

Missouri Economic Analysis of Animal Agriculture: 2012-2022

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Prepared For:



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Missouri Executive Summary

The use of SBM as a key feed ingredient is an important part of Missouri 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 Missouri. The success of Missouri animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Missouri during 2022 animal agriculture contributed:

- \$17.4 billion in economic output
- 108,509 jobs
- \$3.6 billion in earnings
- \$843.4 million in income taxes paid at local, state, and federal levels
- \$234.5 million in the form of property taxes

Missouri's animal agriculture consumed almost 1.3 million tons of SBM in 2022. This SBM was fed primarily to:

- Broilers (593.6 thousand tons)
- Hogs (300.7 thousand tons)
- Turkeys (151.6 thousand tons)

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

Missouri Economic Impact of Animal Agriculture

Animal agriculture is an important part of Missouri’s economy. In 2022, Missouri’s animal agriculture contributed the following to the economy:

- About \$17.4 billion in economic output
- \$3.6 billion in household earnings
- 108,509 jobs
- \$843.4 million in income taxes

And the animal agriculture sector has shown some change during challenging economic times. During the last decade Missouri’s animal agriculture has:

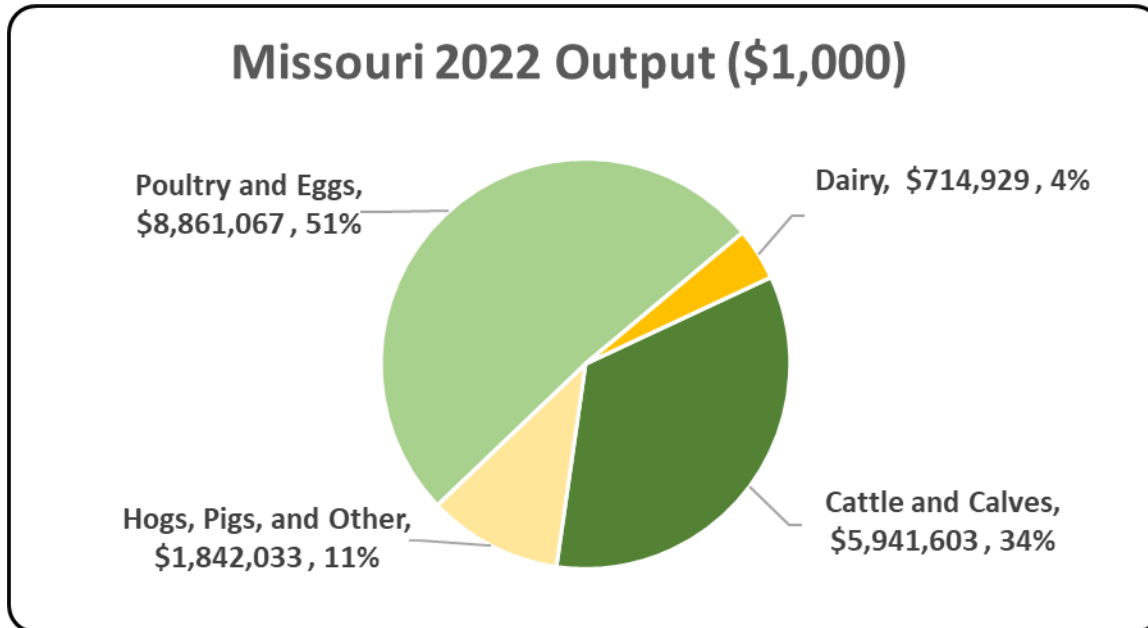
- Increased economic output by \$2.9 billion
- Boosted household earnings by \$552.6 million
- Added 13,856 jobs
- Paid \$130.7 million more in income taxes

Below is a table which demonstrates this decade of change.

Measure	2022	Change 2012-2022	% Change 2012-2022
Output (\$1,000)	\$ 17,359,632	\$ 2,860,017	19.72%
Earnings (\$1,000)	\$ 3,566,227	\$ 552,633	18.34%
Employment (Jobs)	108,509	13,856	14.64%
Income Taxes Paid (\$1,000)	\$ 843,413	\$ 130,698	18.34%
Property Taxes Paid in 2017 (\$1,000)	\$ 234,502		

