

Montana Economic Analysis of Animal Agriculture: 2011-2021

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Prepared For:



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Montana Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Montana 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 Montana. The success of Montana animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the state of Montana during 2021 animal agriculture contributed:

- \$3.5 billion in economic output
- 17,116 jobs
- \$755.0 million in earnings
- \$182.3 million in income taxes paid at local, state, and federal levels
- \$147.9 million in the form of property taxes

Montana's animal agriculture consumed almost 77.4 thousand tons of soybean meal in 2021. This soybean meal was fed primarily to:

- Beef Cows (31.2 thousand tons)
- Hogs (25.8 thousand tons)
- Egg-Laying Hens (10.1 thousand tons)

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

Montana Economic Impact of Animal Agriculture

Animal agriculture is an important part of Montana’s economy. In 2021, Montana’s animal agriculture contributed the following to the economy:

- About \$3.5 billion in economic output
- \$755.0 million in household earnings
- 17,116 jobs
- \$182.3 million in income taxes

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

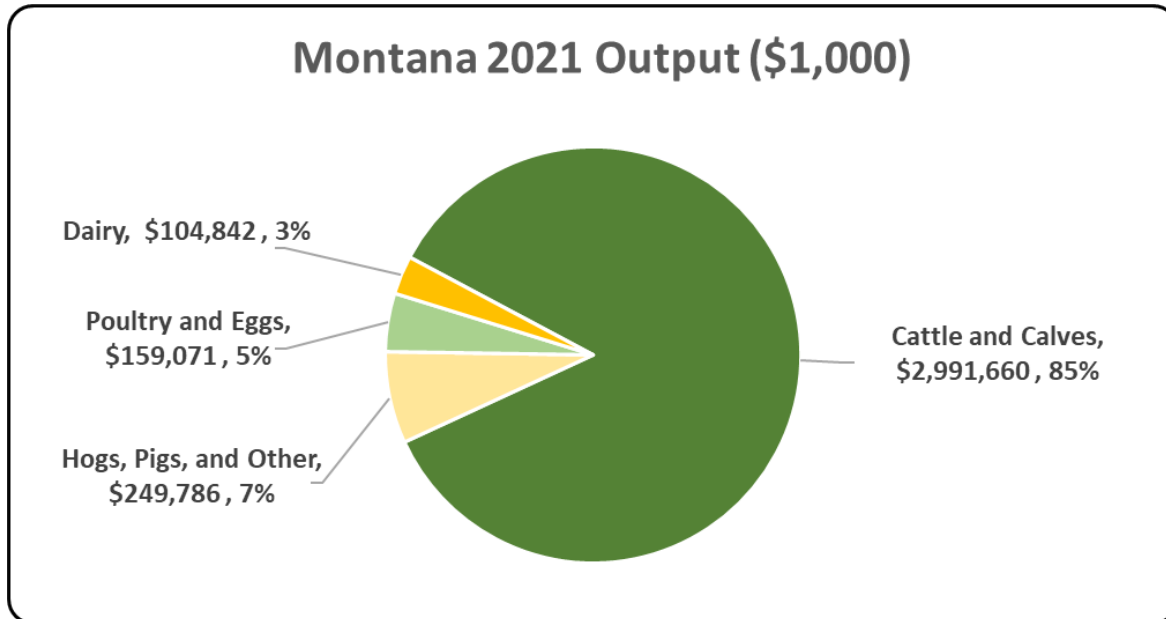
- Decreased economic output by \$283.4 million
- Reduced household earnings by \$58.1 million
- Lost 1,388 jobs
- Paid \$14.0 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2021	Change 2011-2021	% Change 2011-2021
Output (\$1,000)	\$ 3,505,360	\$ (283,397)	-7.48%
Earnings (\$1,000)	\$ 754,998	\$ (58,073)	-7.14%
Employment (Jobs)	17,116	(1,388)	-7.50%
Income Taxes Paid (\$1,000)	\$ 182,332	\$ (14,025)	-7.14%
Property Taxes Paid in 2017 (\$1,000)	\$ 147,883		

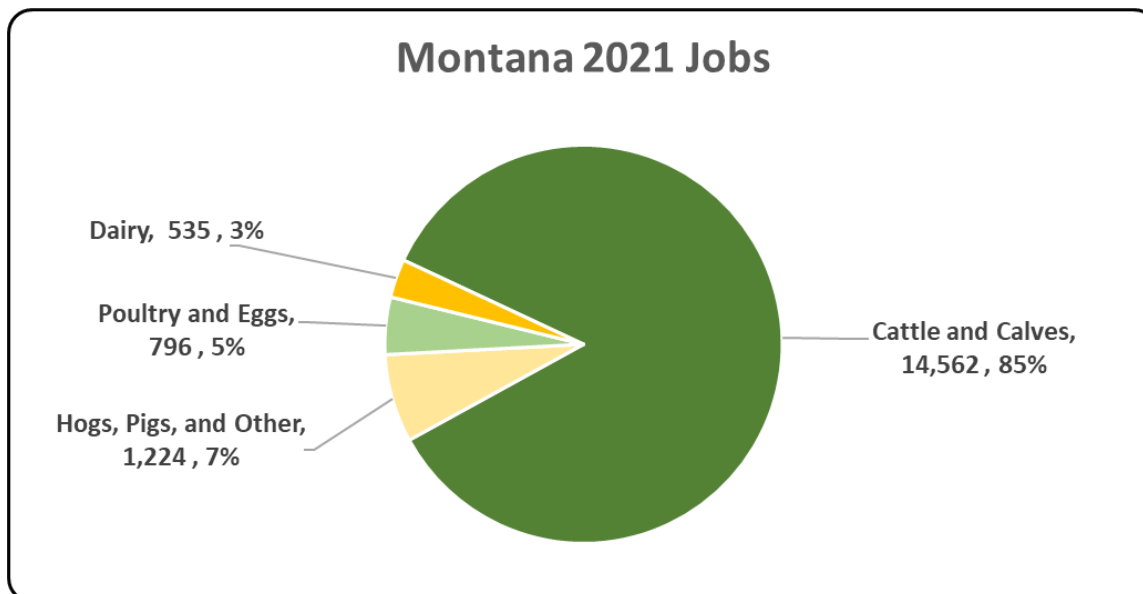
Montana Output

“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 Montana economy. Animal agriculture’s impact on Montana total economic output is about \$3.5 billion.



