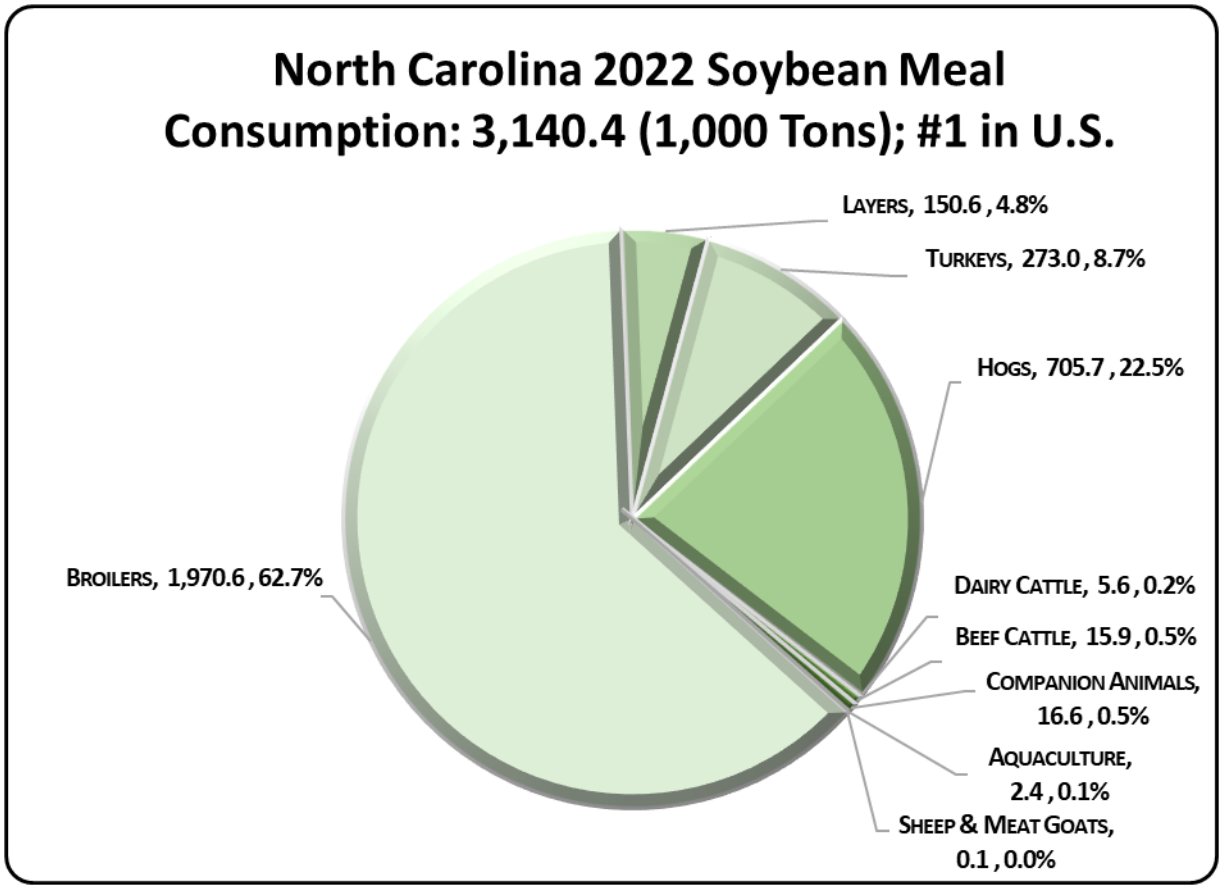
North Carolina Animal Agriculture Soybean Meal Consumption

The choice to use SBM 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 SBM (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 SBM usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of SBM used during the 2021-22 soybean marketing year by up to sixteen specific animal species has been estimated.

North Carolina's animal agriculture consumed more than 3.1 million tons of SBM in 2022, placing the state as 1 in the nation in terms of SBM consumption (see figure below). Additionally, animal agriculture in North Carolina consumed 79.5 thousand tons of soy hulls. The three segments of animal agriculture that led the state in estimated SBM consumption are:

1. Broilers (2.0 million tons)
2. Hogs (705.7 thousand tons)
3. Turkeys (273.0 thousand tons)

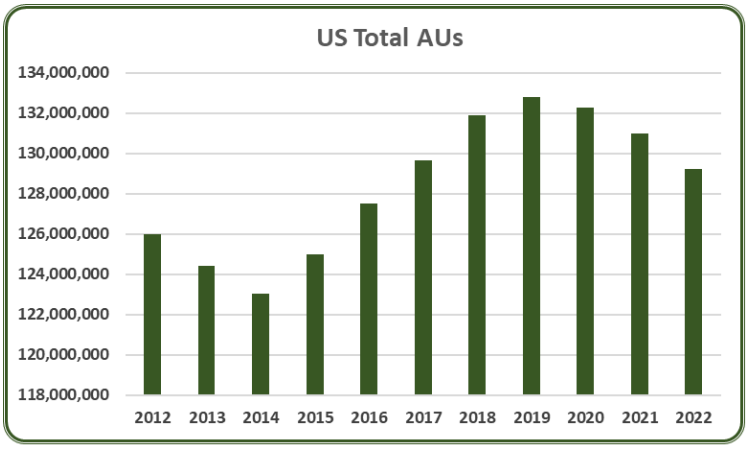


North Carolina Animal Unit (AU) Trends

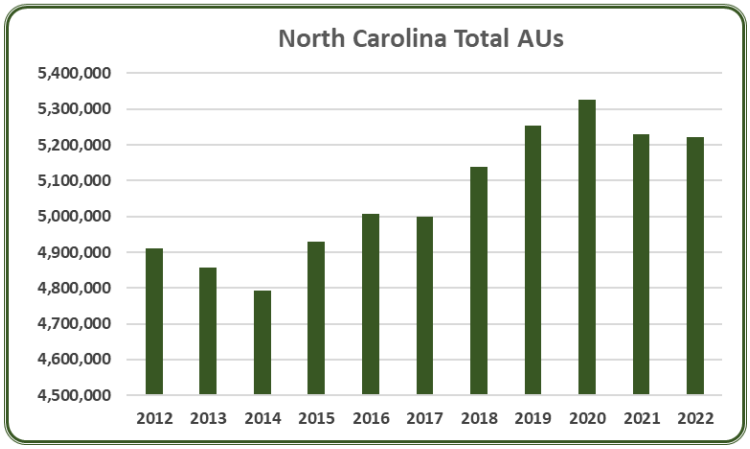
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the U.S. and abroad have an impact on the size of animal agriculture in the state of North Carolina. Due to this reality, using a single year to measure a sector's presence and strength can be misleading. 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.

Like 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.

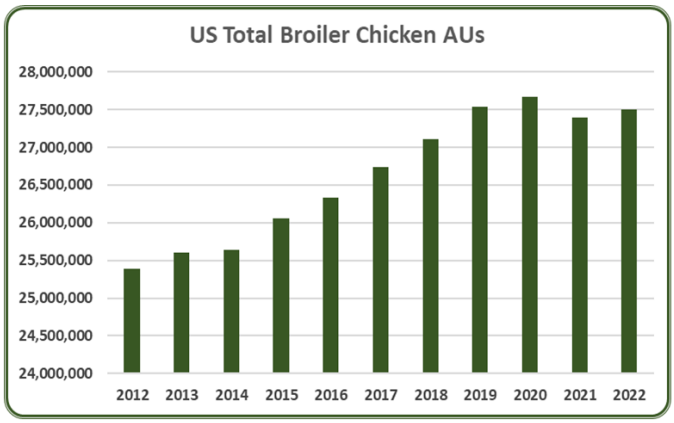
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In North Carolina, the largest three segments of animal agriculture in terms of AUs during 2022 were: Broilers (2.93 million AUs), Hogs (1.10 million Aus), and Beef Cattle (577,933 AUs). Total AUs in North Carolina during 2022 were 5.22 million AUs.



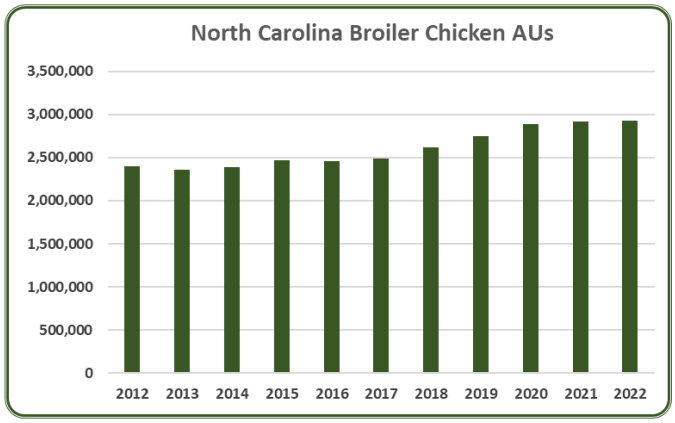
- In 2022, total AUs in the U.S. decreased by 1.4% to 129.2 million, continuing a downward trend that started in 2019. Nine out of the ten animal groups tracked saw a decrease, with the exception being broilers. Over 70% of the total decrease in AUs is due to lower beef cattle inventories.