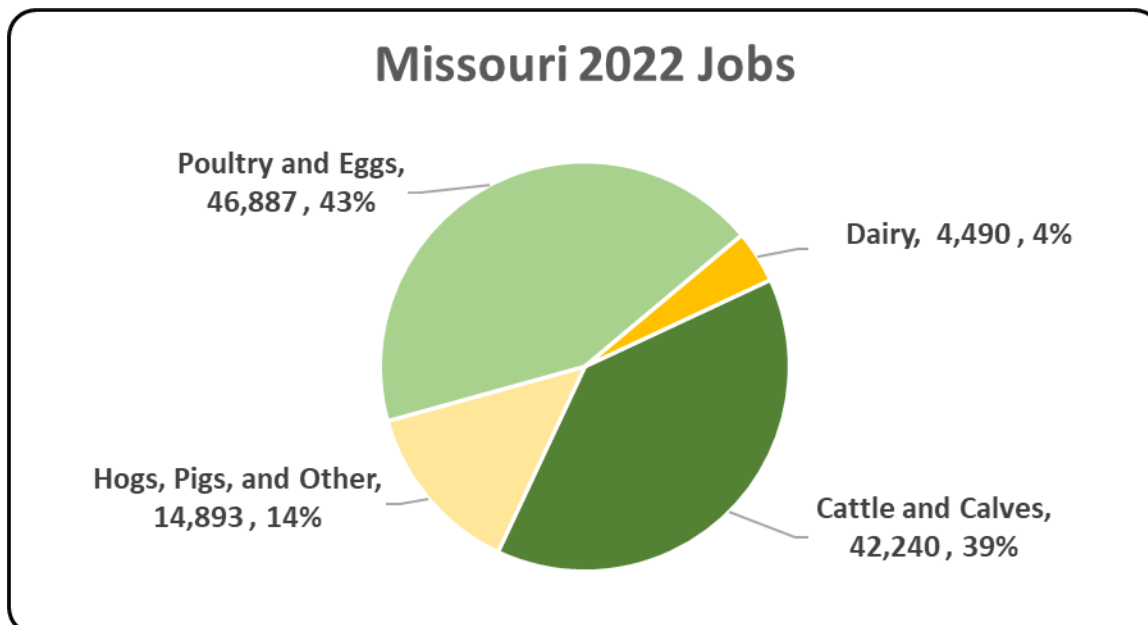
Missouri Output

“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 Missouri economy. Animal agriculture’s impact on Missouri total economic output is about \$17.4 billion.



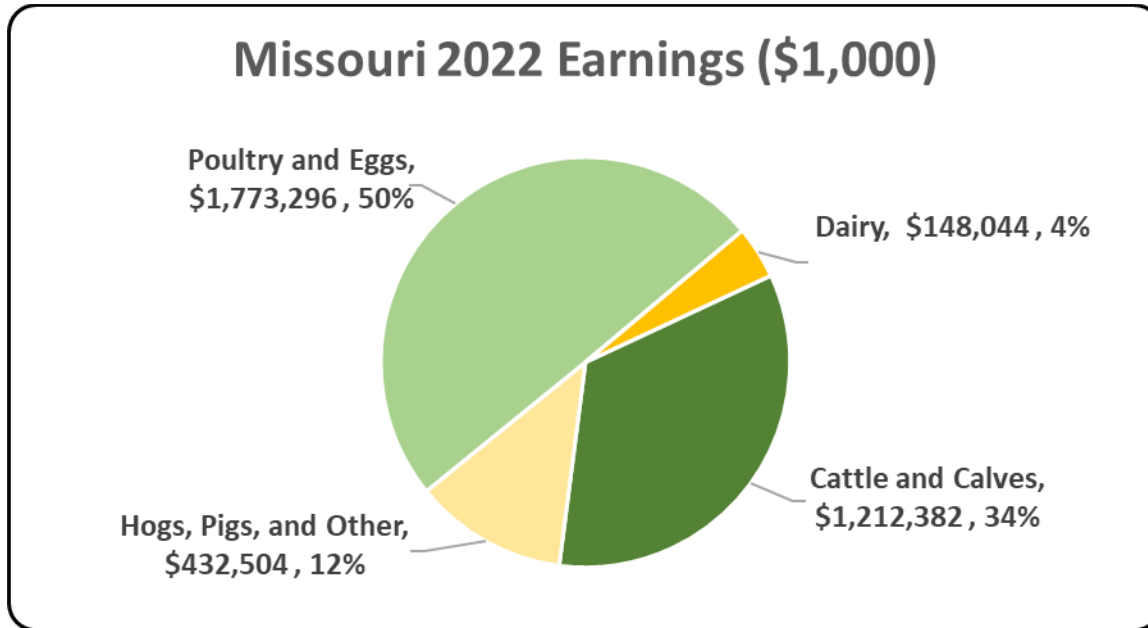
Missouri Jobs

“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 Missouri in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Missouri total jobs, contributing 108,509 jobs within and outside of animal agriculture.



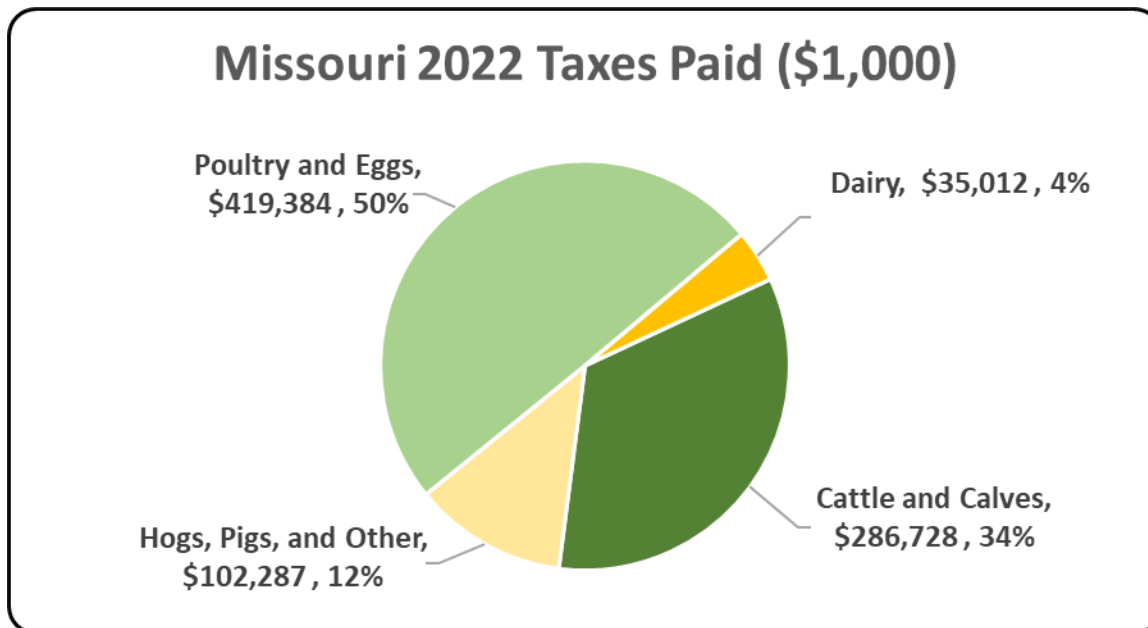
Missouri Earnings

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 Missouri economy in terms of earnings. Missouri's animal agriculture contributed about \$3.6 billion to household earnings in 2022.