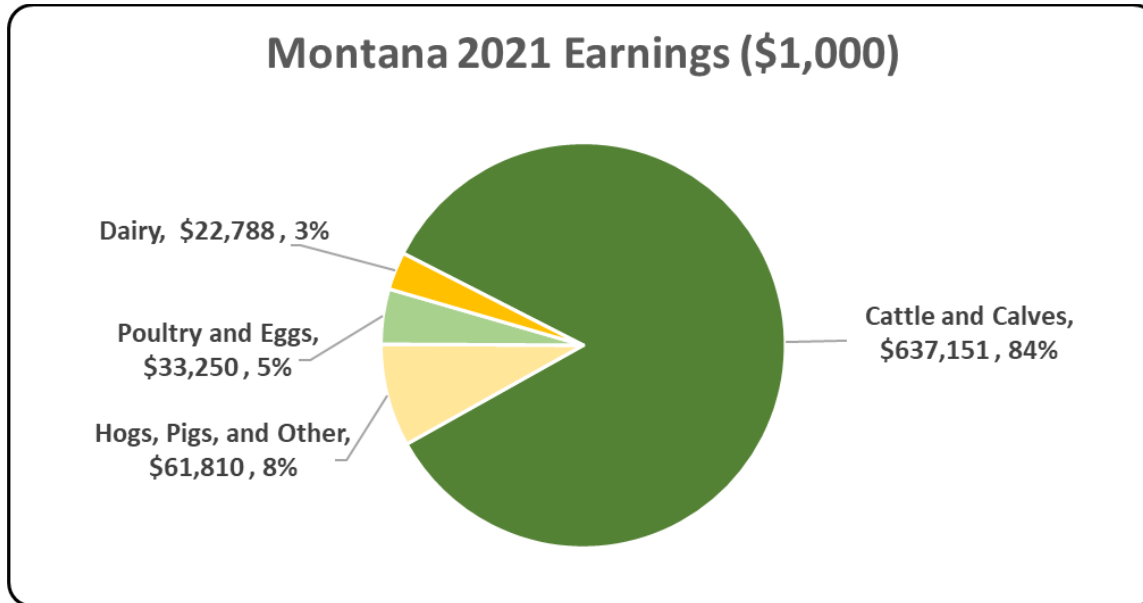
Montana Jobs

“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 Montana in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Montana total jobs, contributing 17,116 jobs within and outside of animal agriculture.



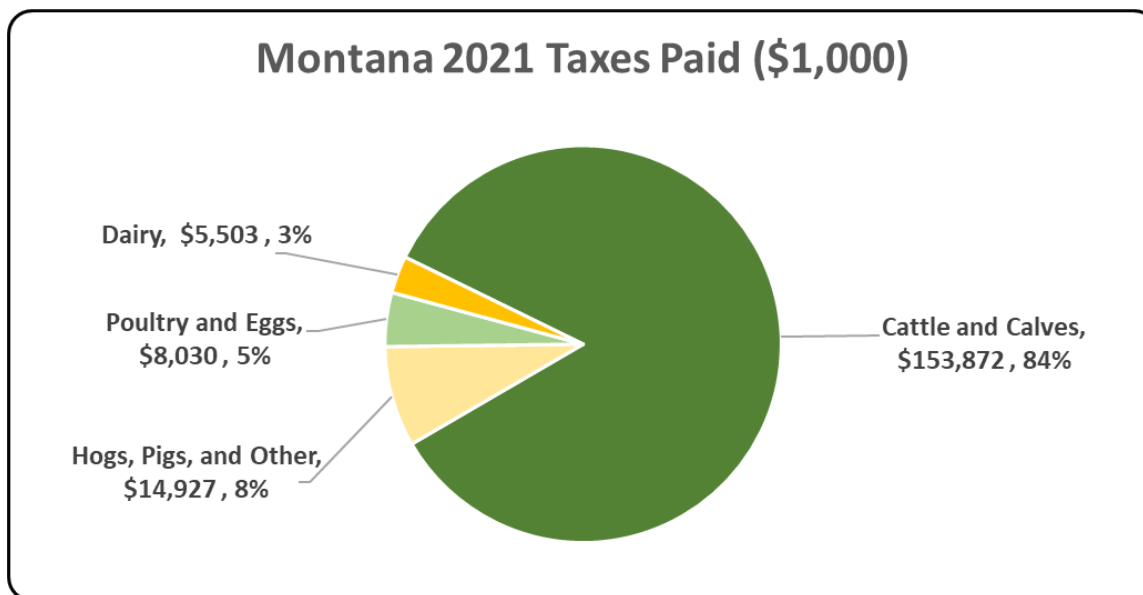
Montana Earnings

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 Montana economy in terms of earnings. Montana's animal agriculture contributed about \$755.0 million to household earnings in 2021.



