

Economic Analysis of Animal Agriculture 2005-2015

MONTANA

**A Report for
United Soybean Board**



September 2016



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Montana Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Montana's animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor in 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 2015 animal agriculture contributed:

- \$4.3 billion in economic output
- 27,678 jobs
- \$876.4 million in earnings
- \$238.6 million in income taxes paid at local, state, and federal levels
- \$126.6 million in the form of property taxes

Plus, from 2005-2015 animal agriculture in Montana has increased economic output by over \$1.0 billion, boosted household earnings by \$210.5 million, contributed 6,644 additional jobs and paid \$57.3 million in additional tax revenues.

Montana's animal agriculture consumed almost 56.8 thousand tons of soybean meal in 2015. This soybean meal was fed primarily to:

- Hogs (25.3 thousand tons)
- Beef Cows (16.1 thousand tons)
- Egg-Laying Hens (4.6 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. It is expected that 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 integral part of Montana's economy. In 2015, Montana's animal agriculture contributed the following to the economy:

- About \$4.3 billion in economic output
- \$876.4 million in household earnings
- 27,678 jobs
- \$238.6 million in income taxes

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

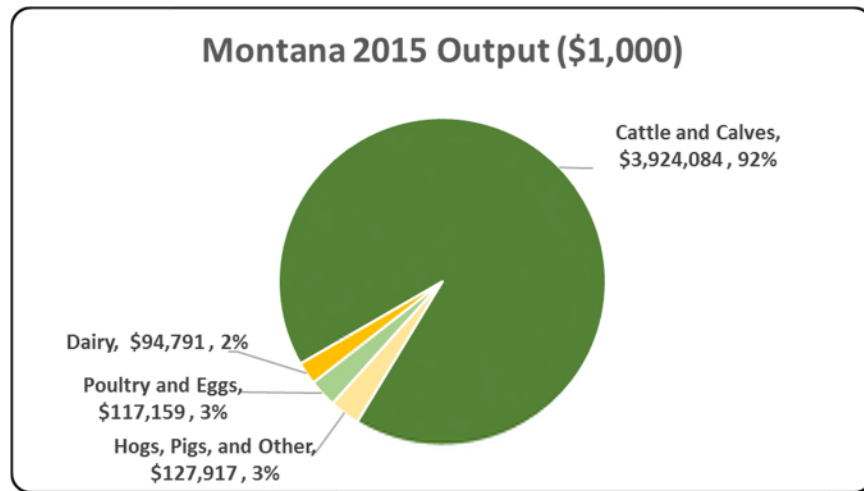
- Increased economic output by \$1.0 billion
- Boosted household earnings by \$210.5 million
- Added 6,644 jobs
- Paid an additional \$57.3 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2015	Change 2005-2015	% Change 2005-2015
Output (\$1,000)	\$ 4,263,950	\$ 1,037,755	32.17%
Earnings (\$1,000)	\$ 876,379	\$ 210,528	31.62%
Employment (Jobs)	27,678	6,644	31.59%
Income Taxes Paid (\$1,000)	\$ 238,638	\$ 57,327	31.62%
Property Taxes Paid in 2012 (\$1,000)	\$ 126,644		

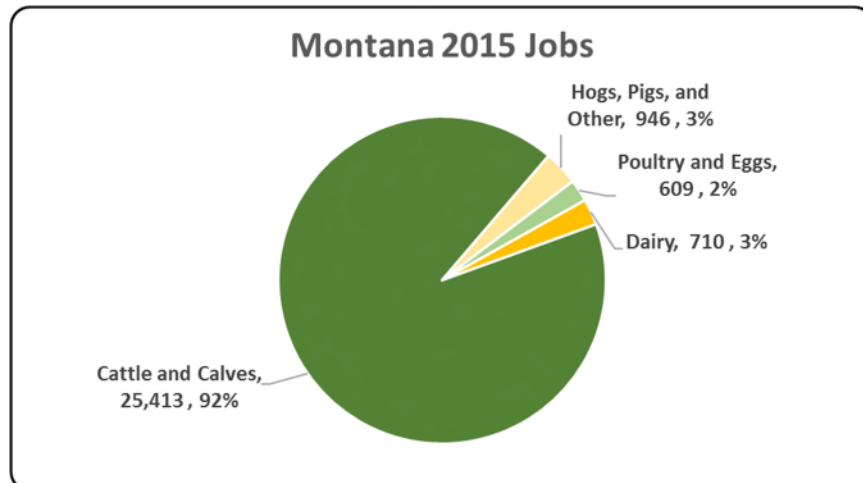
Montana Output

“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 chart illustrates the impact of animal agriculture to the Montana economy. Animal agriculture’s impact on Montana total economic output is about \$4.3 billion.