Missouri Taxes Paid by Animal Agriculture

Missouri's animal agriculture is also a significant source of tax revenue. In 2022, the state's animal agriculture industry paid about \$843.4 million in income taxes at local, state, and federal levels. The 2017 Census of Agriculture estimated \$234.5 million in property taxes paid by all of Missouri agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



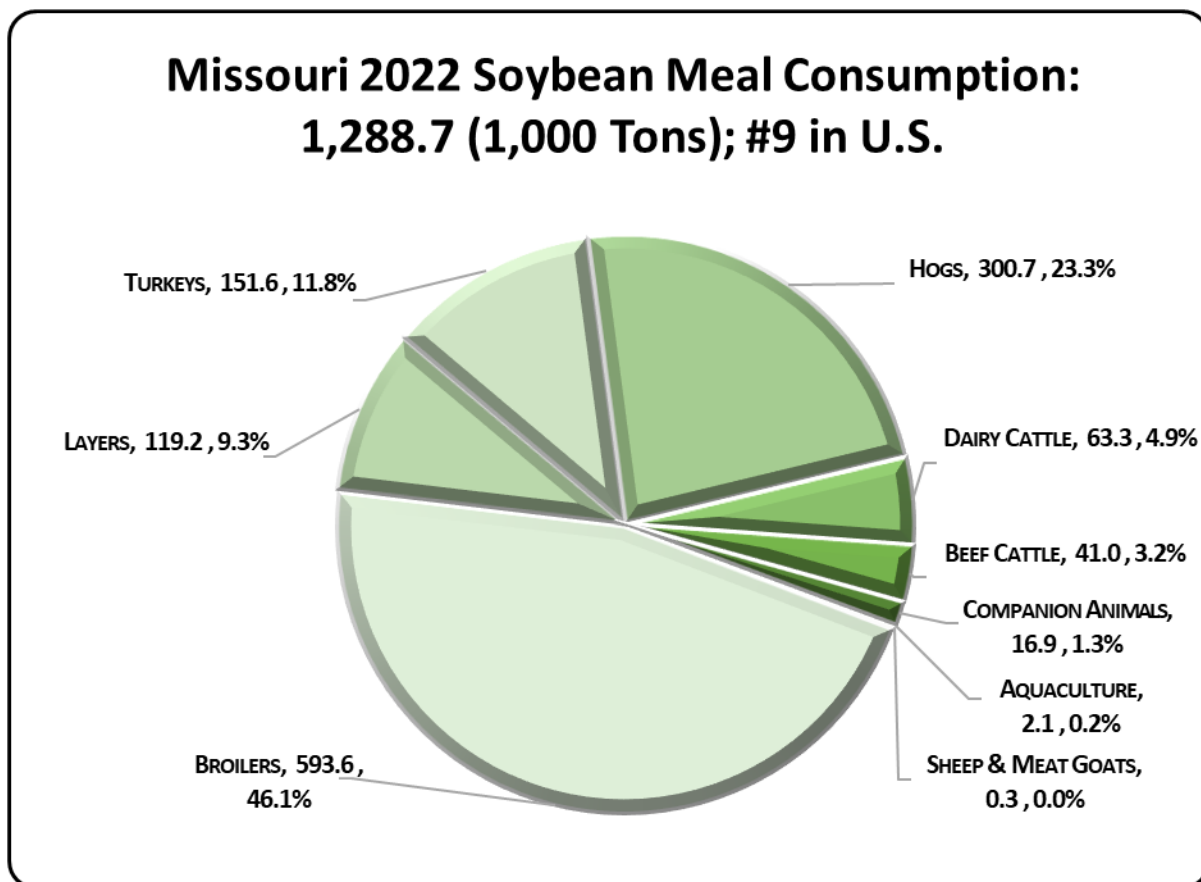
Missouri Animal Agriculture Soybean Meal Consumption

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.

Missouri’s animal agriculture consumed almost 1.3 million tons of SBM in 2022, placing the state as 9 in the nation in terms of SBM consumption (see figure below). Additionally, animal agriculture in Missouri consumed 98.6 thousand tons of soy hulls. The three segments of animal agriculture that led the state in estimated SBM consumption are:

1. Broilers (593.6 thousand tons)
2. Hogs (300.7 thousand tons)
3. Turkeys (151.6 thousand tons)

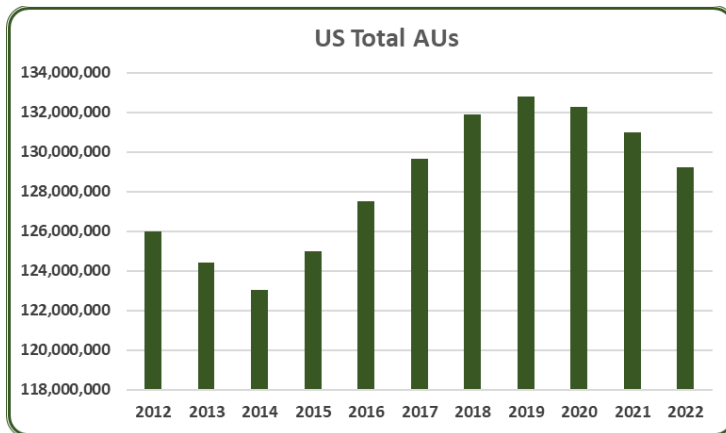


Missouri Animal Unit (AU) Trends

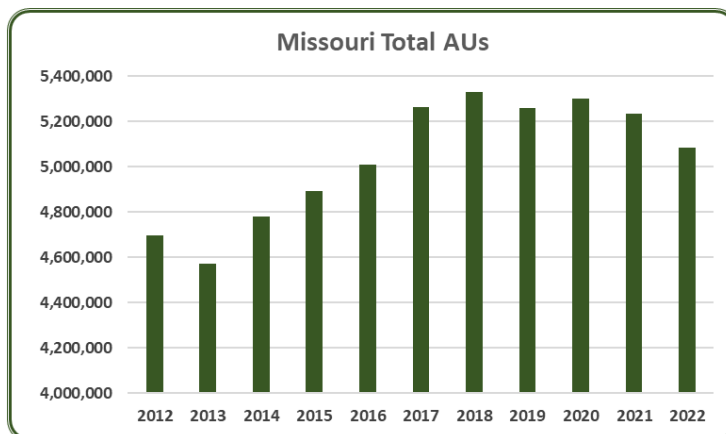
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the U.S. and abroad have an impact on the size of animal agriculture in the state of Missouri. Due to this reality, using a single year to measure a sector’s presence and strength can be misleading. The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

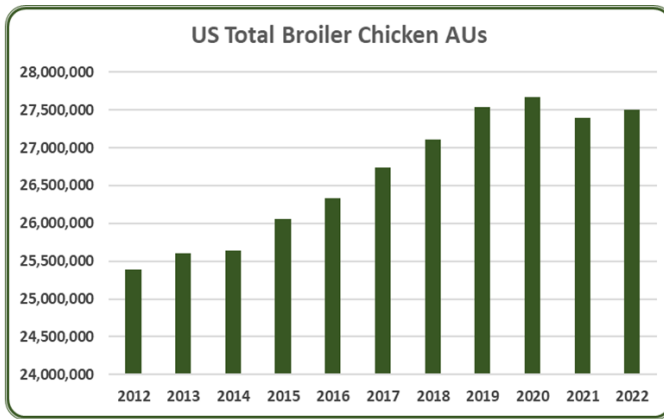
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Missouri, the largest three segments of animal agriculture in terms of AUs during 2022 were: Beef Cattle (3.13 million AUs), Broilers (954,900 AUs), and Hogs (443,982 AUs). Total AUs in Missouri during 2022 were 5.08 million AUs.



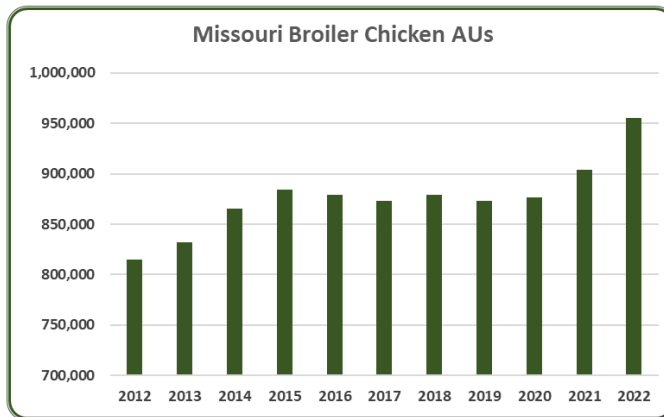
- In 2022, total AUs in the U.S. decreased by 1.4% to 129.2 million, continuing a downward trend that started in 2019. Nine out of the ten animal groups tracked saw a decrease, with the exception being broilers. Over 70% of the total decrease in AUs is due to lower beef cattle inventories.



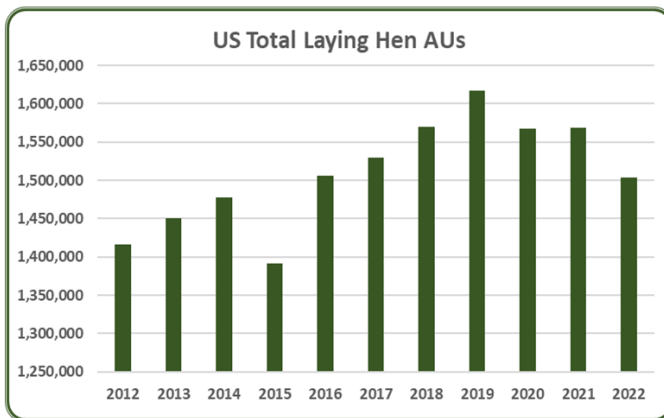
- In 2022, Missouri had 5.08 million total AUs, a 2.9% decrease from 2021. From 2012 to 2022, the average number of total AUs in Missouri was 5.04 million AUs. Since 2012, total AUs in Missouri have increased by 8.2%.



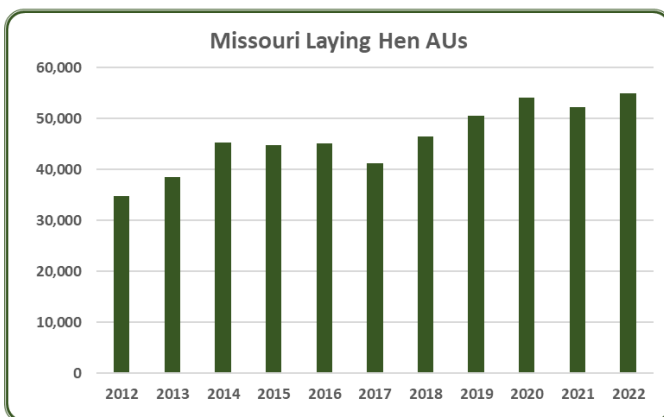
- From 2012 to 2022, broiler chicken AUs averaged 26.6 million across the U.S. Broiler AUs trended up and peaked in 2020 at 27.6 million. Broiler AUs are up 0.4% from 2021 and were the only animal group tracked here that increased compared to last year. Broilers make up about 21% of U.S. AUs.