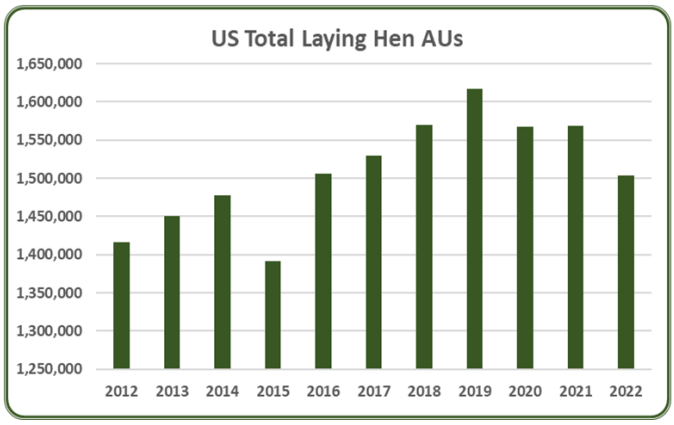
- In 2022, North Carolina had 5.22 million total AUs, a 0.2% decrease from 2021. From 2012 to 2022, the average number of total AUs in North Carolina was 5.06 million AUs. Since 2012, total AUs in North Carolina have increased by 6.3%.



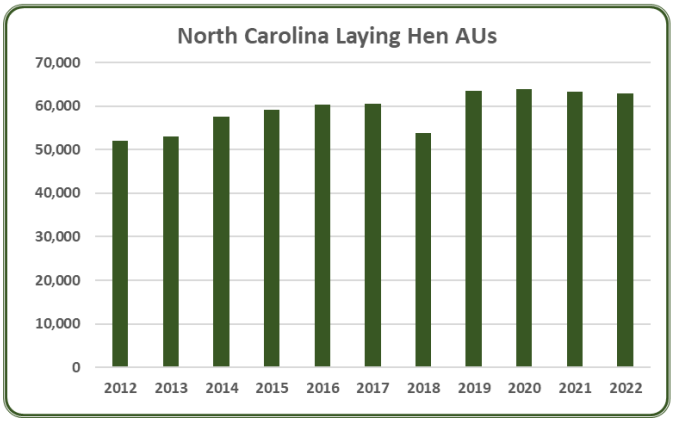
- From 2012 to 2022, broiler chicken AUs averaged 26.6 million across the U.S. Broiler AUs trended up and peaked in 2020 at 27.6 million. Broiler AUs are up 0.4% from 2021 and were the only animal group tracked here that increased compared to last year. Broilers make up about 21% of U.S. AUs.



- In 2022, North Carolina had 2.93 million broiler AUs, a 0.5% increase from 2021. Broilers accounted for 56.1% of the total AUs (5.22 million) in North Carolina. From 2012 to 2022, the average number of broiler AUs in North Carolina was 2.61 million AUs. Since 2012, broiler AUs have increased by 22.1%.



- From 2012 to 2022, U.S. layer AUs averaged 1.51 million. In 2022, layer AUs were 1.50 million, a 4.2% decrease from 2021. The 2022-23 Highly Pathogenic Avian Influenza (HPAI) outbreak contributed to this past year's decrease in layer AUs. Layers make up about 1% of U.S. AUs so large changes in layer AUs do not have a large impact on total AUs.



- In 2022, North Carolina had 62,892 layer AUs, a 0.5% decrease from 2021. Layers accounted for 1.2% of the total AUs (5.22 million) in North Carolina. From 2012 to 2022, the average number of layer AUs in North Carolina was 59,075 AUs. Since 2012, layer AUs have increased by 21.1%.