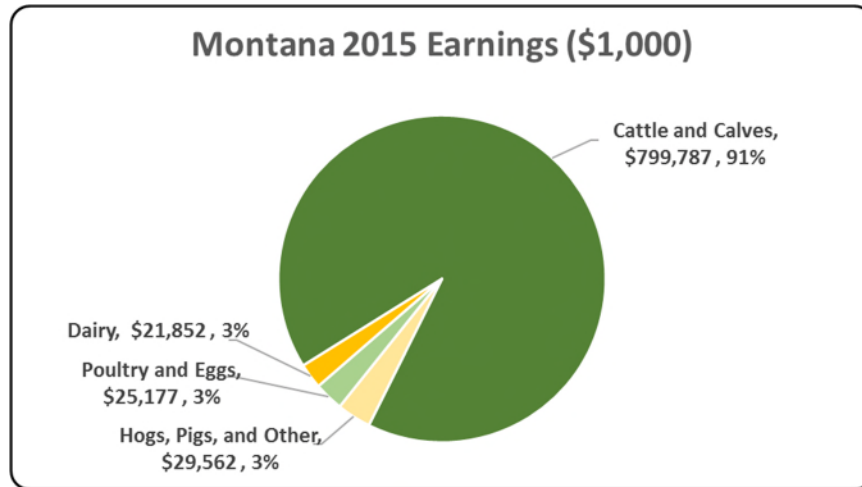
Montana Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The chart illustrates the contribution to Montana in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Montana total jobs, contributing 27,678 jobs within and outside of animal agriculture.



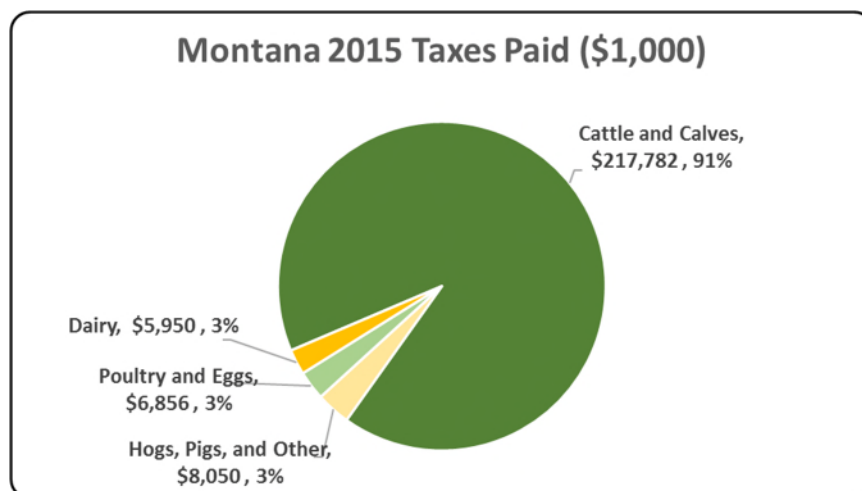
Montana Earnings

Earnings includes wages and salaries plus proprietors' income, which is the net earnings of sole-proprietors and partnerships. The chart illustrates the impact of animal agriculture to the Montana economy in terms of earnings. Montana's animal agriculture contributed about \$876.4 million to household earnings in 2015.