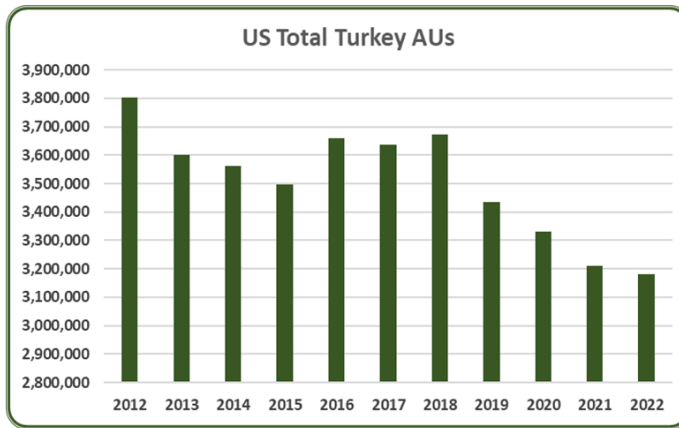
- In 2022, Missouri had 954,900 broiler AUs, a 5.7% increase from 2021. Broilers accounted for 18.8% of the total AUs (5.08 million) in Missouri. From 2012 to 2022, the average number of broiler AUs in Missouri was 875,945 AUs. Since 2012, broiler AUs have increased by 17.2%.



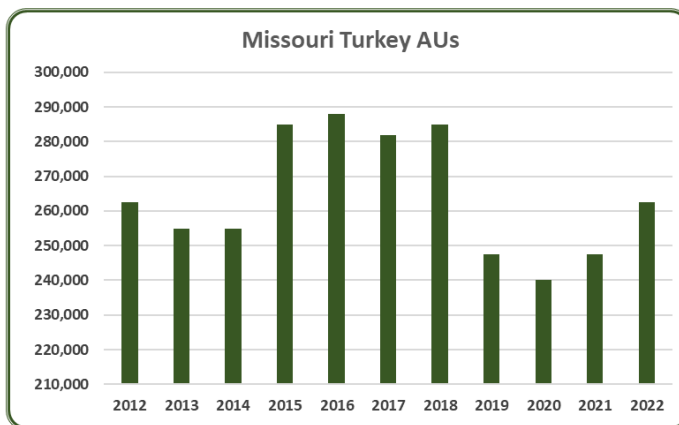
- From 2012 to 2022, U.S. layer AUs averaged 1.51 million. In 2022, layer AUs were 1.50 million, a 4.2% decrease from 2021. The 2022-23 Highly Pathogenic Avian Influenza (HPAI) outbreak contributed to this past year's decrease in layer AUs. Layers make up about 1% of U.S. AUs so large changes in layer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



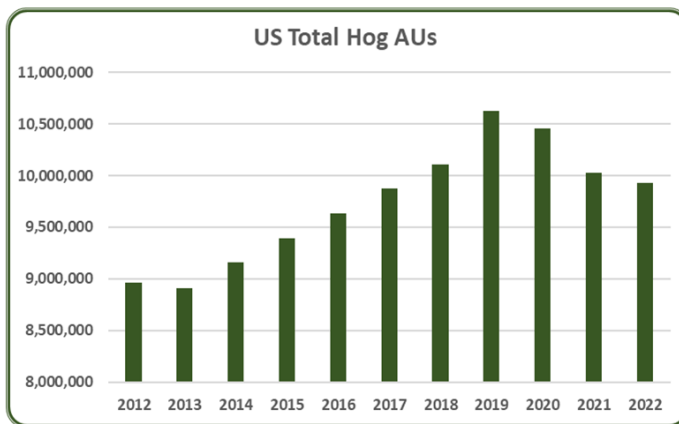
- In 2022, Missouri had 54,928 layer AUs, a 5.1% increase from 2021. Layers accounted for 1.1% of the total AUs (5.08 million) in Missouri. From 2012 to 2022, the average number of layer AUs in Missouri was 46,149 AUs. Since 2012, layer AUs have increased by 57.8%.



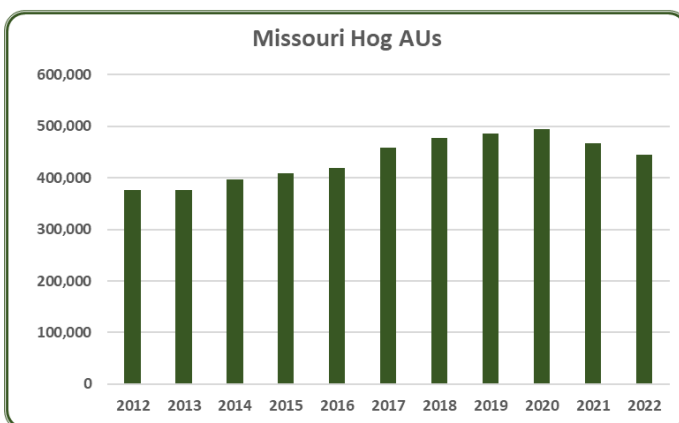
- In 2022, turkey AUs were at 3.18 million, a 0.9% drop from the previous year. This drop is surprisingly low considering the industry battled HPAI for most of 2022. Turkey AUs have been trending down since 2018. Turkey AUs represent about 2% of U.S. AUs, so like layers, large changes in turkey AUs do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



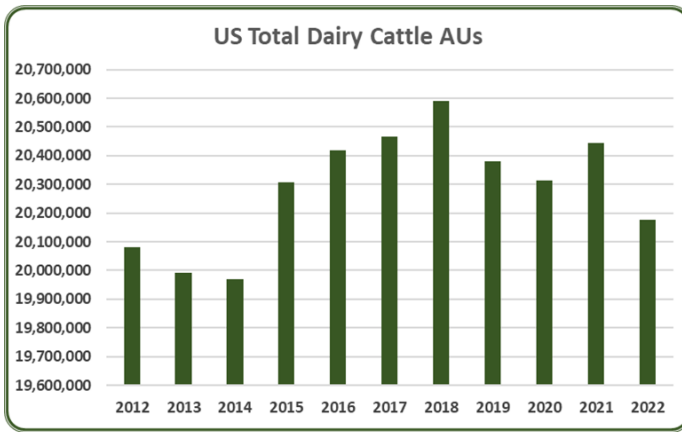
- In 2022, Missouri had 262,500 turkey AUs, a 6.1% increase from 2021. Turkeys accounted for 5.2% of the total AUs (5.08 million) in Missouri. From 2012 to 2022, the average number of turkey AUs in Missouri was 264,545 AUs. Since 2012, turkey AUs have decreased by 0%.



