Colorado Economic Analysis of Animal Agriculture: 2012-2022

September 2023

Prepared For:

Prepared By:

Contents

11107 Aurora Ave | Urbandale, IA 50322 | 515.639.2900 | www.decision-innovation.com

Colorado Executive Summary

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

- $11.4 billion in economic output
- 70,172 jobs
- $2.5 billion in earnings
- $621.6 million in income taxes paid at local, state, and federal levels
- $128.9 million in the form of property taxes

Colorado's animal agriculture consumed almost 307.6 thousand tons of SBM in 2022. This SBM was fed primarily to:

- Dairy Cows (162.6 thousand tons)
- Hogs (63.5 thousand tons)
- Beef Cows (43.5 thousand tons)

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

11107 Aurora Ave | Urbandale, IA 50322 | 515.639.2900 | www.decision-innovation.com

Colorado Economic Impact of Animal Agriculture

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

- About $11.4 billion in economic output
- $2.5 billion in household earnings
- 70,172 jobs
- $621.6 million in income taxes

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

- Increased economic output by $973.8 million
- Boosted household earnings by $212.2 million
- Added 4,407 jobs
- Paid $52.7 million more in income taxes

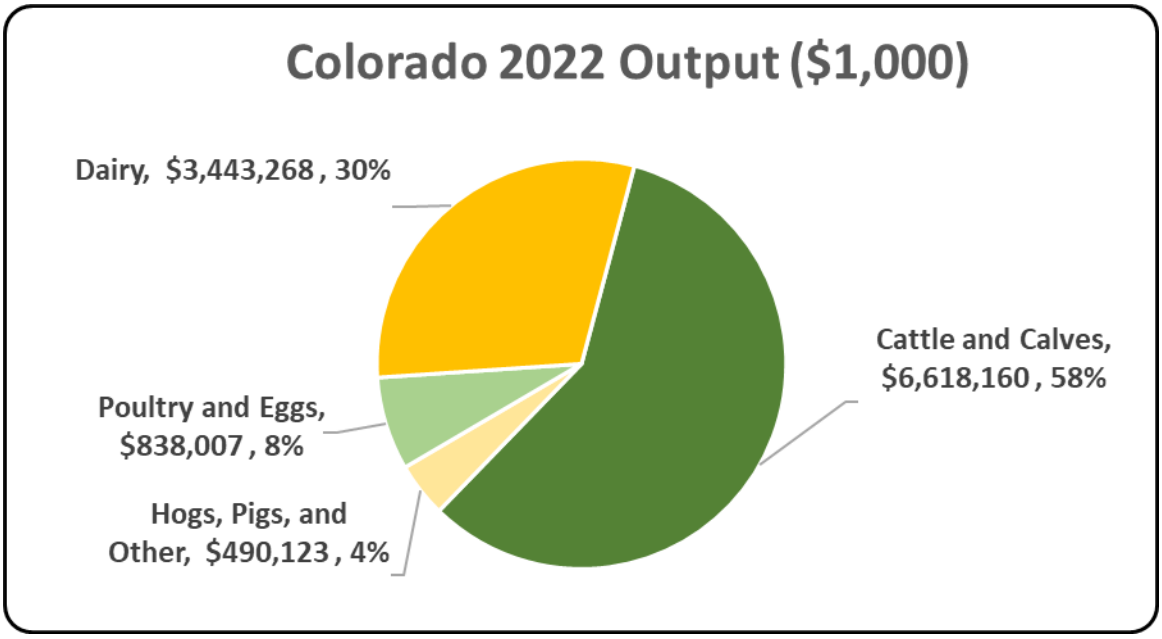
Below is a table which demonstrates this decade of change.

Measure		2022		Change 2012-2022	% Change 2012-2022
Output ($1,000)	$	11,389,558	$	973,760	9.35%
Earnings ($1,000)	$	2,503,514	$	212,249	9.26%
Employment (Jobs)		70,172		4,407	6.70%
Income Taxes Paid ($1,000)	$	621,623	$	52,702	9.26%
Property Taxes Paid in 2017 ($1,000)	$	128,913			

11107 Aurora Ave | Urbandale, IA 50322 | 515.639.2900 | www.decision-innovation.com

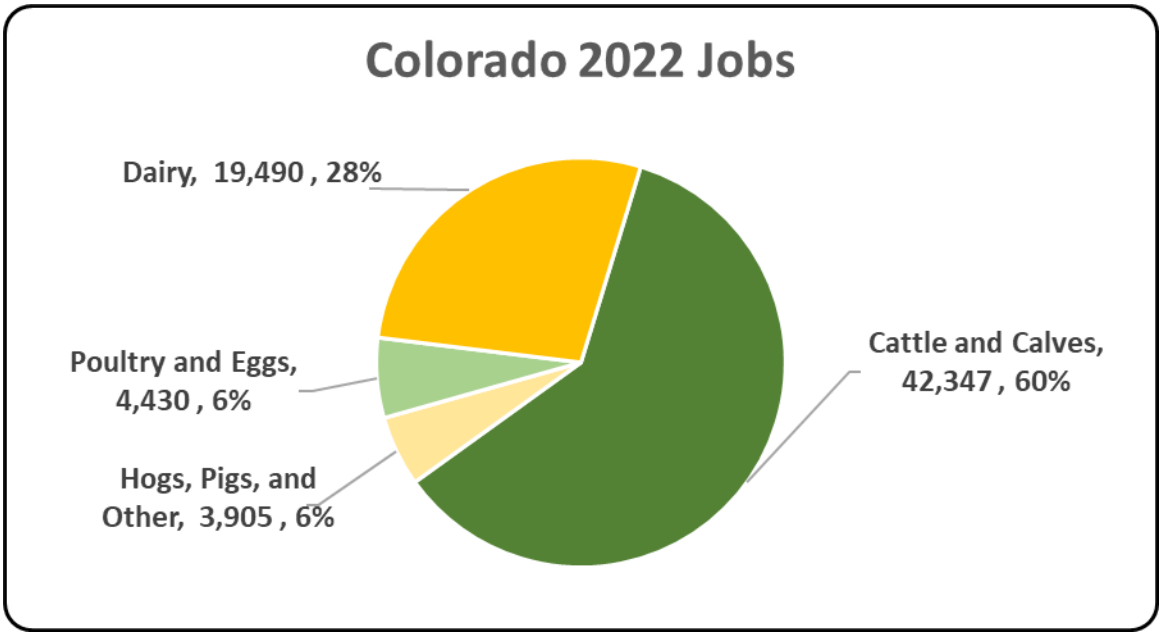
Colorado Output

"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 Colorado economy. Animal agriculture's impact on Colorado total economic output is about $11.4 billion.