Montana Taxes Paid by Animal Agriculture

Montana's animal agriculture is also a significant source of tax revenue. In 2015, the state's animal agriculture industry paid about \$238.6 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$126.6 million in property taxes paid by all of Montana agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



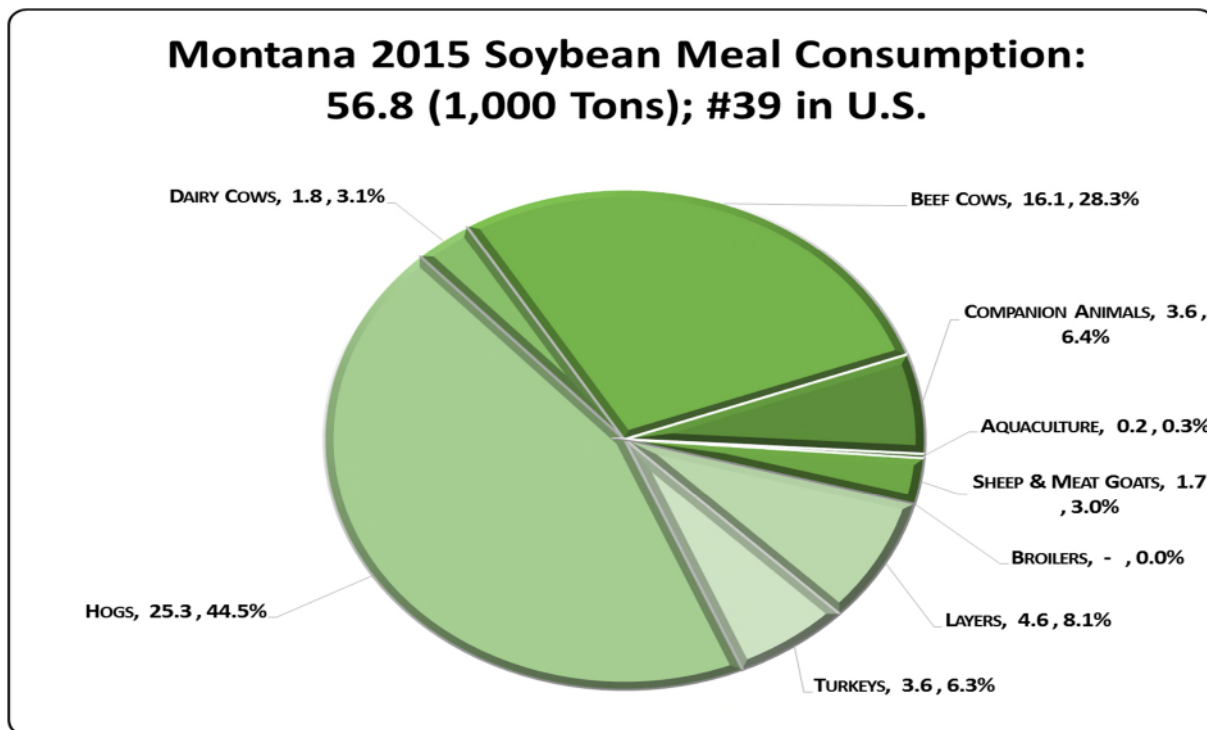
Montana Animal Agriculture Soybean Meal Consumption

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 2014-15 soybean marketing year by up to sixteen specific animal species has been estimated.

Montana’s animal agriculture consumed almost 56.8 thousand tons of soybean meal in 2015, placing the state as #39 in the nation in terms of soybean meal consumption (see figure below). The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (25.3 thousand tons)
- Beef Cows (16.1 thousand tons)
- Egg-Laying Hens (4.6 thousand tons)

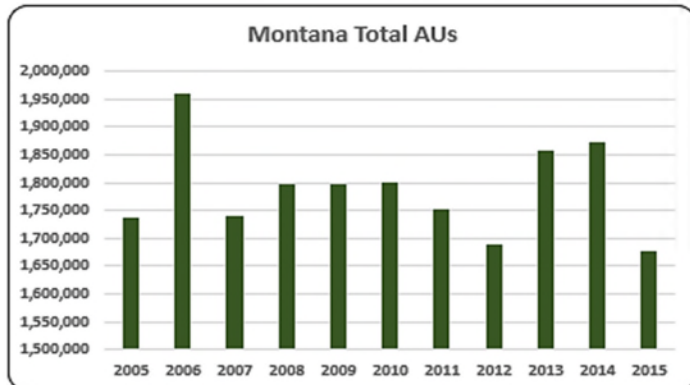
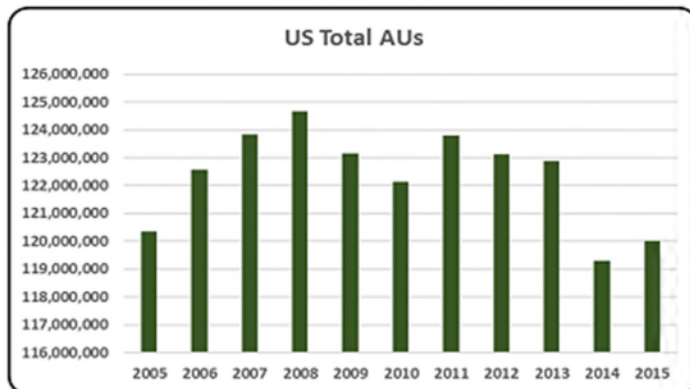