Montana Taxes Paid by Animal Agriculture

Montana's animal agriculture is also a significant source of tax revenue. In 2021, the state's animal agriculture industry paid about \$182.3 million in income taxes at local, state, and federal levels. Plus, the 2017 Census of Agriculture estimated \$147.9 million in property taxes paid by all of Montana agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



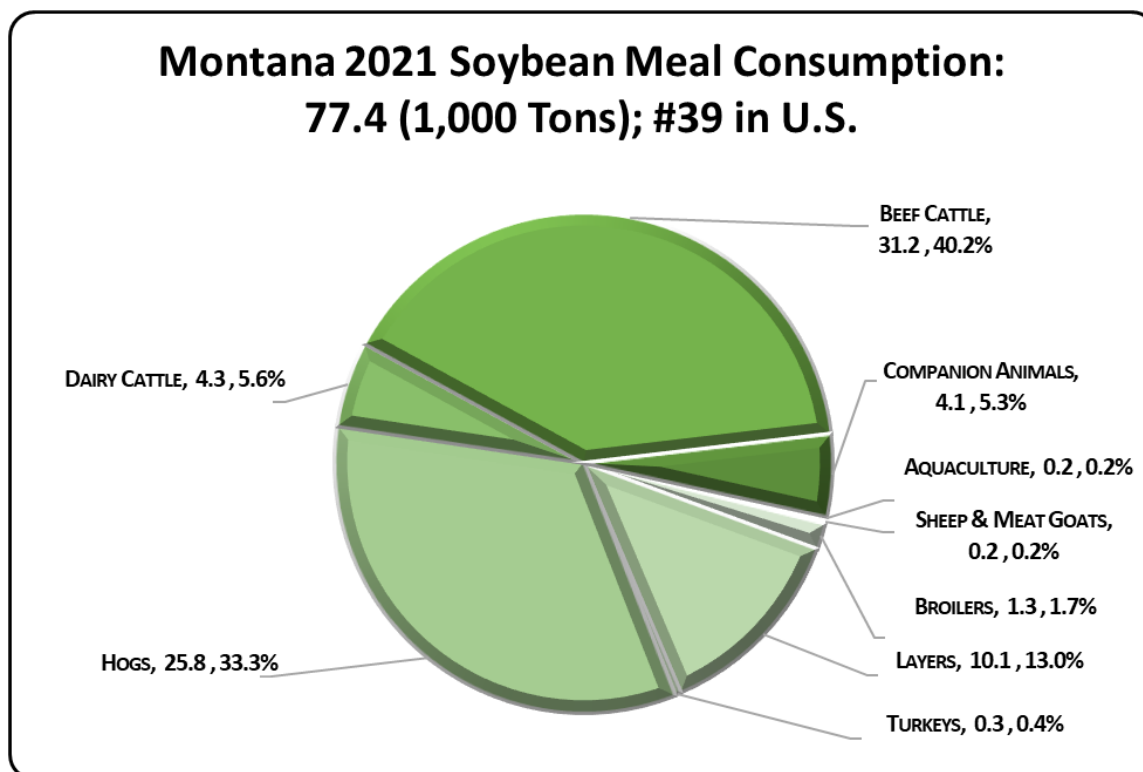
Montana Animal Agriculture Soybean Meal Consumption

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 2020-21 soybean marketing year by up to sixteen specific animal species has been estimated.

Montana’s animal agriculture consumed almost 77.4 thousand tons of soybean meal in 2021, placing the state as number 39 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Montana consumed 40.2 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Beef Cows (31.2 thousand tons)
2. Hogs (25.8 thousand tons)
3. Egg-Laying Hens (10.1 thousand tons)

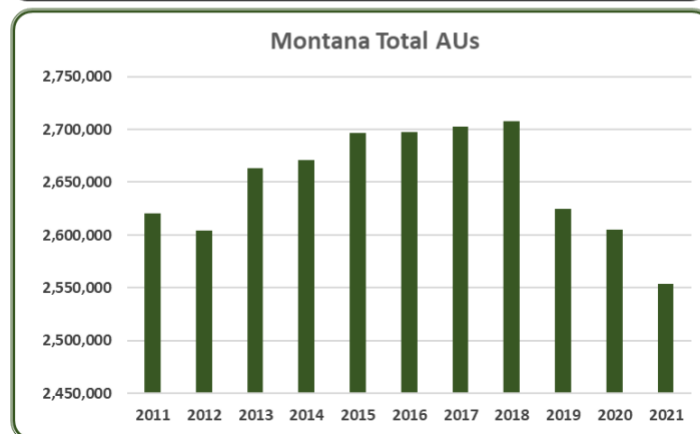
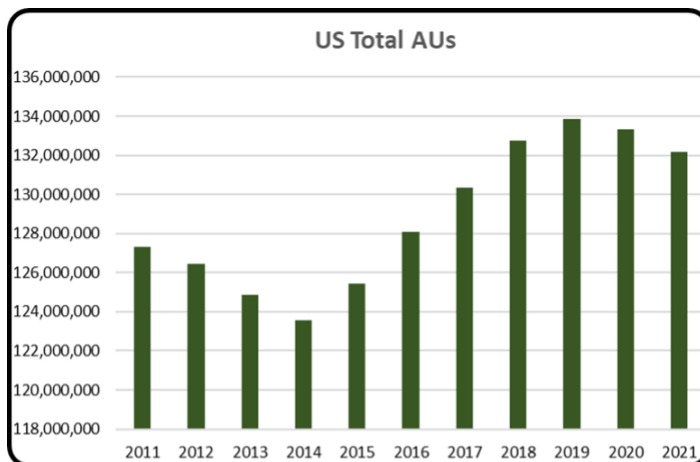