Colorado Jobs

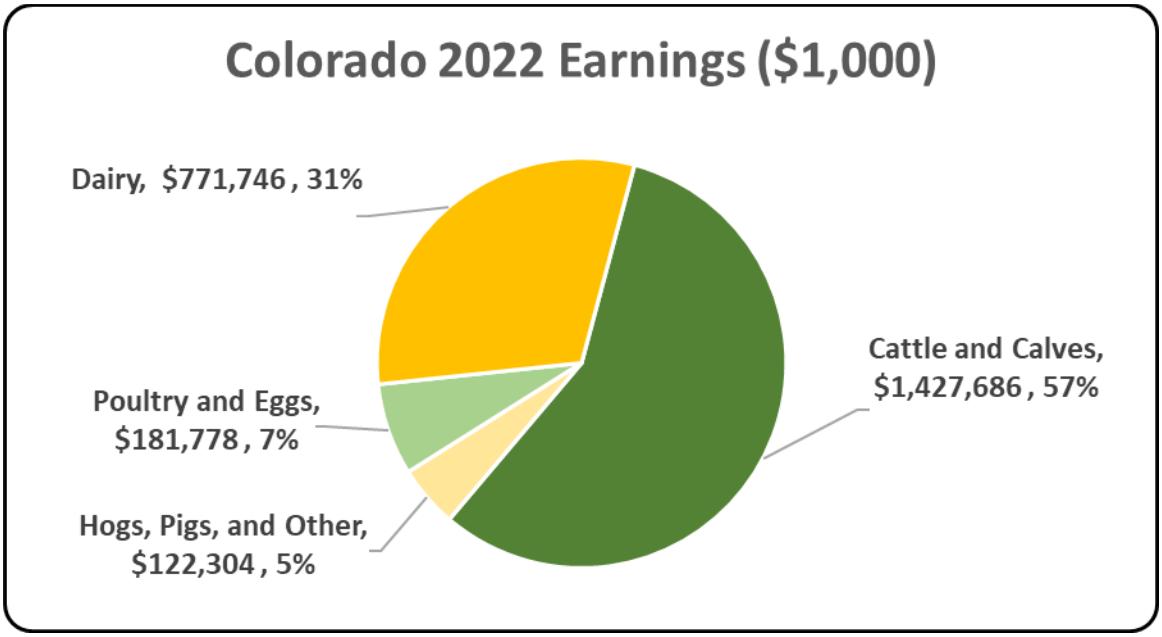
"Jobs" represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The figure illustrates the contribution to Colorado in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Colorado total jobs, contributing 70,172 jobs within and outside of animal agriculture.



11107 Aurora Ave | Urbandale, IA 50322 | 515.639.2900 | www.decision-innovation.com

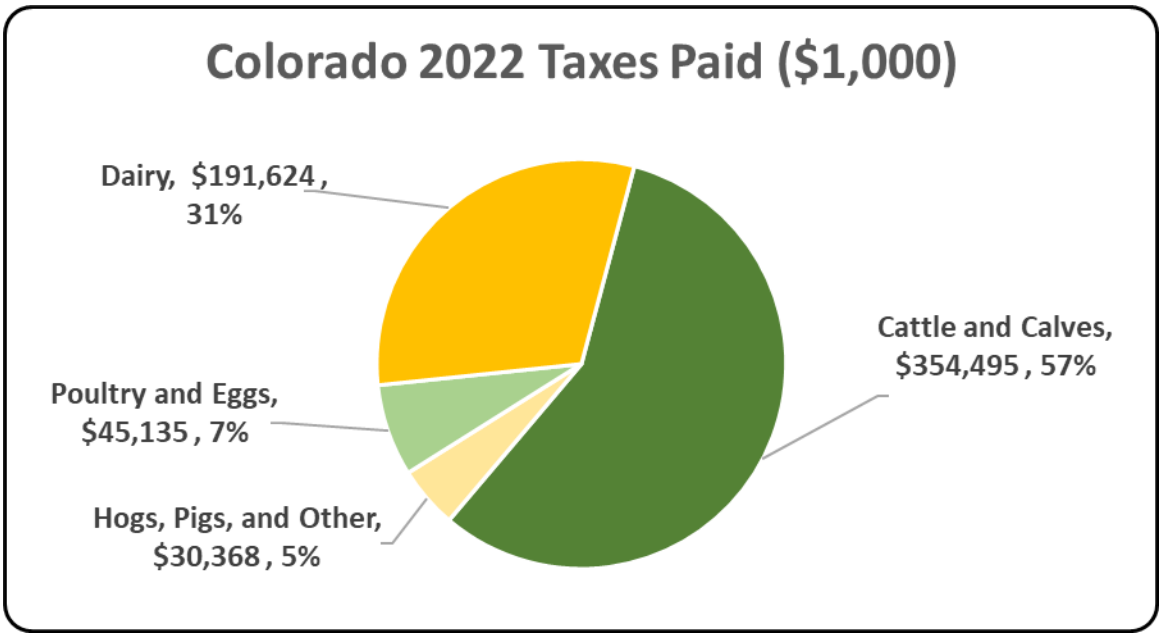
Colorado Earnings

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 Colorado economy in terms of earnings. Colorado's animal agriculture contributed about $2.5 billion to household earnings in 2022.