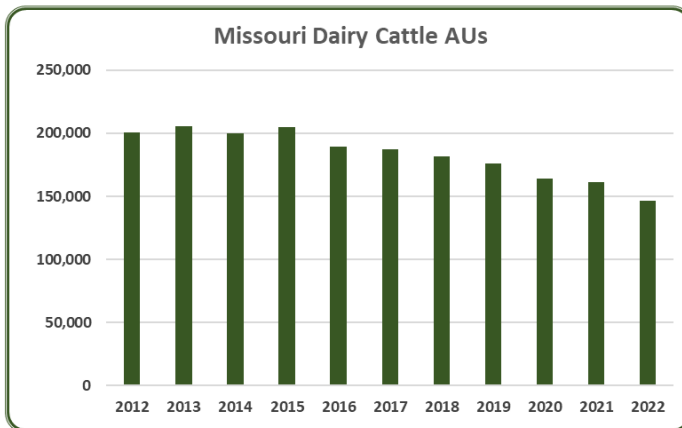
- In 2022, hog AUs totaled 9.93 million, a 1.0% drop from the previous year. From 2012 to 2022, hog AUs averaged 9.73 million. Hog AUs have been trending down since 2019 when they peaked at 10.62 million AUs. Hogs make up 7.70% of all AUs within the U.S.



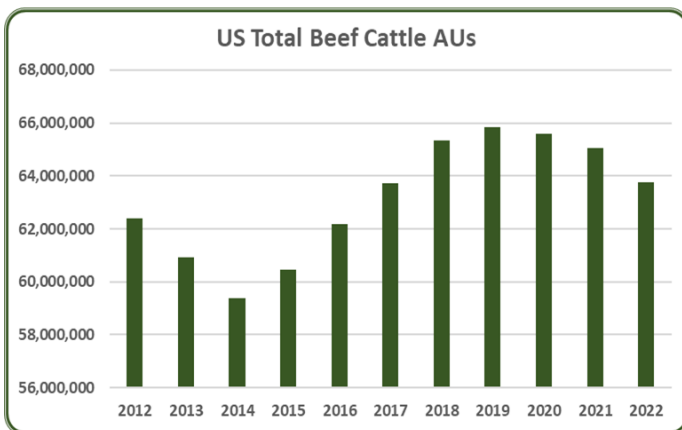
- In 2022, Missouri had 443,982 hog AUs, a 4.8% decrease from 2021. Hogs accounted for 8.7% of the total AUs (5.08 million) in Missouri. From 2012 to 2022, the average number of hog AUs in Missouri was 436,491 AUs. Since 2012, hog AUs have increased by 18.2%.



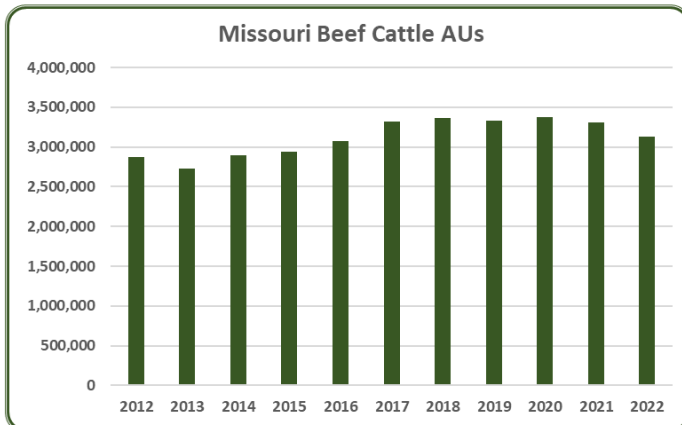
- From 2012 to 2022, dairy cattle AUs averaged 20.29 million. The herd was also relatively steady, fluctuating between 19.9-20.6 million AUs during that time. In 2022, dairy cattle AUs totaled 20.18 million, down 1.3% from 2021. Dairy cattle represented about 16% of all U.S. AUs.