Montana Animal Unit (AU) Trends

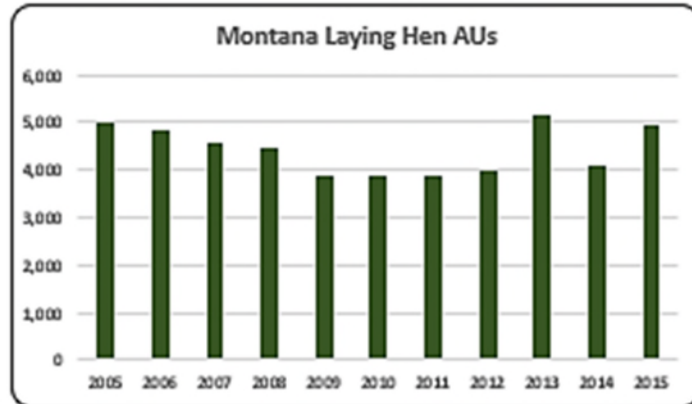
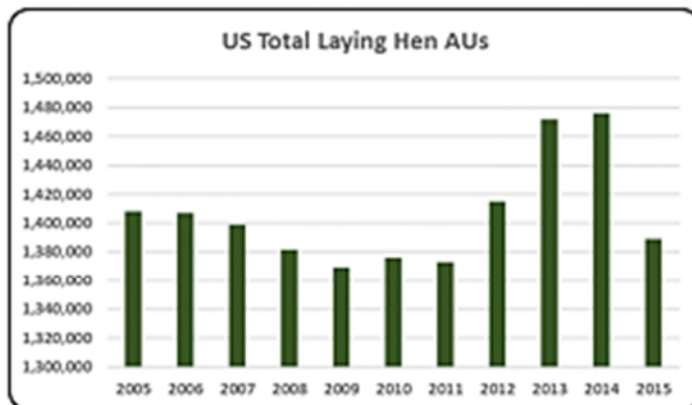
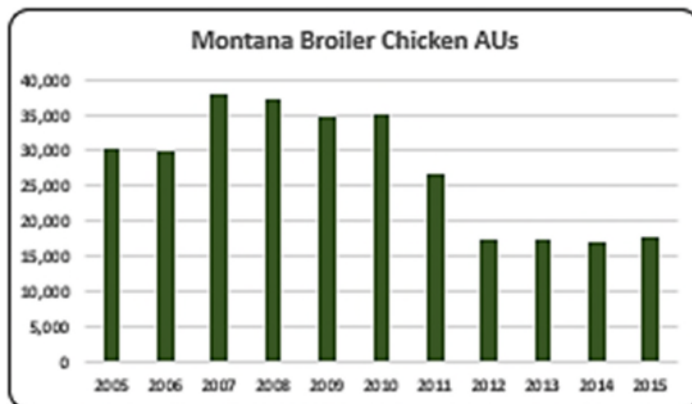
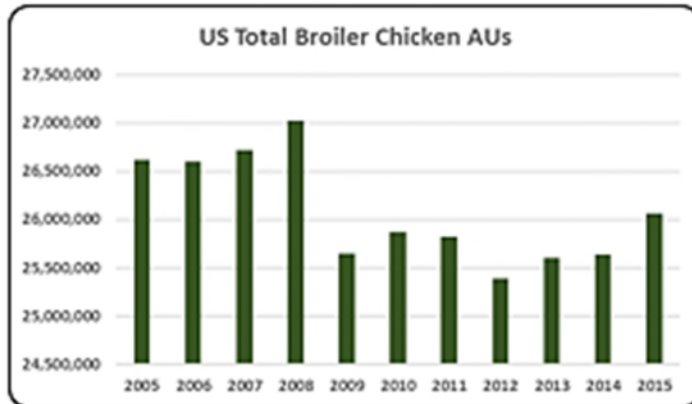
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Montana. Due to this reality, using a single year as a measure of the presence and strength of a sector can be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