Colorado Taxes Paid by Animal Agriculture

Colorado's animal agriculture is also a significant source of tax revenue. In 2022, the state's animal agriculture industry paid about $621.6 million in income taxes at local, state, and federal levels. The 2017 Census of Agriculture estimated $128.9 million in property taxes paid by all of Colorado agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



11107 Aurora Ave | Urbandale, IA 50322 | 515.639.2900 | www.decision-innovation.com

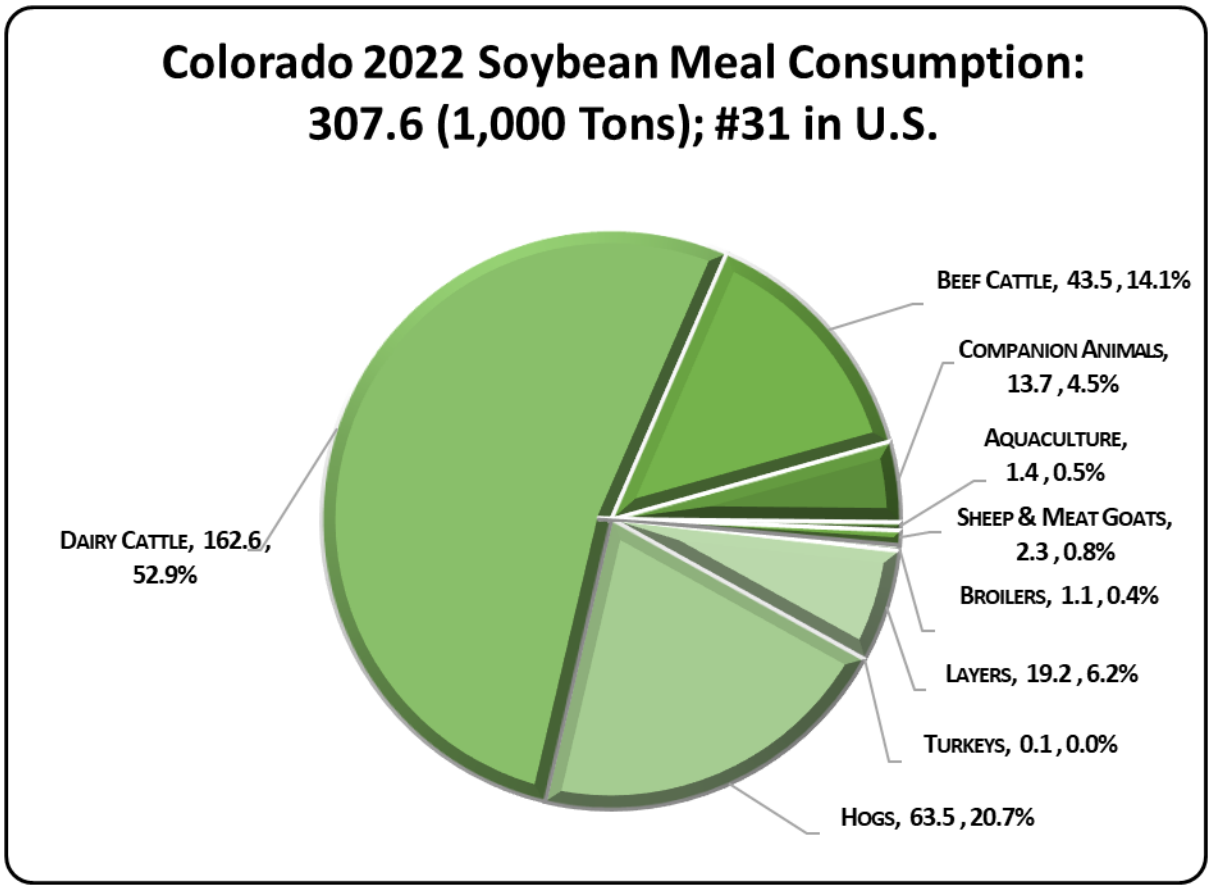
Colorado Animal Agriculture Soybean Meal Consumption

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.

Colorado's animal agriculture consumed almost 307.6 thousand tons of SBM in 2022, placing the state as 31 in the nation in terms of SBM consumption (see figure below). Additionally, animal agriculture in Colorado consumed 210.2 thousand tons of soy hulls. The three segments of animal agriculture that led the state in estimated SBM consumption are:

1. Dairy Cows (162.6 thousand tons)
2. Hogs (63.5 thousand tons)
3. Beef Cows (43.5 thousand tons)

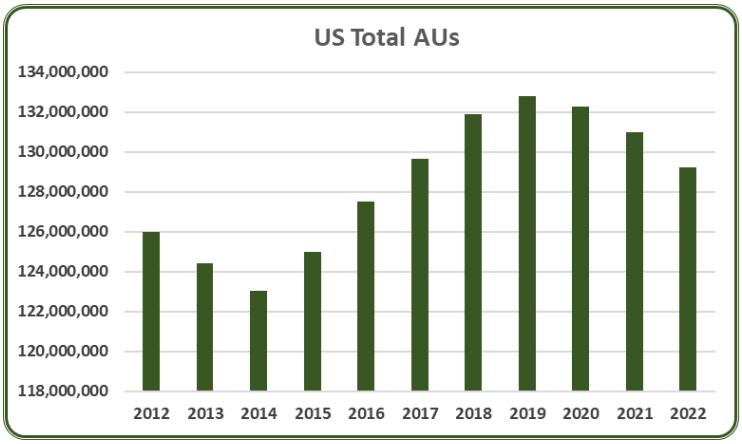


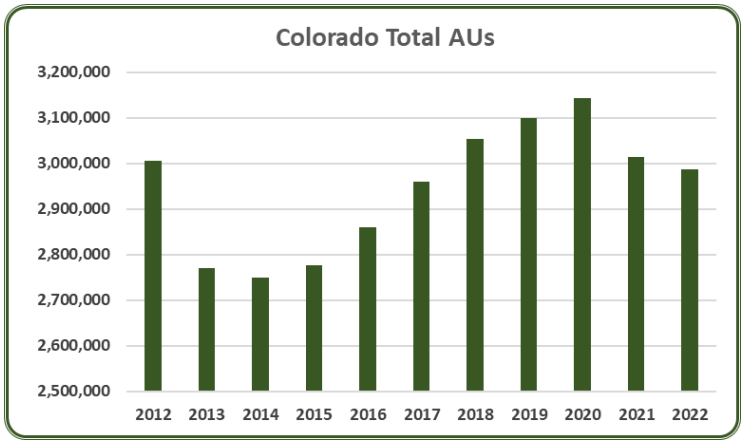
Colorado Animal Unit (AU) Trends

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 Colorado. 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 Colorado and to give perspective on Colorado'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 Colorado, the largest three segments of animal agriculture in terms of AUs during 2022 were: Beef Cattle (2.31 million AUs), Dairy Cattle (451,114 AUs), and Hogs (94,197 AUs). Total AUs in Colorado during 2022 were 2.99 million AUs.

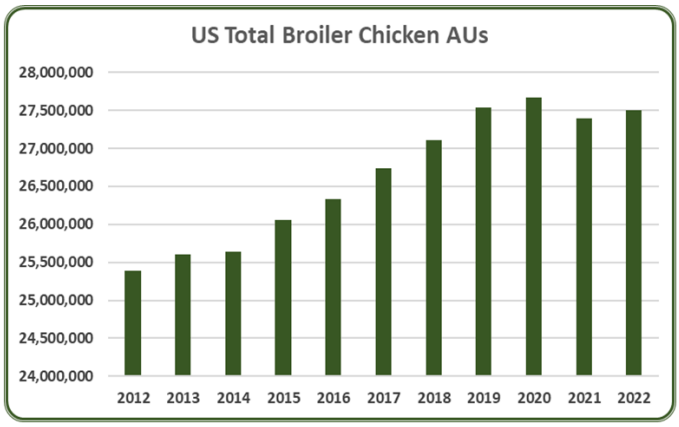




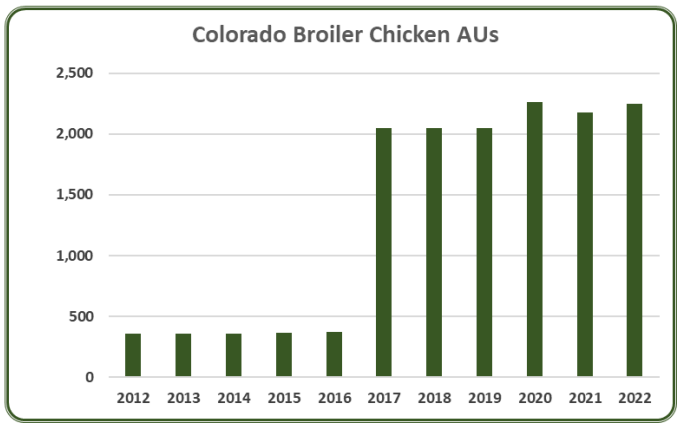
- In 2022, total AUs in the U.S. decreased by 1.4% to 129.2 million, continuing a downward trend that started in 2019.

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.

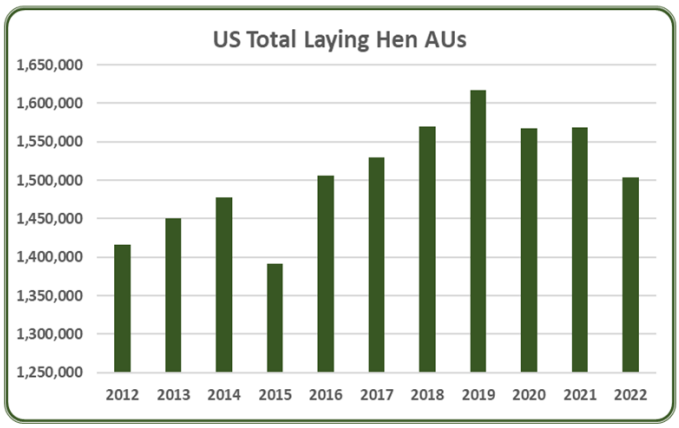
- In 2022, Colorado had 2.99 million total AUs, a 0.9% decrease from 2021. From 2012 to 2022, the average number of total AUs in Colorado was 2.95 million AUs. Since 2012, total AUs in Colorado have decreased by 0.6%.



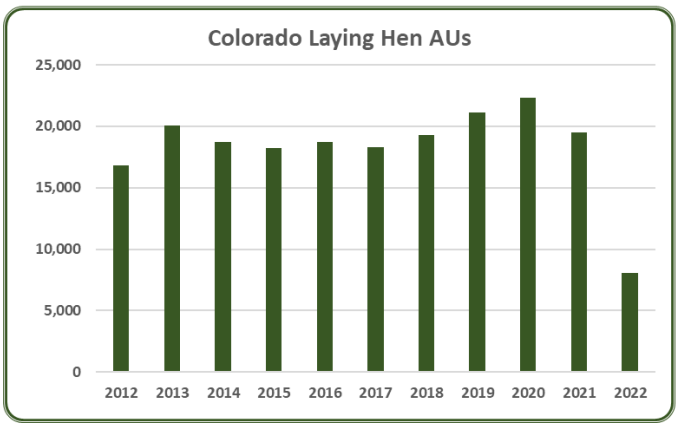
- From 2012 to 2022, broiler chicken AUs averaged 26.6 million across the U.S. Broiler AUs trended up and peaked in 2020 at 27.6 million. Broiler AUs are up 0.4% from 2021 and were the only animal group tracked here that increased compared to last year. Broilers make up about 21% of U.S. AUs.