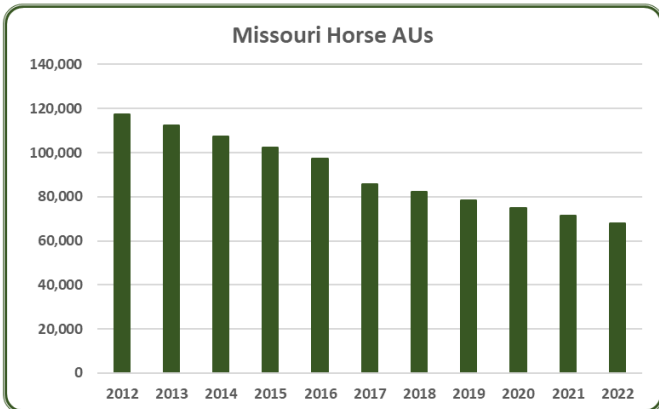
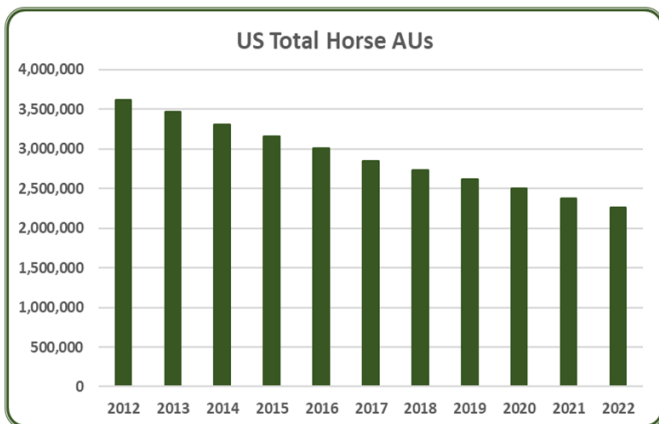
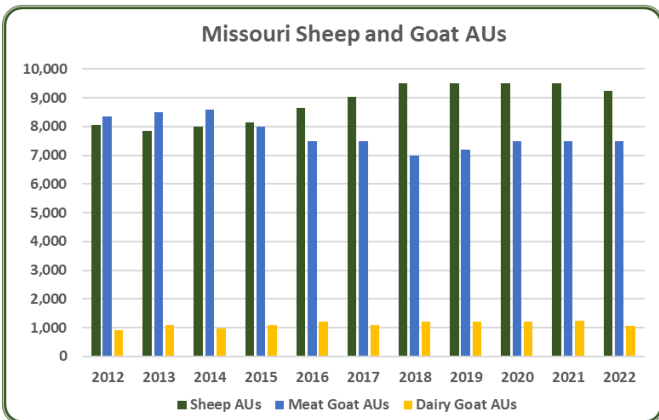
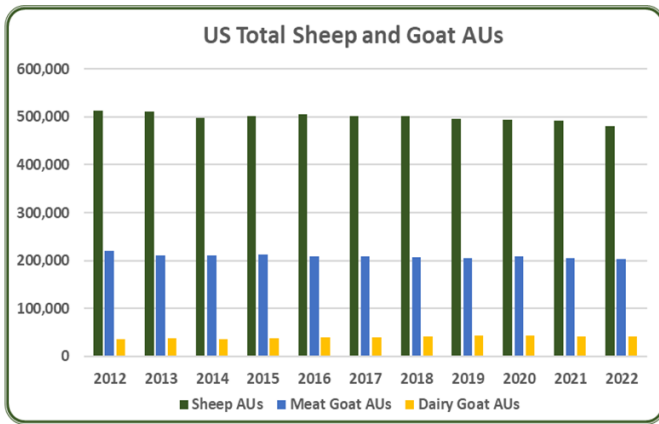
- In 2022, Missouri had 146,204 dairy cattle AUs, a 9.2% decrease from 2021. Dairy cattle accounted for 2.9% of the total AUs (5.08 million) in Missouri. From 2012 to 2022, the average number of dairy cattle AUs in Missouri was 183,290 AUs. Since 2012, dairy cattle AUs have decreased by 27.2%.



- 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, Missouri had 3.13 million beef cattle AUs, a 5.4% decrease from 2021. Beef cattle accounted for 61.7% of the total AUs (5.08 million) in Missouri. From 2012 to 2022, the average number of beef cattle AUs in Missouri was 3.12 million AUs. Since 2012, beef cattle AUs have increased by 9.1%.



- 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, Missouri had a combined 17,820 sheep, meat goat, and dairy goat AUs, a 2.4% decrease from 2021. These accounted for 0.4% of the total AUs (5.08 million) in Missouri. Individually, sheep AUs decreased 2.6%, meat goat AUs decreased 0% and dairy goat AUs decreased 14.4%. Combined there was a 3% increase 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, Missouri had 67,882 horse AUs, a 5% decrease from 2021. Horses accounted for 1.3% of the total AUs (5.08 million) in Missouri. From 2012 to 2022, the average number of horse AUs in Missouri was 90,616 AUs. Since 2012, horse AUs have decreased by 42.1%.

Missouri Additional Information and Methodology

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

Missouri 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 Missouri'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 Missouri, \$2.00 to \$3.44 million in total economic activity, \$0.47 to \$0.69 in household wages and 16 to 20 additional jobs are generated in the economy at large.