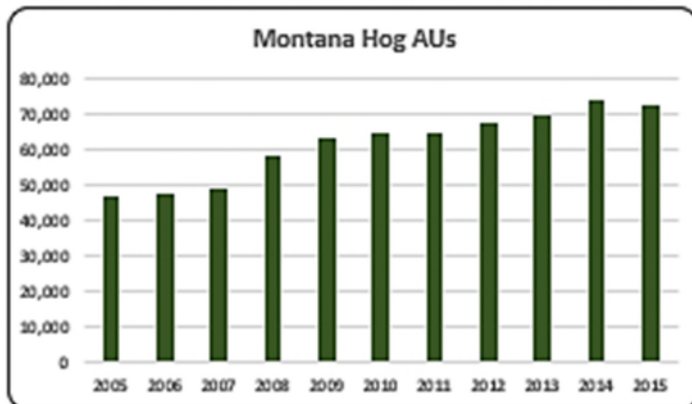
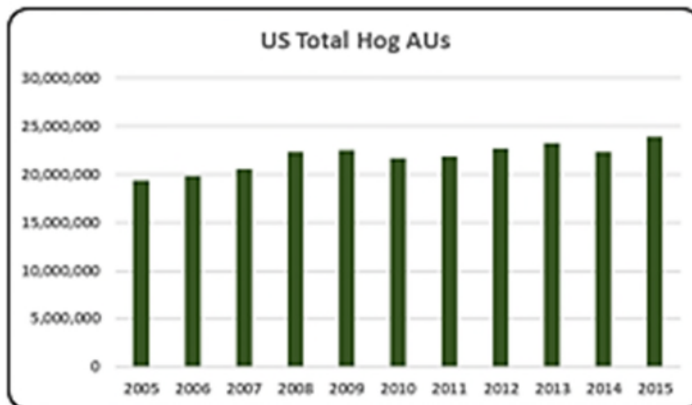
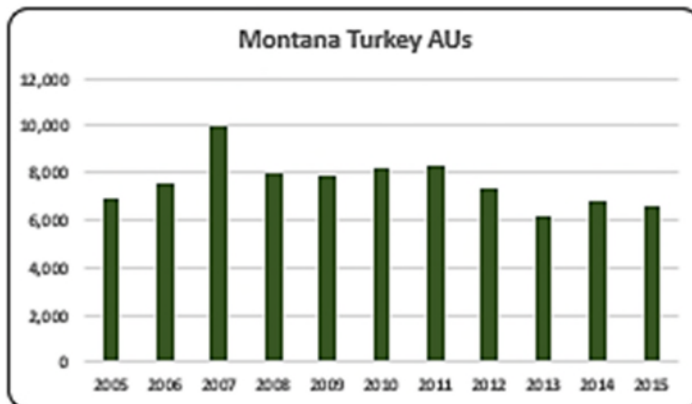
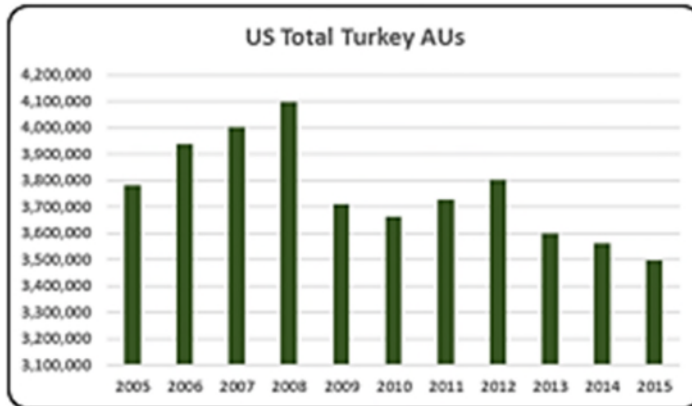
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Montana, the largest three segments of animal agriculture in terms of AUs during 2015 were: Beef Cows (1.55 million AUs), Hogs (72,000 AUs), and Dairy Cows (19,600 AUs). Total animal units in Montana during 2015 were nearly 1.7 million AUs.