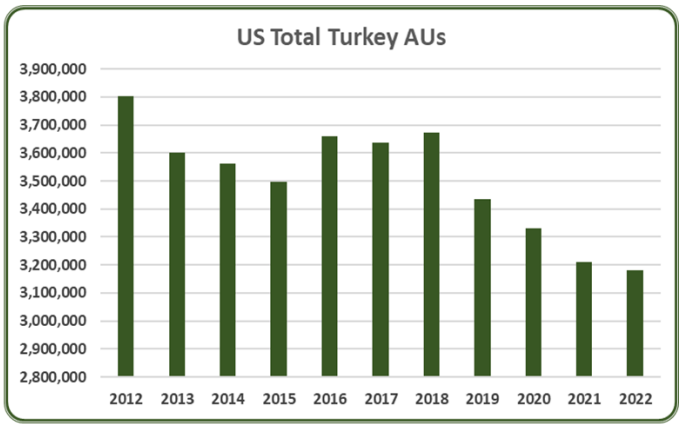
- In 2022, Colorado had 2,247 broiler AUs, a 3.3% increase from 2021. Broilers accounted for 0.1% of the total AUs (2.99 million) in Colorado. From 2012 to 2022, the average number of broiler AUs in Colorado was 1,332 AUs. Since 2012, broiler AUs have increased by 521.5%.



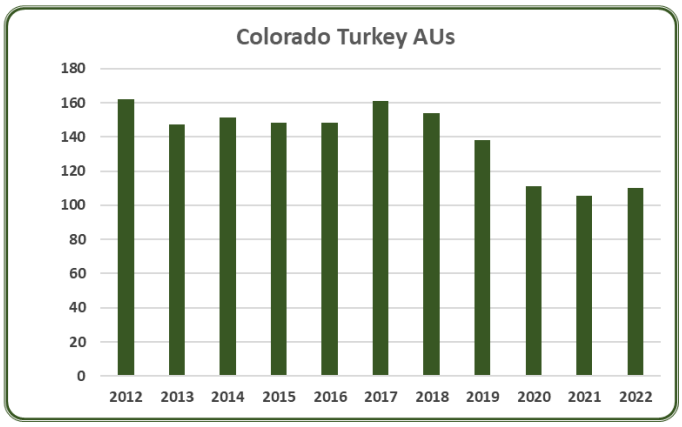
- From 2012 to 2022, U.S. layer AUs averaged 1.51 million. In 2022, layer AUs were 1.50 million, a 4.2% decrease from 2021. The 2022-23 Highly Pathogenic Avian Influenza (HPAI) outbreak contributed to this past year's decrease in layer AUs. Layers make up about 1% of U.S. AUs so large changes in layer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



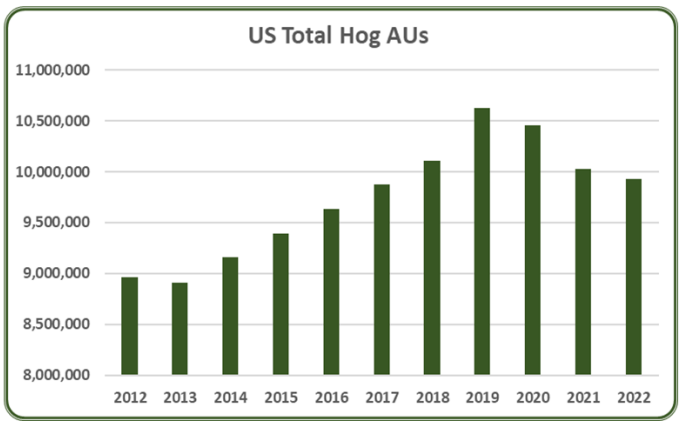
- In 2022, Colorado had 8,064 layer AUs, a 58.7% decrease from 2021. Layers accounted for 0.3% of the total AUs (2.99 million) in Colorado. From 2012 to 2022, the average number of layer AUs in Colorado was 18,282 AUs. Since 2012, layer AUs have decreased by 52%.



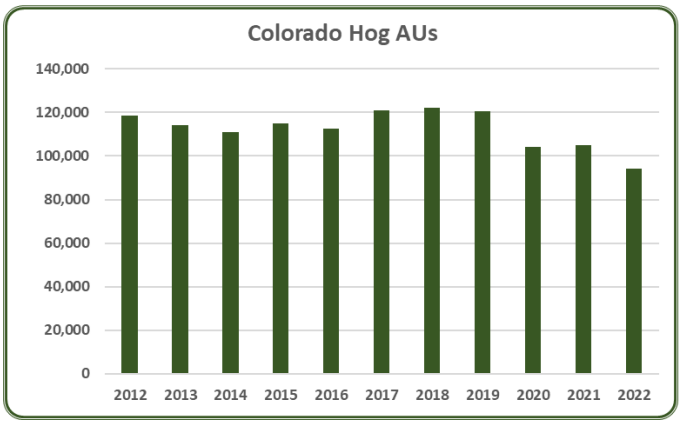
- In 2022, turkey AUs were at 3.18 million, a 0.9% drop from the previous year. This drop is surprisingly low considering the industry battled HPAI for most of 2022. Turkey AUs have been trending down since 2018. Turkey AUs represent about 2% of U.S. AUs, so like layers, large changes in turkey AUs do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



- In 2022, Colorado had 110 turkey AUs, a 4.3% increase from 2021. Turkeys accounted for less than 0.05% of the total AUs (2.99 million) in Colorado. From 2012 to 2022, the average number of turkey AUs in Colorado was 140 AUs. Since 2012, turkey AUs have decreased by 32%.