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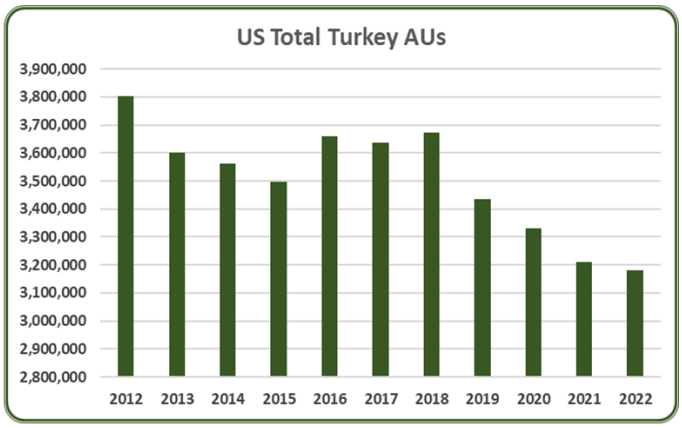
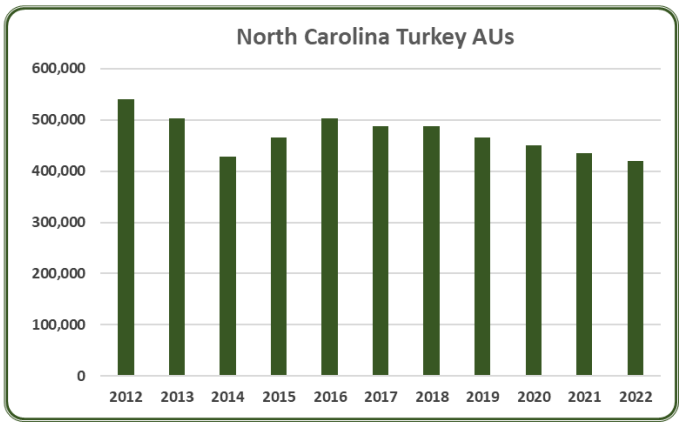
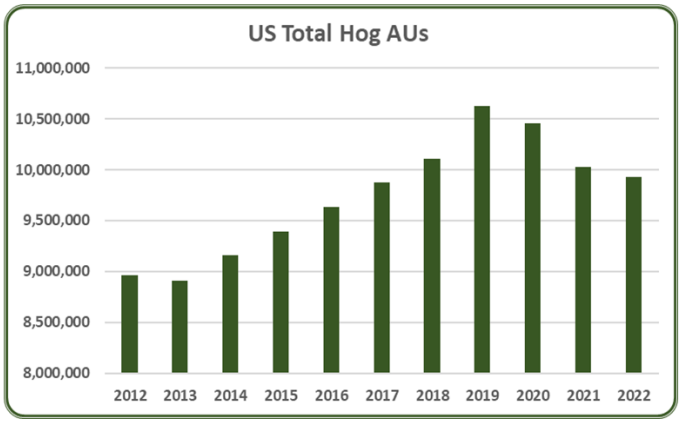


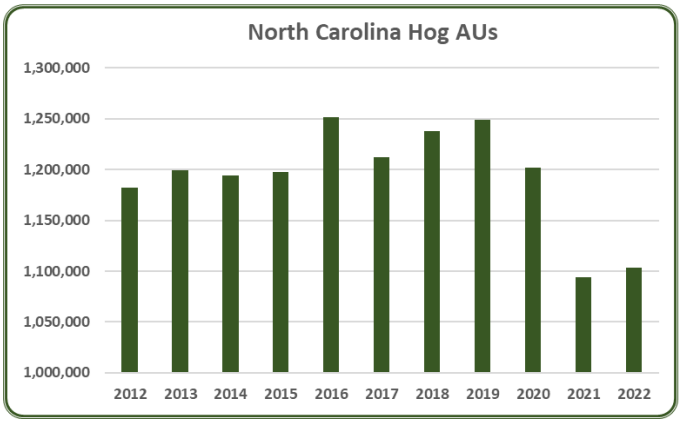
- In 2022, turkey AUs were at 3.18 million, a 0.9% drop from the previous year. This drop is surprisingly low considering the industry battled HPAI for most of 2022. Turkey AUs have been trending down since 2018. Turkey AUs represent about 2% of U.S. AUs, so like layers, large changes in turkey AUs do not cause large changes in total AUs.



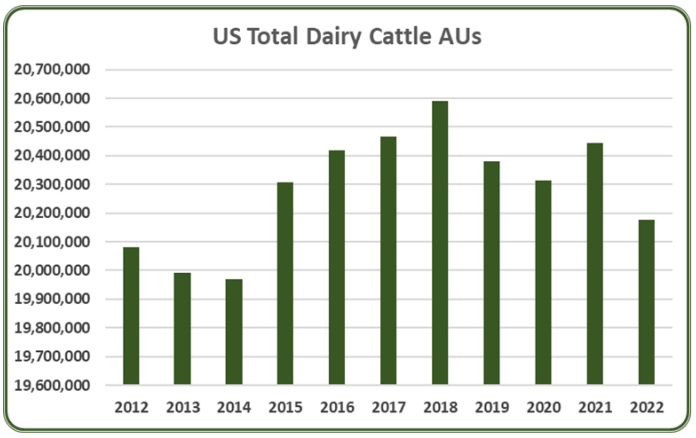
- In 2022, North Carolina had 420,000 turkey AUs, a 3.4% decrease from 2021. Turkeys accounted for 8% of the total AUs (5.22 million) in North Carolina. From 2012 to 2022, the average number of turkey AUs in North Carolina was 471,136 AUs. Since 2012, turkey AUs have decreased by 22.2%.