Montana Animal Unit (AU) Trends

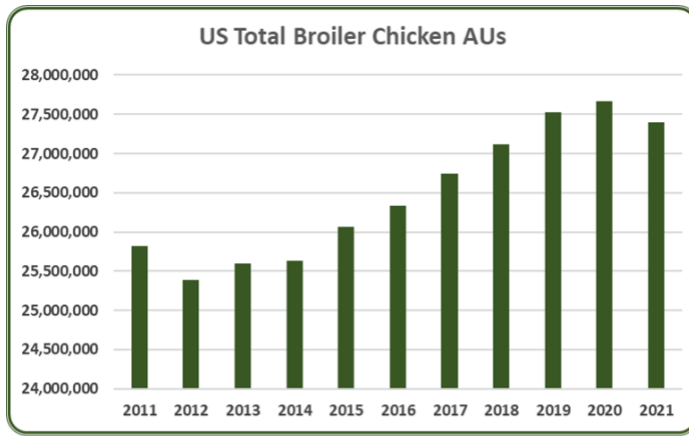
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the state of Montana. Due to this reality, using a single year as a measure of the presence and strength of a sector can be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

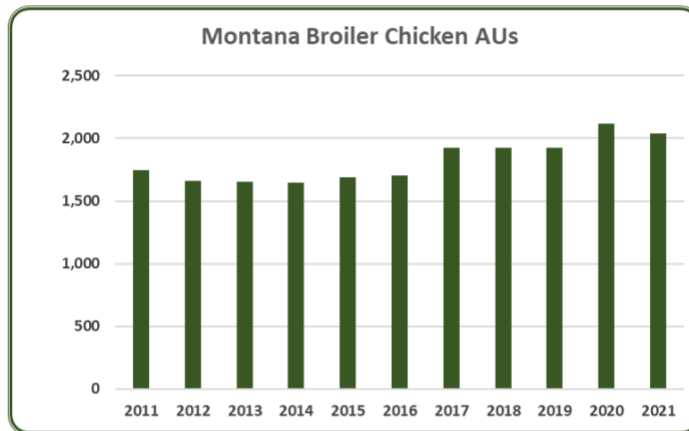
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Montana, the largest three segments of animal agriculture in terms of AUs during 2021 were: Beef Cattle (2.40 million AUs), Horses (65,774 AUs), and Hogs (34,593 AUs). Total animal units in Montana during 2021 were 2.55 million AUs.



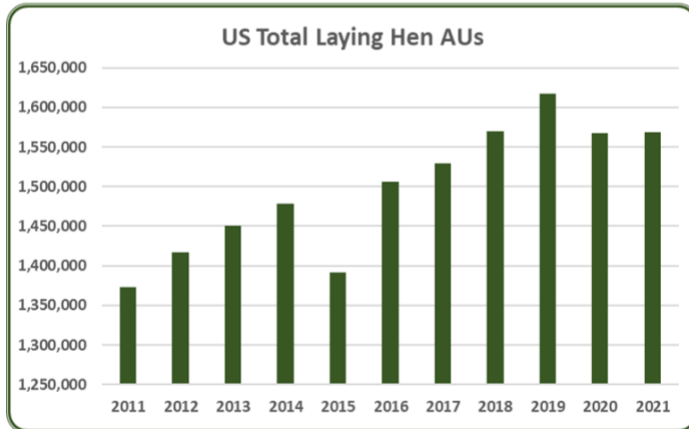
- In 2021, total AUs in the U.S. decreased by 0.87% to 132 million. Eight out of the ten commodities followed saw a decrease, with four seeing a decrease of over 100,000 AUs. Total AUs were lowest in 2013 and 2014 and peaked in 2019. There has been a downward trend in total AUs since 2019.
- In 2021, Montana had 2.55 million total AUs, a 1.97% decrease from 2020. This was primarily due to a decrease in beef cattle AUs. From 2011 to 2021, the average number of total AUs in Montana was 2.65 million AUs. Since 2011, total AUs in Montana have decreased by 2.54%.



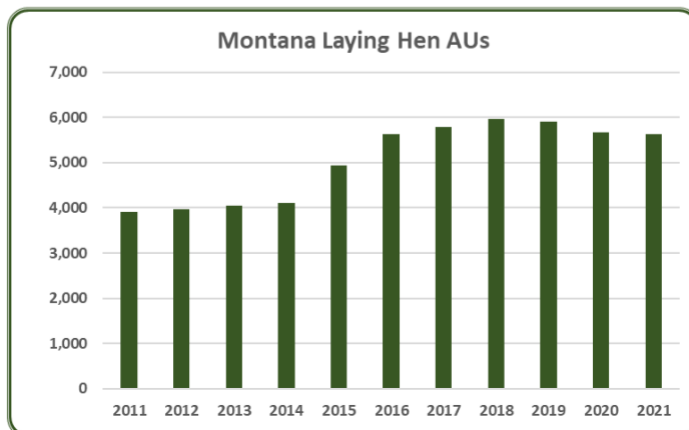
- U.S. broiler production is concentrated in the southern states – Georgia being the largest producer. On average, from 2011 to 2021, broiler chicken AUs were 26.5 million across the U.S. From 2020 and 2021 there was a 0.99% decrease (274,200) in broiler chicken AUs –Alabama, Delaware, and Maryland, were the largest contributors to this decrease.



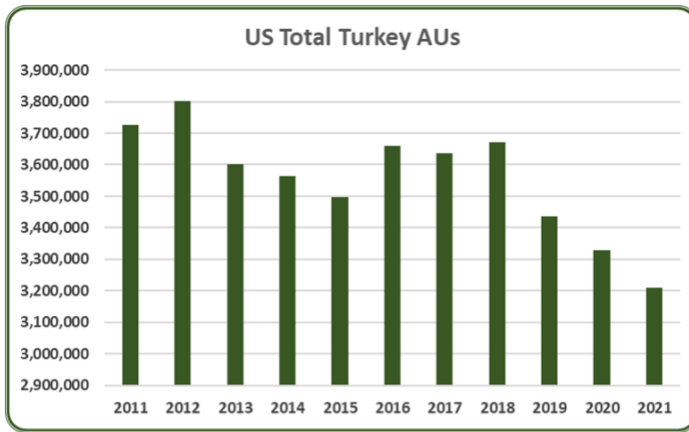
- In 2021, Montana had 2,038 broiler AUs, a 3.86% decrease from 2020. Broilers accounted for 0.08% of the total AUs (2.55 million) in Montana. From 2011 to 2021, the average number of broiler AUs in Montana was 1,820. Since 2011, broiler AUs have increased by 16.53%.