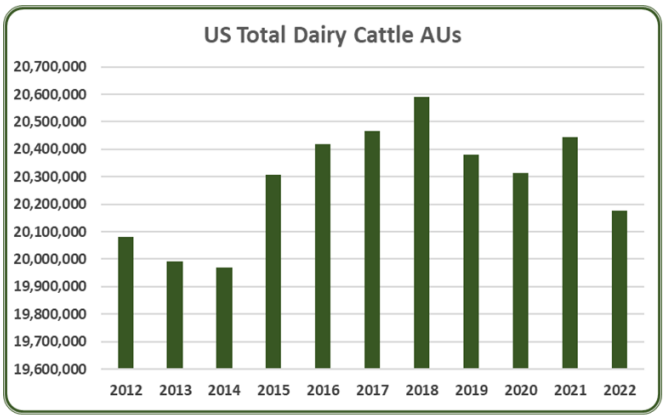


- In 2022, hog AUs totaled 9.93 million, a 1.0% drop from the previous year. From 2012 to 2022, hog AUs averaged 9.73 million. Hog AUs have been trending down since 2019 when they peaked at 10.62 million AUs. Hogs make up 7.70% of all AUs within the U.S.

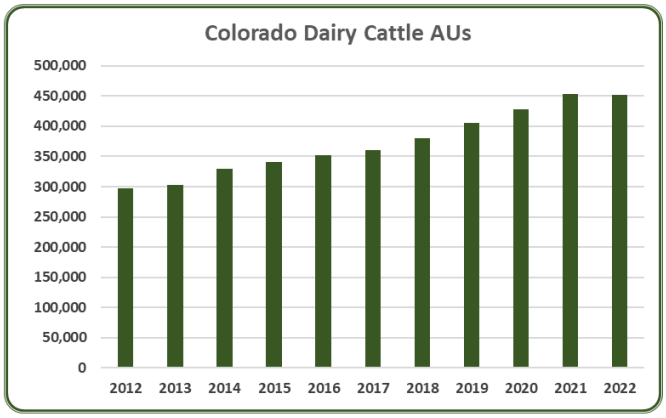


- In 2022, Colorado had 94,197 hog AUs, a 10.2% decrease from 2021. Hogs accounted for 3.2% of the total AUs (2.99 million) in Colorado. From 2012 to 2022, the average number of hog AUs in Colorado was 112,570 AUs. Since 2012, hog AUs have decreased by 20.6%.

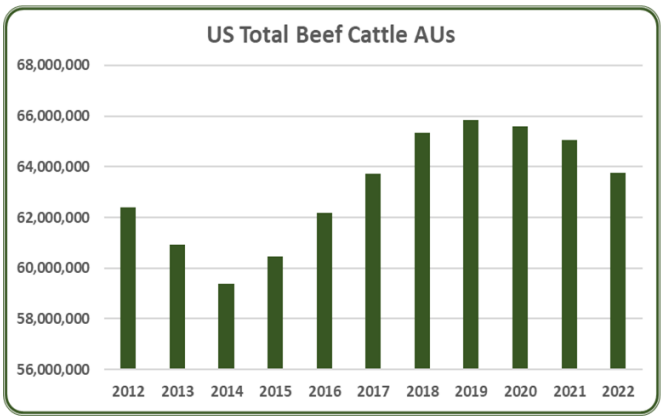
11107 Aurora Ave | Urbandale, IA 50322 | 515.639.2900 | www.decision-innovation.com



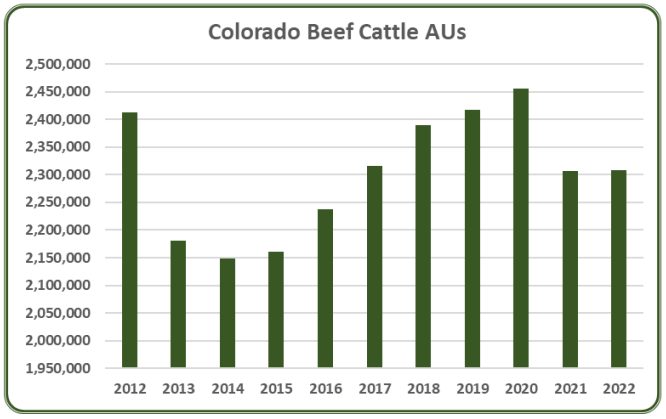
- From 2012 to 2022, dairy cattle AUs averaged 20.29 million. The herd was also relatively steady, fluctuating between 19.9-20.6 million AUs during that time. In 2022, dairy cattle AUs totaled 20.18 million, down 1.3% from 2021. Dairy cattle represented about 16% of all U.S. AUs.



- In 2022, Colorado had 451,114 dairy cattle AUs, a 0.6% decrease from 2021. Dairy cattle accounted for 15.1% of the total AUs (2.99 million) in Colorado. From 2012 to 2022, the average number of dairy cattle AUs in Colorado was 372,844 AUs. Since 2012, dairy cattle AUs have increased by 51.8%.

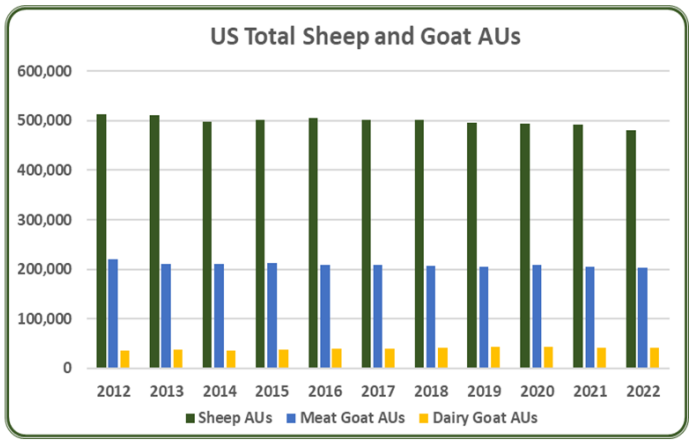


- From 2012 to 2022, beef cattle AUs averaged 63.9 million. In 2022 beef cattle AUs totaled 63.93 million, down 2% from last year, as beef cattle continued through a contraction phase in the cattle cycle which started in 2019. Beef AUs represent almost 50% of U.S. AUs, so changes in beef cattle AUs have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