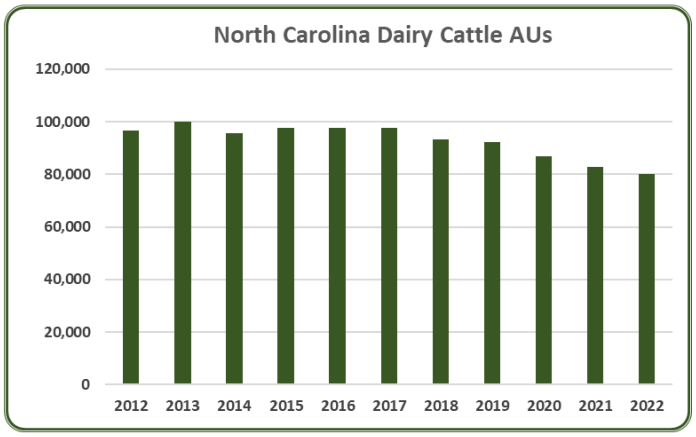
- In 2022, hog AUs totaled 9.93 million, a 1.0% drop from the previous year. From 2012 to 2022, hog AUs averaged 9.73 million. Hog AUs have been trending down since 2019 when they peaked at 10.62 million AUs. Hogs make up 7.70% of all AUs within the U.S.



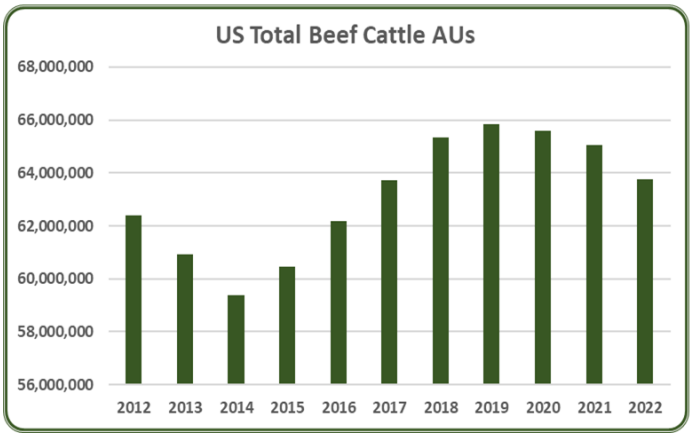
- In 2022, North Carolina had 1.1 million hog AUs, a 0.8% increase from 2021. Hogs accounted for 21.1% of the total AUs (5.22 million) in North Carolina. From 2012 to 2022, the average number of hog AUs in North Carolina was 1.19 million AUs. Since 2012, hog AUs have decreased by 6.7%.



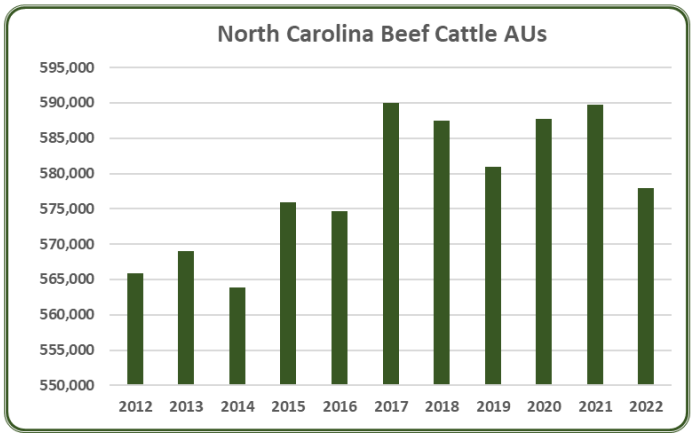
- From 2012 to 2022, dairy cattle AUs averaged 20.29 million. The herd was also relatively steady, fluctuating between 19.9-20.6 million AUs during that time. In 2022, dairy cattle AUs totaled 20.18 million, down 1.3% from 2021. Dairy cattle represented about 16% of all U.S. AUs.