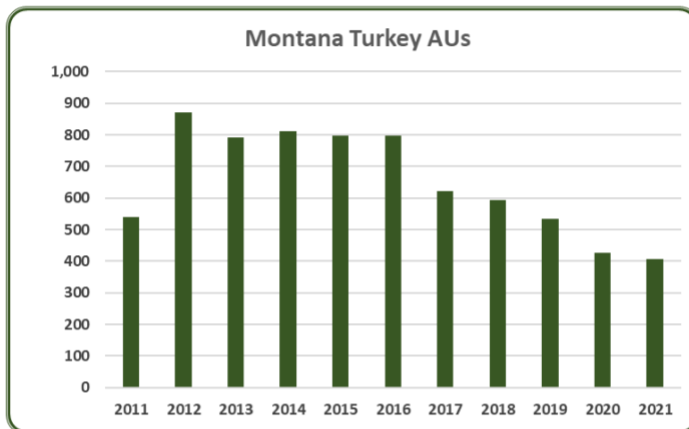
- From 2011 to 2021, U.S. layer AUs averaged 1.5 million. In 2021, layer AUs were 1.57 million, a 1.19% increase from the year before. Despite nationwide increase, 38 states experienced a decrease in layer AUs compared to last year.



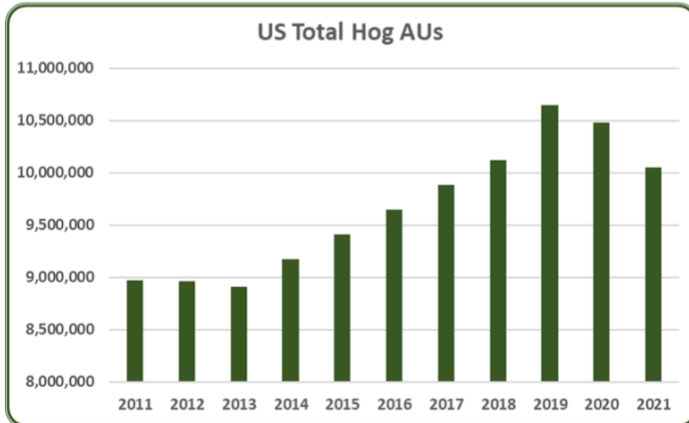
- In 2021, Montana had 5,619 layer AUs, a 0.7% decrease from 2020. Layers accounted for 0.22% of the total AUs (2.55 million) in Montana. From 2011 to 2021, the average number of layer AUs in Montana was 5,046. Since 2011, layer AUs have increased by 44.07%.



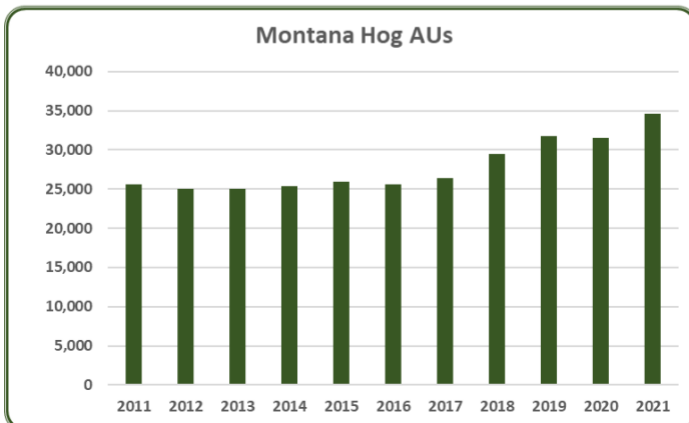
- In 2021, turkey AUs were at 3.2 million, a 3.60% drop from the previous year. Minnesota had the most turkey AUs during 2021 with 18.93% of the total U.S. turkey AUs. Although growth occurred immediately following the 2015 avian influenza outbreak, 2021 AUs reached a decade low – 47 states experienced a decrease in turkey AUs.