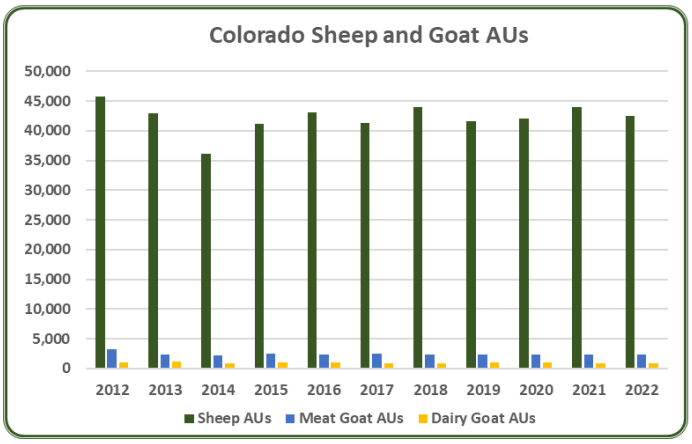


- In 2022, Colorado had 2.31 million beef cattle AUs, a 0.1% increase from 2021. Beef cattle accounted for 77.3% of the total AUs (2.99 million) in Colorado. From 2012 to 2022, the average number of beef cattle AUs in Colorado was 2.3 million AUs. Since 2012, beef cattle AUs have decreased by 4.3%.

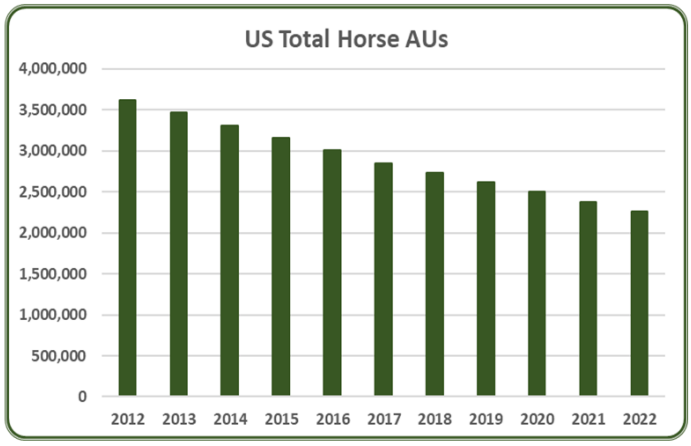
11107 Aurora Ave | Urbandale, IA 50322 | 515.639.2900 | www.decision-innovation.com



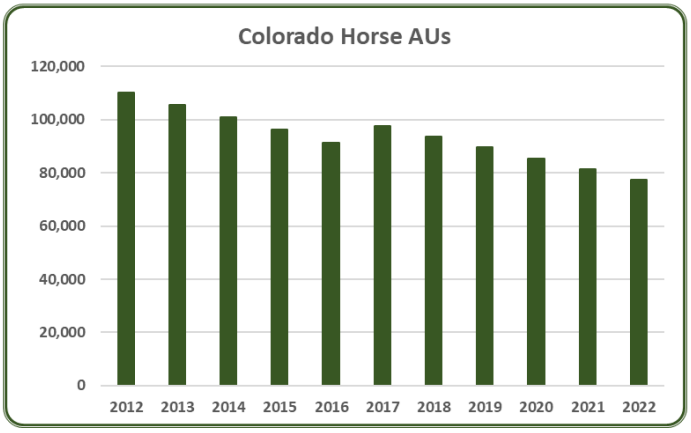
- Sheep, meat goats, and dairy goats account for less than 0.6% of U.S. total AUs. Over the past decade, sheep AUs averaged 500,000, meat goat AUs averaged 209,000 and dairy goat AUs averaged 40,000. Sheep and meat goat AUs have trended down while dairy goats trended up until 2019, then leveled off.



- In 2022, Colorado had a combined 45,700 sheep, meat goat, and dairy goat AUs, a 3.1% decrease from 2021. These accounted for 1.5% of the total AUs (2.99 million) in Colorado. Individually, sheep AUs decreased 3.3%, meat goat AUs decreased 0% and dairy goat AUs decreased 0%. Combined there was a 8.5% 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, Colorado had 77,423 horse AUs, a 5% decrease from 2021. Horses accounted for 2.6% of the total AUs (2.99 million) in Colorado. From 2012 to 2022, the average number of horse AUs in Colorado was 93,617 AUs. Since 2012, horse AUs have decreased by 29.8%.

11107 Aurora Ave | Urbandale, IA 50322 | 515.639.2900 | www.decision-innovation.com

Colorado Additional Information and Methodology

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

Colorado 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 Colorado'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 Colorado, $1.84 to $2.63 million in total economic activity, $0.46 to $0.57 in household wages and 14 to 16 additional jobs are generated in the economy at large.