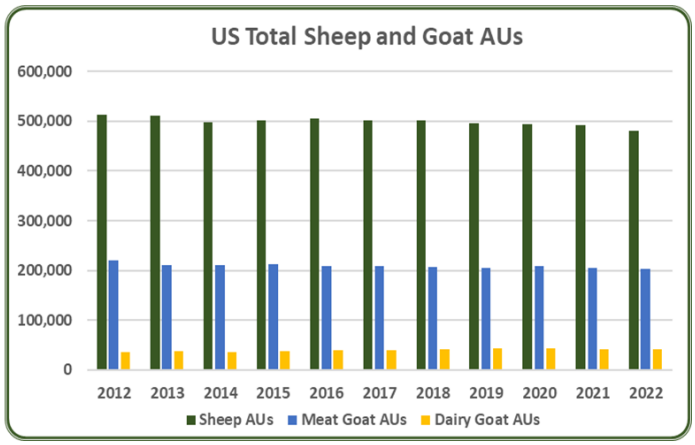
- In 2022, North Carolina had 80,124 dairy cattle AUs, a 3.2% decrease from 2021. Dairy cattle accounted for 1.5% of the total AUs (5.22 million) in North Carolina. From 2012 to 2022, the average number of dairy cattle AUs in North Carolina was 92,793 AUs. Since 2012, dairy cattle AUs have decreased by 17%.



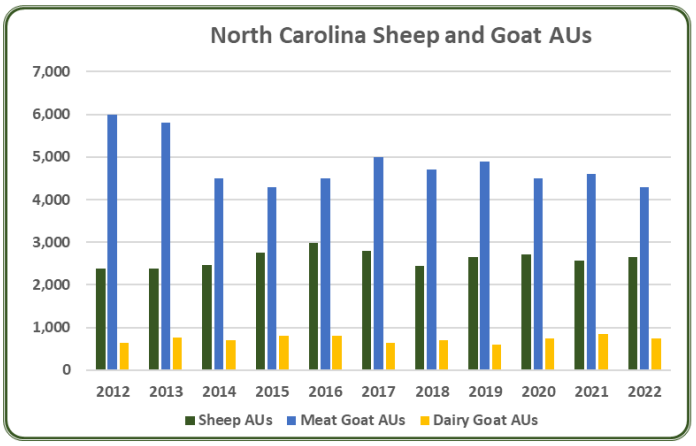
- From 2012 to 2022, beef cattle AUs averaged 63.9 million. In 2022 beef cattle AUs totaled 63.93 million, down 2% from last year, as beef cattle continued through a contraction phase in the cattle cycle which started in 2019. Beef AUs represent almost 50% of U.S. AUs, so changes in beef cattle AUs have large effects on total AUs.



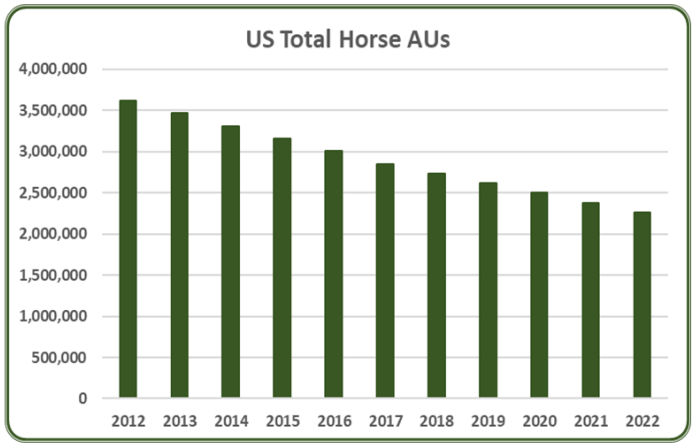
- In 2022, North Carolina had 577,933 beef cattle AUs, a 2% decrease from 2021. Beef cattle accounted for 11.1% of the total AUs (5.22 million) in North Carolina. From 2012 to 2022, the average number of beef cattle AUs in North Carolina was 578,450 AUs. Since 2012, beef cattle AUs have increased by 2.1%.



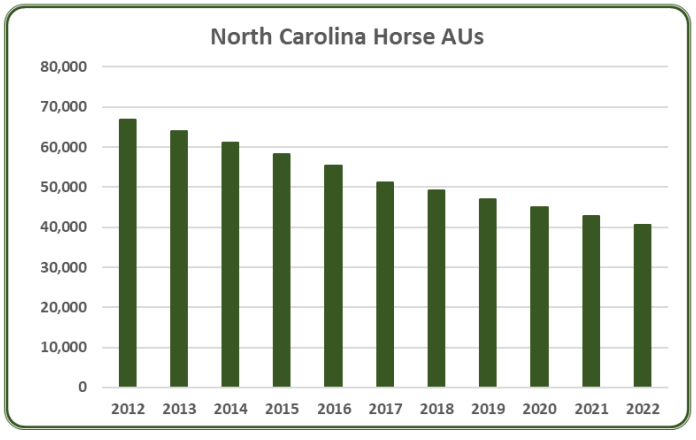
- Sheep, meat goats, and dairy goats account for less than 0.6% of U.S. total AUs. Over the past decade, sheep AUs averaged 500,000, meat goat AUs averaged 209,000 and dairy goat AUs averaged 40,000. Sheep and meat goat AUs have trended down while dairy goats trended up until 2019, then leveled off.