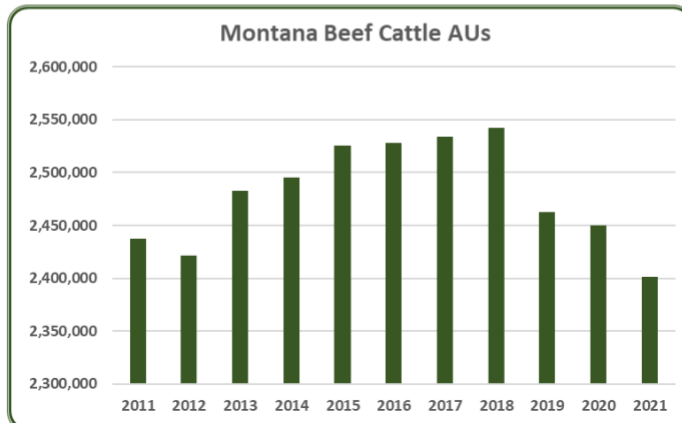
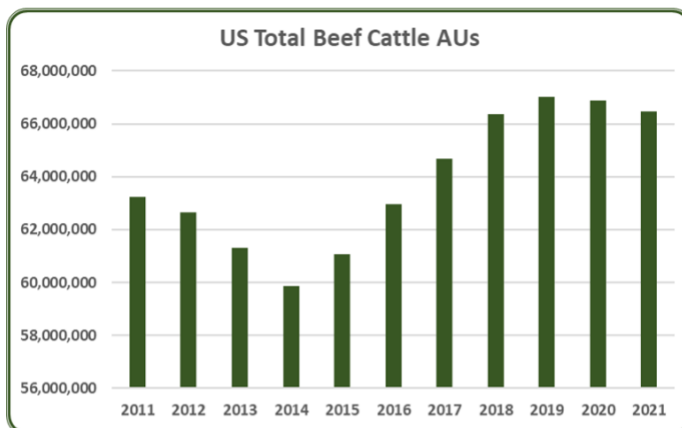
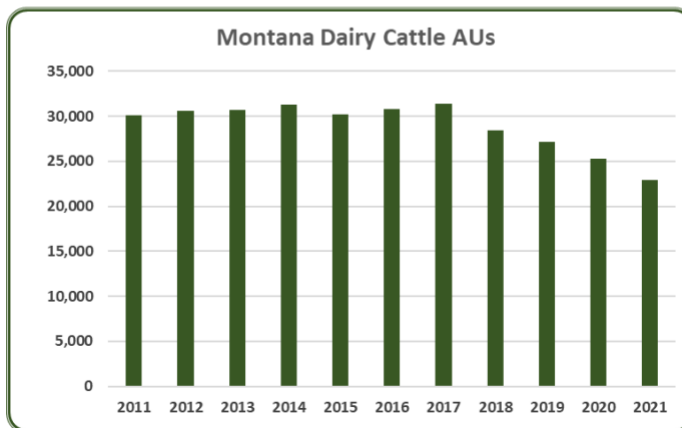
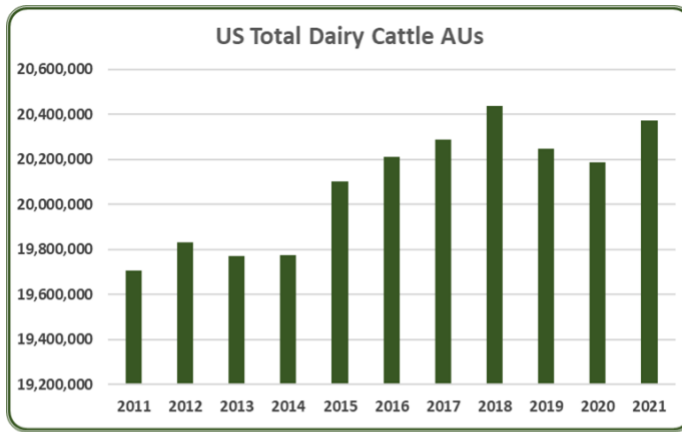
- In 2021, Montana had 407 turkey AUs, a 4.94% decrease from 2020. Turkeys accounted for 0.02% of the total AUs (2.55 million) in Montana. From 2011 to 2021, the average number of turkey AUs in Montana was 653. Since 2011, turkey AUs have decreased by 24.6%.



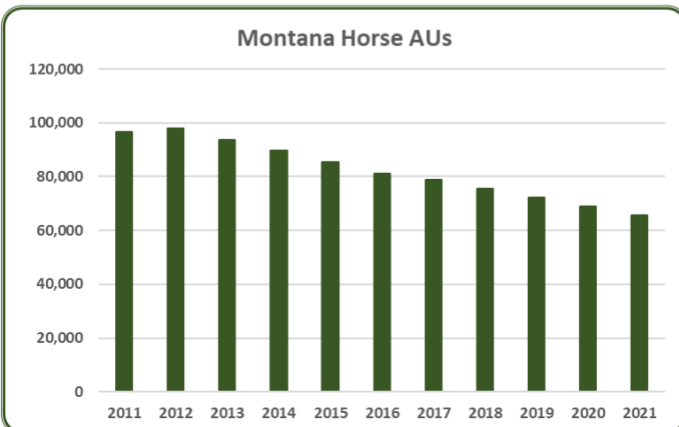
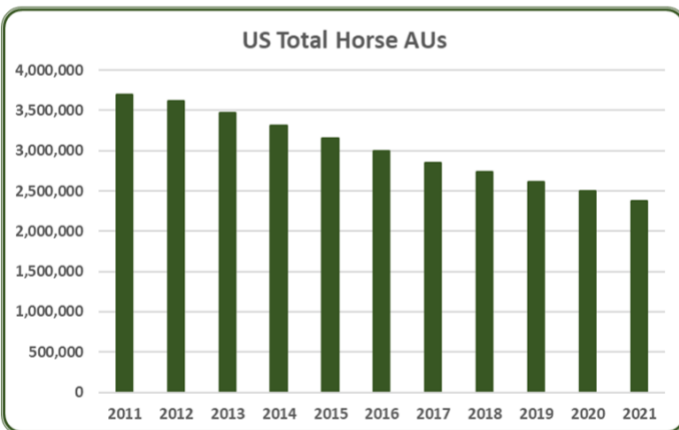
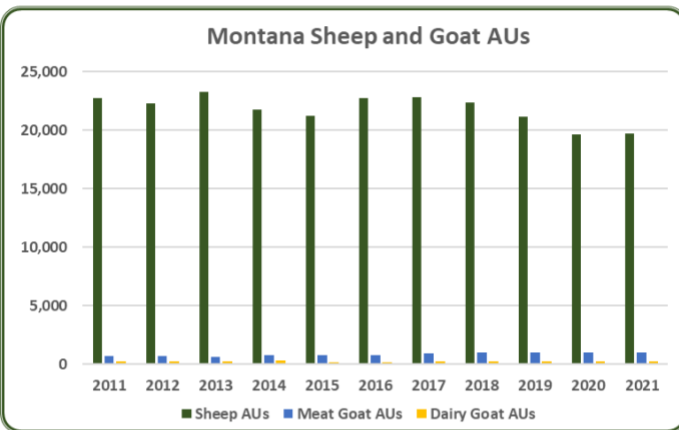
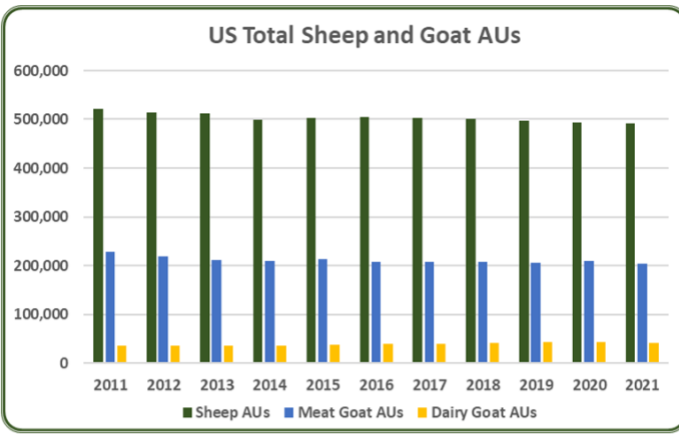
- From 2011 to 2021, hog AUs increased 19.72% (1.73 million AUs). Hogs make up 7.86% of all animal units within the United States. The decade average for Hog AUs is 9.54 million. In 2021, hog AUs were at 10.48 million, a 1.58% drop from the previous year.