- Overall U.S. total AUs have varied from 2005 to 2015. In 2014 AUs were at an all-time low reflecting, in part, the impact of severe weather on cattle production in some parts of country. During the 2005-15 time period, total AUs in the nation peaked in 2008.
- Total AU numbers in Montana shifted irregularly during the decade with nearly 1.7 million in 2015. AUs were a record 1.96 million in 2006.



- U.S. broiler production is clustered in a number of states, with Georgia being the largest producer. On average from 2005 to 2015, broiler chicken AUs were about 26.0 million. In 2015, AUs rebounded 3% from the low AUs numbers in 2012 (25.4 million AUs).
- There has been a sharp decline in broiler production in Montana from 37,894 broiler AUs in 2007 to 17,615 broiler AUs in 2015.
- On average, the layer AUs during 2005-2015 were 1.4 million. In 2015 layer AUs were 1.3 million, down 6% from the 2014 decade high (1.4 million AUs). This drastic decrease in 2015 was due to the losses in major egg laying states from the avian influenza outbreak.
- Only 0.3% (4,934) of all animal production in Montana came from layer production in 2015. On average from 2005 to 2015, there has been 4,427 layer AUs in the state.

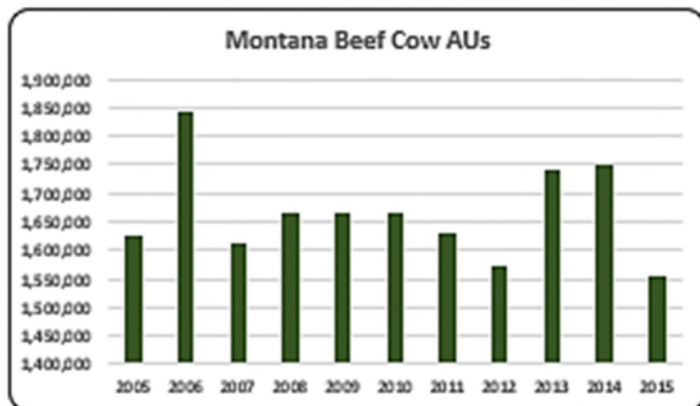
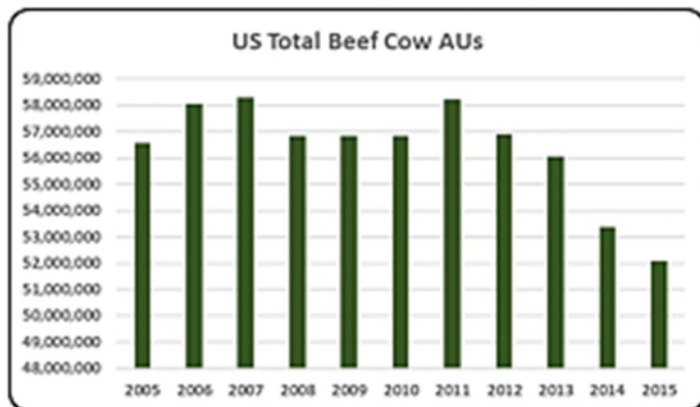
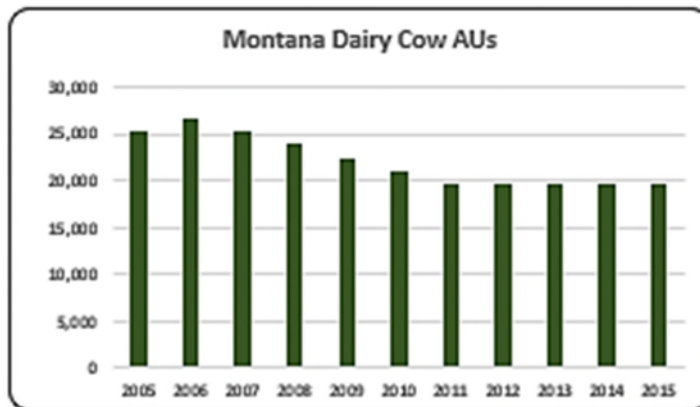
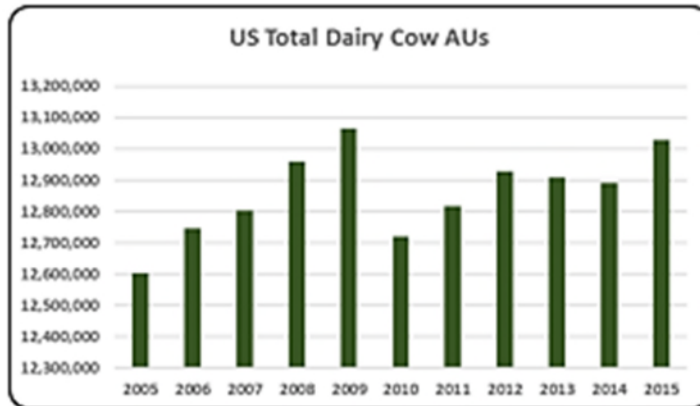