Appendix

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Animal Units (AUs)	Beef Cattle AUs	2,872,593	2,733,088	2,894,363	2,944,753	3,075,800	3,318,327	3,360,281	3,333,006	3,379,688	3,313,543	3,134,848
	Hog and Pig AUs	375,508	376,633	397,058	408,153	419,394	457,844	476,721	485,340	494,375	466,398	443,982
	Broiler AUs	814,800	832,200	865,500	883,800	879,000	873,300	879,300	872,700	876,300	903,600	954,900
	Turkey AUs	262,500	255,000	255,000	285,000	288,000	282,000	285,000	247,500	240,000	247,500	262,500
	Egg Layer AUs	34,808	38,424	45,212	44,732	45,144	41,160	46,400	50,556	54,020	52,256	54,928
	Dairy AUs	200,936	205,160	199,961	205,082	189,029	187,269	181,265	175,889	164,367	161,026	146,204
	Total Animal Units	4,695,741	4,570,231	4,781,930	4,891,032	5,010,945	5,263,090	5,328,748	5,261,422	5,301,932	5,234,005	5,083,064
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,592,860	\$ 1,569,300	\$ 2,071,624	\$ 2,035,443	\$ 1,652,942	\$ 1,839,489	\$ 1,979,678	\$ 1,879,389	\$ 1,509,768	\$ 1,853,094	\$ 2,163,809
	Hogs and Pigs (\$1,000)	\$ 905,013	\$ 953,226	\$ 1,211,552	\$ 886,242	\$ 828,806	\$ 850,265	\$ 711,869	\$ 841,679	\$ 647,831	\$ 1,029,890	\$ 896,198
	Broilers (\$1,000)	\$ 651,850	\$ 808,221	\$ 882,118	\$ 760,786	\$ 686,265	\$ 775,962	\$ 819,215	\$ 706,887	\$ 533,313	\$ 833,218	\$ 1,491,030
	Turkeys (\$1,000)	\$ 404,201	\$ 342,847	\$ 398,809	\$ 484,080	\$ 514,740	\$ 398,536	\$ 312,269	\$ 327,422	\$ 397,789	\$ 440,604	\$ 360,397
	Eggs (\$1,000)	\$ 173,312	\$ 244,290	\$ 305,609	\$ 421,446	\$ 192,578	\$ 207,485	\$ 298,491	\$ 204,174	\$ 255,840	\$ 279,197	\$ 725,664
	Milk (\$1,000)	\$ 264,704	\$ 276,545	\$ 342,678	\$ 245,680	\$ 213,278	\$ 232,067	\$ 201,786	\$ 209,000	\$ 194,215	\$ 189,880	\$ 247,483
	Other	\$ 17,734	\$ 18,500	\$ 17,951	\$ 19,261	\$ 19,704	\$ 20,659	\$ 21,833	\$ 22,259	\$ 22,845	\$ 23,508	\$ 24,220
	Sheep and Lambs (\$1,000)	\$ 7,478	\$ 7,743	\$ 6,693	\$ 7,502	\$ 7,444	\$ 7,898	\$ 8,571	\$ 8,496	\$ 8,581	\$ 8,743	\$ 8,954
	Aquaculture (\$1,000)	\$ 10,256	\$ 10,757	\$ 11,258	\$ 11,759	\$ 12,260	\$ 12,761	\$ 13,262	\$ 13,763	\$ 14,264	\$ 14,765	\$ 15,266
	Total (\$1,000)	\$ 4,009,674	\$ 4,212,929	\$ 5,230,341	\$ 4,852,938	\$ 4,108,313	\$ 4,324,463	\$ 4,345,141	\$ 4,190,810	\$ 3,561,601	\$ 4,649,391	\$ 5,908,800

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	48,441	44,336	40,724	41,949
	Cattle feedlots (112112)	3,029	1,300	730	638
	Dairy cattle and milk production (11212)	2,664	1,705	1,153	944
	Hog and pig farming (1122)	1,469	1,056	689	992
	Poultry and egg production (1123)	1,362	2,245	1,645	1,597
	Sheep and goat farming (1124)	922	1,595	2,086	2,646
	Animal aquaculture and other animal production (1125,1129)	8,047	9,216	7,265	6,485
Value of Sales (\$1,000)	Cattle and Calves	1,285,288	1,676,632	1,968,617	1,869,893
	Hogs and Pigs	570,551	725,738	882,526	1,272,599
	Poultry and Eggs	784,986	1,265,166	1,441,676	1,626,134
	Milk*			246,358	221,909
	Aquaculture	11,107	9,506	10,256	12,761
	Other (calculated)	38,417	38,262	25,866	46,327
	Total	2,990,809	4,017,988	4,575,299	5,049,623
Input Purchases	Livestock and poultry purchased (Farms)	30,120	25,620	27,112	28,043
	\$1,000	546,196	761,333	906,474	858,466
	Breeding livestock purchased (Farms)	19,512	17,469	18,367	20,421
	\$1,000	97,217	142,362	209,880	248,613
	Other livestock and poultry purchased (Farms)	14,508	11,591	12,517	11,651
	\$1,000	448,979	618,971	696,594	609,853
Feed purchased	(Farms)	69,368	59,938	63,616	63,851
	\$1,000	1,136,939	1,383,506	1,989,225	1,629,153
<i>* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.</i>					

	<u>Animal Type</u>	<u>Output (\$1,000)</u>	<u>Earnings (\$1,000)</u>	<u>Employment (Jobs)</u>	<u>Income Taxes Paid (\$1,000)</u>
2022 Animal Agriculture	Cattle and Calves	\$ 5,941,603	\$ 1,212,382	42,240	\$ 286,728
	Hogs, Pigs, and Other	\$ 1,842,033	\$ 432,504	14,893	\$ 102,287
	Poultry and Eggs	\$ 8,861,067	\$ 1,773,296	46,887	\$ 419,384
	Dairy	\$ 714,929	\$ 148,044	4,490	\$ 35,012
	Total	\$ 17,359,632	\$ 3,566,227	108,509	\$ 843,413

Change from 2012 to 2022	Cattle and Calves	\$ 285,385	\$ 58,233	2,029	\$ 13,772
	Hogs, Pigs, and Other	\$ (546,100)	\$ (128,223)	(4,415)	\$ (30,325)
	Poultry and Eggs	\$ 3,394,679	\$ 679,350	17,963	\$ 160,666
	Dairy	\$ (273,947)	\$ (56,728)	(1,720)	\$ (13,416)
	Total	\$ 2,860,017	\$ 552,633	13,856	\$ 130,698

	<u>Animal Type</u>	<u>Output(\$)</u>	<u>Earnings (\$)</u>	<u>Employment (Jobs)</u>
RIMS II Multipliers	Cattle and Calves	\$ 2.75	\$ 0.56	19.5
	Hogs, Pigs, and Other	\$ 2.00	\$ 0.47	16.2
	Poultry and Eggs	\$ 3.44	\$ 0.69	18.2
	Dairy	\$ 2.89	\$ 0.60	18.1

Tax Rates	Federal effective income tax rate	14.0%
	Federal Social Security tax rate	6.2%
	State Effective Rate	3.5%
	Total	23.7%

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.