- In 2021, Montana had 34,593 hog AUs, a 9.86% increase from 2020. Hogs accounted for 1.35% of the total AUs (2.55 million) in Montana. From 2011 to 2021, the average number of hog AUs in Montana was 27,851. Since 2011, hog AUs have increased by 35.35%.



- From 2011 to 2021, dairy cattle AUs averaged 20.1 million. In 2021, dairy cattle AUs increased by 0.93% (187,902 AUs) from 2020 – 26 states experienced a decrease in dairy cattle AUs. California, Wisconsin, and Idaho have, respectively, the highest number of dairy cattle AUs.
- In 2021, Montana had 22,923 dairy cattle AUs, a 9.49% decrease from 2020. Dairy cattle accounted for 0.9% of the total AUs (2.55 million) in Montana. From 2011 to 2021, the average number of dairy cattle AUs in Montana was 28,993. Since 2011, dairy cattle AUs have decreased by 23.92%.
- From 2011 to 2021, beef cattle AUs averaged 63.9 million. Over the past decade beef cattle AUs have increased by 5.13%, but have decreased by 0.60% (402,745 AUs) from last year. Beef AUs have trended upward after a drought occurred in the middle of the ten-year period, still up 11.02% since the recent low in 2014.
- In 2021, Montana had 2.40 million beef cattle AUs, a 1.98% decrease from 2020. Beef cattle accounted for 94.04% of the total AUs (2.55 million) in Montana, making it the largest animal sector in the state. From 2011 to 2021, the average number of beef cattle AUs in Montana was 2.48 million. Since 2011, beef cattle AUs have decreased by 1.5%.



- Sheep, meat goats, and dairy goats account for less than 0.56% of U.S. total AUs. Individually, dairy goat AUs increased by 16.67% over the past decade; sheep AUs and meat goat AUs decreased by 5.53% and 10.23%. Combined, there was a 5.88% decrease in AUs – from 784,600 in 2011 to 738,500 in 2021.
- In 2021, Montana had a combined 20947 sheep, meat goat, and dairy goat AUs, a 0.21% increase from 2020. These account for 0.82% of the total AUs (2.55 million) in Montana. Individually, meat goat and dairy goat AUs decreased 40.48% and 1.46% respectively while sheep AUs decreased 13.41%. Combined there was a 11.65% decrease since 2011.
- Horses account for about 1.80% of U.S total AUs. From 2011 to 2021, horse AUs show a downward trend – from 3.70 million in 2011 to 2.38 million in 2021; a 35.79% decrease. In 2021, all 50 states experienced a decrease in horse AUs.
- In 2021, Montana had 65,774 horse AUs, a 4.73% decrease from 2020. Horses accounted for 2.58% of the total AUs (2.55 million) in Montana, making it the second largest animal sector in the state. From 2011 to 2021, the average number of horse AUs in Montana was 82,359. Since 2011, horse AUs have decreased by 32%.

Montana Additional Information and Methodology

Animal agriculture is an important part of Montana’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 2011-2021 time period
2. Soybean meal usage by animal species during the 2020-21 soybean marketing year
3. Animal Unit (AU) trends from 2011-2021

Given the long-term presence of animal agriculture in Montana, of interest is the degree to which the industry impacts the Montana economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Montana 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 Montana’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 2011-2021 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 Montana which have occurred. As shown in this state report, Montana 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 Montana. 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 2020-21 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.

Montana 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 Montana'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 Montana, \$1.79 to \$2.53 million in total economic activity, \$0.44 to \$0.53 in household wages and 9 to 13 additional jobs are generated in the economy at large.