- In 2022, North Carolina had a combined 7,710 sheep, meat goat, and dairy goat AUs, a 3.8% decrease from 2021. These accounted for 0.1% of the total AUs (5.22 million) in North Carolina. Individually, sheep AUs increased 3.7%, meat goat AUs decreased 6.5% and dairy goat AUs decreased 11.8%. Combined there was a 14.4% decrease in sheep and goat AUs since 2012.



- Horses account for about 2% of U.S. total AUs. From 2012 to 2022, horse AUs averaged 2.90 million. However, a steady downtrend is present and 2022 horse AUs only totaled 2.26 million. U.S. horse AUs have decreased every year from 2012 to 2022, decreasing 37.6% over the entire period.



- In 2022, North Carolina had 40,694 horse AUs, a 5% decrease from 2021. Horses accounted for 0.8% of the total AUs (5.22 million) in North Carolina. From 2012 to 2022, the average number of horse AUs in North Carolina was 52,890 AUs. Since 2012, horse AUs have decreased by 39.1%.

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:

1. Economic impact of animal agriculture to local (state) economies during the 2012-2022 time period
2. SBM usage by animal species during the 2021/22 soybean marketing year
3. Animal Unit (AU) trends from 2012-2022

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 2012-2022 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 SBM in North Carolina. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of SBM usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of SBM used during the 2021-22 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 515.639.2900.

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, $1.88 to $2.99 million in total economic activity, $0.40 to $0.63 in household wages and 10 to 12 additional jobs are generated in the economy at large.

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Appendix

		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Animal Units (AUs)	Beef Cattle AUs	565,858	568,953	563,900	575,892	574,616	590,022	587,455	580,888	587,702	589,727	577,933
	Hog and Pig AUs	1,182,299	1,198,889	1,193,925	1,197,704	1,251,154	1,212,187	1,237,935	1,248,990	1,201,564	1,094,352	1,103,298
	Broiler AUs	2,398,800	2,359,800	2,385,600	2,468,100	2,456,100	2,492,400	2,620,800	2,748,300	2,883,900	2,914,200	2,928,600
	Turkey AUs	540,000	502,500	427,500	465,000	502,500	487,500	487,500	465,000	450,000	435,000	420,000
	Egg Layer AUs	51,944	52,968	57,612	59,128	60,248	60,532	53,868	63,456	63,968	63,212	62,892
	Dairy AUs	96,569	100,005	95,730	97,594	97,702	97,592	93,342	92,324	86,979	82,764	80,124
	Total Animal Units	**4,911,345**	**4,856,071**	**4,793,095**	**4,929,577**	**5,006,045**	**4,999,947**	**5,137,950**	**5,254,196**	**5,327,027**	**5,230,091**	**5,221,251**
Value of Production ($1,000)	Cattle and Calves ($1,000)	$ 316,790	$ 304,014	$ 412,922	$ 404,242	$ 272,237	$ 283,501	$ 247,350	$ 226,824	$ 229,681	$ 245,498	$ 262,715
	Hogs and Pigs ($1,000)	$ 2,553,214	$ 2,824,115	$ 2,821,777	$ 2,209,833	$ 2,067,317	$ 2,269,339	$ 2,078,354	$ 2,100,521	$ 1,839,738	$ 3,085,513	$ 3,132,866
	Broilers ($1,000)	$ 2,838,600	$ 3,580,997	$ 3,849,710	$ 3,452,400	$ 3,091,561	$ 3,570,435	$ 3,857,883	$ 3,606,314	$ 2,822,007	$ 4,289,303	$ 6,900,707
	Turkeys ($1,000)	$ 826,506	$ 717,835	$ 728,993	$ 879,794	$ 989,027	$ 730,463	$ 583,279	$ 647,896	$ 775,873	$ 930,650	$ 1,028,338
	Eggs ($1,000)	$ 392,549	$ 431,075	$ 500,526	$ 588,368	$ 444,441	$ 461,195	$ 509,017	$ 443,693	$ 504,920	$ 512,783	$ 753,086
	Milk ($1,000)	$ 192,700	$ 200,090	$ 246,977	$ 183,210	$ 165,015	$ 178,976	$ 162,101	$ 174,086	$ 168,260	$ 176,981	$ 240,768
	Other	$ 24,550	$ 26,067	$ 27,656	$ 29,449	$ 30,971	$ 32,437	$ 33,771	$ 35,385	$ 36,973	$ 38,435	$ 40,083
	Sheep and Lambs ($1,000)	$ 1,185	$ 1,185	$ 1,258	$ 1,535	$ 1,540	$ 1,489	$ 1,306	$ 1,404	$ 1,475	$ 1,421	$ 1,552
	Aquaculture ($1,000)	$ 23,365	$ 24,882	$ 26,398	$ 27,915	$ 29,431	$ 30,948	$ 32,465	$ 33,981	$ 35,498	$ 37,014	$ 38,531
	Total ($1,000)	**$ 7,144,909**	**$ 8,084,193**	**$ 8,588,561**	**$ 7,747,296**	**$ 7,060,569**	**$ 7,526,347**	**$ 7,471,755**	**$ 7,234,719**	**$ 6,377,452**	**$ 9,279,163**	**$ 12,358,564**