11107 Aurora Ave | Urbandale, IA 50322 | 515.639.2900 | www.decision-innovation.com

Appendix

		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Animal Units (AUs)	Beef Cattle AUs	2,413,296	2,180,582	2,149,138	2,160,785	2,237,457	2,315,866	2,389,291	2,417,243	2,456,279	2,306,289	2,308,846
	Hog and Pig AUs	118,704	114,200	111,116	115,084	112,596	120,959	122,073	120,478	104,015	104,845	94,197
	Broiler AUs	361	360	358	367	370	2,049	2,051	2,050	2,262	2,174	2,247
	Turkey AUs	162	147	151	148	148	161	154	138	111	106	110
	Egg Layer AUs	16,796	20,056	18,692	18,216	18,752	18,300	19,276	21,100	22,348	19,504	8,064
	Dairy AUs	297,160	303,122	329,939	340,636	352,237	360,246	379,530	405,305	428,173	453,820	451,114
	Total Animal Units	**3,006,810**	**2,770,629**	**2,749,569**	**2,776,194**	**2,859,599**	**2,959,895**	**3,053,192**	**3,100,832**	**3,144,007**	**3,015,359**	**2,987,700**
Value of Production ($1,000)	Cattle and Calves ($1,000)	$ 2,140,163	$ 2,162,134	$ 2,398,256	$ 2,473,508	$ 1,899,569	$ 2,070,461	$ 1,976,010	$ 2,072,324	$ 2,024,602	$ 2,346,939	$ 2,605,267
	Hogs and Pigs ($1,000)	$ 206,066	$ 206,725	$ 236,205	$ 185,803	$ 175,439	$ 166,909	$ 134,955	$ 166,448	$ 97,295	$ 178,075	$ 143,186
	Broilers ($1,000)	$ 53,804	$ 65,559	$ 68,777	$ 60,001	$ 53,349	$ 62,644	$ 70,716	$ 61,698	$ 50,417	$ 70,914	$ 113,345
	Turkeys ($1,000)	$ 34,087	$ 26,990	$ 18,836	$ 20,243	$ 20,299	$ 13,095	$ 11,195	$ 13,971	$ 15,718	$ 21,229	$ 43,262
	Eggs ($1,000)	$ 96,215	$ 103,845	$ 129,688	$ 177,115	$ 67,929	$ 77,227	$ 113,657	$ 65,455	$ 84,833	$ 89,372	$ 161,966
	Milk ($1,000)	$ 597,618	$ 672,256	$ 862,320	$ 668,746	$ 655,475	$ 758,209	$ 761,019	$ 903,716	$ 896,100	$ 985,677	$ 1,360,384
	Other	$ 131,476	$ 88,878	$ 92,114	$ 109,838	$ 114,174	$ 111,383	$ 117,492	$ 109,670	$ 112,111	$ 119,083	$ 123,330
	Sheep and Lambs ($1,000)	$ 117,001	$ 74,027	$ 76,887	$ 94,235	$ 98,195	$ 95,028	$ 100,761	$ 92,563	$ 94,628	$ 101,224	$ 105,095
	Aquaculture ($1,000)	$ 14,475	$ 14,851	$ 15,227	$ 15,603	$ 15,979	$ 16,355	$ 16,731	$ 17,107	$ 17,483	$ 17,859	$ 18,235
	Total ($1,000)	**$ 3,259,429**	**$ 3,326,387**	**$ 3,806,195**	**$ 3,695,254**	**$ 2,986,234**	**$ 3,259,928**	**$ 3,185,044**	**$ 3,393,282**	**$ 3,281,075**	**$ 3,811,289**	**$ 4,550,740**

11107 Aurora Ave | Urbandale, IA 50322 | 515.639.2900 | www.decision-innovation.com

Ag Census Data Category	Animal Type		2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)		9,819	9,598	10,528	12,298
	Cattle feedlots (112112)		1,081	615	268	291
	Dairy cattle and milk production (11212)		232	267	183	228
	Hog and pig farming (1122)		445	453	343	387
	Poultry and egg production (1123)		237	742	611	500
	Sheep and goat farming (1124)		902	1,010	1,212	1,741
	Animal aquaculture and other animal production (1125,1129)		6,111	7,941	7,153	7,438
Value of Sales ($1,000)	Cattle and Calves		2,632,740	3,156,348	4,321,308	3,989,383
	Hogs and Pigs		179,415	159,808	208,763	234,752
	Poultry and Eggs		113,256	161,320	102,175	117,682
	Milk*				559,422	703,562
	Aquaculture		28,805	11,258	14,475	16,355
	Other (calculated)		107,667	134,925	108,550	191,106
		Total	3,308,918	4,079,735	5,314,693	5,252,840
Input Purchases	Livestock and poultry purchased	(Farms)	8,174	8,517	9,728	11,167
		$1,000	1,662,797	1,778,706	1,885,482	1,804,260
	Breeding livestock purchased	(Farms)	*4,686*	4,866	5,372	6,267
		$1,000	*46,389*	86,507	98,374	116,442
	Other livestock and poultry purchased	(Farms)	*4,650*	4,944	5,838	6,772
		$1,000	*1,616,409*	1,692,199	1,787,108	1,687,819
	Feed purchased	(Farms)	18,525	18,817	21,744	24,605
		$1,000	866,170	1,221,367	1,972,993	1,857,442

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

	Animal Type	Output ($1,000)	Earnings ($1,000)	Employment (Jobs)	Income Taxes Paid ($1,000)
2022 Animal Agriculture	Cattle and Calves	$ 6,618,160	$ 1,427,686	42,347	$ 354,495
	Hogs, Pigs, and Other	$ 490,123	$ 122,304	3,905	$ 30,368
	Poultry and Eggs	$ 838,007	$ 181,778	4,430	$ 45,135
	Dairy	$ 3,443,268	$ 771,746	19,490	$ 191,624
	Total	$ 11,389,558	$ 2,503,514	70,172	$ 621,623
Change from 2012 to 2022	Cattle and Calves	$ (412,493)	$ (88,984)	(2,639)	$ (22,095)
	Hogs, Pigs, and Other	$ (312,614)	$ (78,009)	(2,491)	$ (19,370)
	Poultry and Eggs	$ 211,725	$ 45,927	1,119	$ 11,404
	Dairy	$ 1,487,142	$ 333,316	8,418	$ 82,762
	Total	$ 973,760	$ 212,249	4,407	$ 52,702

	Animal Type	Output($)	Earnings ($)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	$ 2.54	$ 0.55	16.3
	Hogs, Pigs, and Other	$ 1.84	$ 0.46	14.7
	Poultry and Eggs	$ 2.63	$ 0.57	13.9
	Dairy	$ 2.53	$ 0.57	14.3

Tax Rates	Federal effective income tax rate	14.0%
	Federal Social Security tax rate	6.2%
	State Effective Rate	4.6%
	Total	24.8%

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.