Appendix

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Animal Units (AUs)	Beef Cattle AUs	2,437,786	2,421,201	2,483,055	2,495,667	2,525,729	2,527,762	2,533,536	2,542,083	2,462,459	2,449,724	2,401,204
	Hog and Pig AUs	25,558	25,021	24,978	25,408	25,968	25,649	26,422	29,539	31,738	31,488	34,593
	Broiler AUs	1,749	1,660	1,654	1,645	1,687	1,700	1,921	1,922	1,922	2,120	2,038
	Turkey AUs	539	870	791	813	797	797	621	593	533	428	407
	Egg Layer AUs	3,900	3,977	4,045	4,103	4,938	5,627	5,780	5,957	5,905	5,659	5,619
	Dairy AUs	30,131	30,637	30,650	31,280	30,172	30,826	31,425	28,421	27,133	25,326	22,923
	Total Animal Units	2,620,101	2,604,526	2,663,118	2,671,364	2,696,859	2,697,233	2,702,477	2,707,685	2,624,493	2,604,692	2,553,505
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,107,700	\$ 1,263,600	\$ 1,348,847	\$ 1,750,836	\$ 1,659,653	\$ 1,295,999	\$ 1,326,412	\$ 1,218,945	\$ 1,247,675	\$ 1,117,754	\$ 1,208,556
	Hogs and Pigs (\$1,000)	\$ 54,381	\$ 58,332	\$ 61,604	\$ 71,353	\$ 59,652	\$ 48,482	\$ 54,142	\$ 57,950	\$ 84,472	\$ 54,529	\$ 110,992
	Broilers (\$1,000)	\$ 23,584	\$ 17,268	\$ 21,041	\$ 22,074	\$ 19,257	\$ 17,122	\$ 20,105	\$ 22,892	\$ 19,973	\$ 16,321	\$ 22,956
	Turkeys (\$1,000)	\$ 12,546	\$ 12,072	\$ 9,559	\$ 6,671	\$ 7,169	\$ 7,189	\$ 4,638	\$ 3,549	\$ 4,428	\$ 4,982	\$ 6,729
	Eggs (\$1,000)	\$ 8,682	\$ 8,642	\$ 10,642	\$ 12,775	\$ 22,500	\$ 7,870	\$ 11,192	\$ 33,674	\$ 26,277	\$ 38,073	\$ 33,241
	Milk (\$1,000)	\$ 57,312	\$ 53,820	\$ 55,726	\$ 66,220	\$ 44,551	\$ 46,610	\$ 50,400	\$ 43,840	\$ 47,397	\$ 47,244	\$ 43,983
	Other	\$ 25,993	\$ 36,791	\$ 28,946	\$ 27,047	\$ 33,564	\$ 33,569	\$ 32,963	\$ 31,030	\$ 29,587	\$ 28,196	\$ 28,944
	Sheep and Lambs (\$1,000)	\$ 23,231	\$ 33,619	\$ 25,783	\$ 23,893	\$ 30,418	\$ 30,433	\$ 29,835	\$ 27,910	\$ 26,476	\$ 25,094	\$ 25,851
	Aquaculture (\$1,000)	\$ 2,762	\$ 3,172	\$ 3,163	\$ 3,154	\$ 3,146	\$ 3,137	\$ 3,128	\$ 3,119	\$ 3,110	\$ 3,102	\$ 3,093
	Total (\$1,000)	\$ 1,290,198	\$ 1,450,526	\$ 1,536,365	\$ 1,956,976	\$ 1,846,346	\$ 1,456,842	\$ 1,499,852	\$ 1,411,879	\$ 1,459,809	\$ 1,307,099	\$ 1,455,402

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	9,859	9,804	8,703	9,585
	Cattle feedlots (112112)	355	244	162	165
	Dairy cattle and milk production (11212)	136	138	75	54
	Hog and pig farming (1122)	142	118	88	110
	Poultry and egg production (1123)	131	398	206	141
	Sheep and goat farming (1124)	687	606	576	798
	Animal aquaculture and other animal production (1125,1129)	4,500	5,294	5,261	5,163
Value of Sales (\$1,000)	Cattle and Calves	1,015,169	1,368,699	1,783,908	1,715,741
	Hogs and Pigs	26,531	36,331	54,091	59,728
	Poultry and Eggs	5,243	7,975	withheld	23,239
	Milk*			44,671	45,428
	Aquaculture	4,185	3,188	3,172	3,128
	Other (calculated)	55,821	58,386	31,233	88,344
	Total	1,148,791	1,529,340	1,917,075	1,935,608
Input Purchases	Livestock and poultry purchased (Farms)	7,935	7,287	8,619	8,151
	\$1,000	207,332	291,561	365,896	306,329
	Breeding livestock purchased (Farms)	5,514	5,523	6,466	6,131
	\$1,000	41,400	90,394	117,977	122,237
	Other livestock and poultry purchased (Farms)	3,700	2,996	3,507	3,276
	\$1,000	165,932	201,167	247,919	184,092
Feed purchased	(Farms)	15,381	13,716	16,861	17,316
	\$1,000	192,619	219,242	439,672	393,577

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

	<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>
2021 Animal Agriculture	Cattle and Calves	\$ 2,991,660	\$ 637,151	14,562	\$ 153,872
	Hogs, Pigs, and Other	\$ 249,786	\$ 61,810	1,224	\$ 14,927
	Poultry and Eggs	\$ 159,071	\$ 33,250	796	\$ 8,030
	Dairy	\$ 104,842	\$ 22,788	535	\$ 5,503
	Total	\$ 3,505,360	\$ 754,998	17,116	\$ 182,332
Change from 2011 to 2021	Cattle and Calves	\$ (321,760)	\$ (68,527)	(1,566)	\$ (16,549)
	Hogs, Pigs, and Other	\$ 76,421	\$ 18,910	374	\$ 4,567
	Poultry and Eggs	\$ 22,184	\$ 4,637	111	\$ 1,120
	Dairy	\$ (60,242)	\$ (13,094)	(307)	\$ (3,162)
	Total	\$ (283,397)	\$ (58,073)	(1,388)	\$ (14,025)
RIMS II Multipliers	<u>Animal Type</u>	<u>Output(\$)</u>	<u>Earnings (\$)</u>	<u>Employment (Jobs)</u>	
	Cattle and Calves	\$ 2.48	\$ 0.53	12.0	
	Hogs, Pigs, and Other	\$ 1.79	\$ 0.44	8.7	
	Poultry and Eggs	\$ 2.53	\$ 0.53	12.7	
	Dairy	\$ 2.38	\$ 0.52	12.2	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				4.0%
	Total				24.2%

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.