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Ag Census Data Category	Animal Type		2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)		16,761	14,413	13,909	13,583
	Cattle feedlots (112112)		13	3	10	18
	Dairy cattle and milk production (11212)		740	381	263	261
	Hog and pig farming (1122)		1,735	1,619	1,170	1,264
	Poultry and egg production (1123)		3,827	4,096	3,404	3,106
	Sheep and goat farming (1124)		1,004	2,437	1,922	2,046
	Animal aquaculture and other animal production (1125,1129)		5,232	6,290	5,190	4,943
Value of Sales ($1,000)	Cattle and Calves		185,222	288,801	332,733	275,175
	Hogs and Pigs		2,183,646	3,104,731	2,873,988	3,216,902
	Poultry and Eggs		2,382,365	4,087,004	4,837,026	5,413,591
	Milk*				179,265	184,855
	Aquaculture		17,669	32,175	23,365	30,948
	Other (calculated)		33,744	33,266	15,340	44,223
		Total	4,953,052	7,707,350	8,261,717	9,165,694
Input Purchases	Livestock and poultry purchased	(Farms)	11,972	12,342	12,827	12,188
		$1,000	1,049,514	1,666,076	1,397,510	1,674,565
	Breeding livestock purchased	(Farms)	*5,119*	5,004	5,806	5,789
		$1,000	*57,036*	131,277	136,342	193,167
	Other livestock and poultry purchased	(Farms)	*7,997*	8,677	8,692	8,015
		$1,000	*992,478*	1,534,800	1,261,168	1,481,398
	Feed purchased	(Farms)	30,938	28,263	29,837	29,230
		$1,000	1,917,997	3,183,993	4,121,552	3,124,286

** Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.*

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	Animal Type	Output ($1,000)	Earnings ($1,000)	Employment (Jobs)	Income Taxes Paid ($1,000)
2022 Animal Agriculture	Cattle and Calves	$ 492,748	$ 104,587	2,591	$ 26,617
	Hogs, Pigs, and Other	$ 6,056,842	$ 1,490,651	33,556	$ 379,371
	Poultry and Eggs	$ 25,942,209	$ 5,471,479	103,110	$ 1,392,491
	Dairy	$ 602,113	$ 131,507	2,806	$ 33,469
	Total	$ 33,093,912	$ 7,198,225	142,062	$ 1,831,948
Change from 2012 to 2022	Cattle and Calves	$ (275,631)	$ (58,503)	(1,450)	$ (14,889)
	Hogs, Pigs, and Other	$ (306,571)	$ (75,450)	(1,698)	$ (19,202)
	Poultry and Eggs	$ 10,263,168	$ 2,164,608	40,792	$ 550,893
	Dairy	$ (21,083)	$ (4,605)	(98)	$ (1,172)
	Total	$ 9,659,882	$ 2,026,049	37,546	$ 515,630

	Animal Type	Output($)	Earnings ($)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	$ 1.88	$ 0.40	9.9
	Hogs, Pigs, and Other	$ 1.91	$ 0.47	10.6
	Poultry and Eggs	$ 2.99	$ 0.63	11.9
	Dairy	$ 2.50	$ 0.55	11.7

Tax Rates	Federal effective income tax rate	14.0%
	Federal Social Security tax rate	6.2%
	State Effective Rate	5.3%
	Total	25.5%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.