- In 2015 turkey AUs were the lowest of the decade at 3.5 million, decreasing 15% compared to 2008 (4.1 million turkey AUs) the largest turkey AUs of the decade. The most recent contributor to this decline has been avian influenza.

- 2007 was record year in turkey production in Montana with 10,027 turkey AUs. In 2015 there were only 6,642 AUs in the state.

- On average from 2005 to 2015, hog AUs were about 21.8 million. Hog AUs in 2015 increased 24% to 23.9 million AUs compared to the decade low in 2005 (19.4 million AUs). Despite the fluctuation in AUs, the pork supply was relatively stable.

- Hog production represented about 4.3% of animal production in 2015. Hog AUs increased 54% to 72,000 hog AUs in 2015 relative to 2005.



- From 2005 to 2015 dairy cow AUs averaged 12.8 million. In 2015, dairy cow AUs (13.0 million) finally reached near the 2009 high of 13.1 million AUs. Milk supplies have steadily risen.

- From 2011 to 2015 dairy cow AUs averaged 19,600 staying 26% below the record high in 2006 (26,600 dairy cow AUs).

- From 2005 to 2015 beef cow AUs averaged 56.3 million. In 2015 beef cow AUs decreased to 52.0 million, the lowest of the decade. States that traditionally raise a lot of cattle like Texas and Oklahoma continue to work through the lingering effects of the drought of the last several years.

- About 92.8% (1.55 million) of all AUs in 2015 were beef cow AUs, making it the number one animal production in the state.

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:

- Economic impact of animal agriculture to local (state) economies during the 2005-2015 time period
- Soybean meal usage by animal species during the 2014/15 soybean marketing year
- Animal Unit (AU) trends from 2005-2015

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 2005-2015 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 2014-15 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.257.6077.

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, \$1.65 to \$2.36 million in total economic activity, \$0.38 to \$0.49 in household wages and 11 to 16 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.364	\$ 0.482	15.3
	Hogs, Pigs, and Other	\$ 1.650	\$ 0.381	12.2
	Poultry and Eggs	\$ 2.200	\$ 0.473	11.4
	Dairy	\$ 2.128	\$ 0.491	15.9

Appendix

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Animal Units (AUs)	Beef Cattle AUs	1,623,750	1,844,250	1,613,250	1,666,500	1,666,500	1,628,550	1,571,700	1,740,000	1,750,200	1,554,525	
	Hog and Pig AUs	46,815	47,445	49,170	58,170	63,150	64,350	64,815	67,170	69,630	72,000	
	Broiler AUs	30,124	29,920	37,894	37,303	34,683	35,149	26,485	17,330	17,270	17,172	17,615
	Turkey AUs	6,944	7,545	10,027	8,014	7,850	8,177	8,323	7,371	6,149	6,788	6,642
	Egg Layer AUs	4,989	4,814	4,594	4,463	3,904	3,878	3,900	3,975	5,146	4,101	4,934
	Dairy AUs	25,200	26,600	25,200	23,800	22,400	21,000	19,600	19,600	19,600	19,600	19,600
	Total Animal Units	1,737,822	1,960,575	1,740,134	1,798,250	1,798,487	1,799,054	1,751,674	1,687,146	1,857,795	1,871,555	1,675,316
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 997,754	\$ 858,727	\$ 999,384	\$ 875,617	\$ 773,385	\$ 1,041,683	\$ 1,107,700	\$ 1,263,600	\$ 1,358,818	\$ 1,776,184	\$ 1,659,653
	Hogs and Pigs (\$1,000)	\$ 36,959	\$ 33,778	\$ 37,104	\$ 35,785	\$ 33,794	\$ 43,709	\$ 54,381	\$ 58,332	\$ 61,604	\$ 71,353	\$ 59,655
	Broilers (\$1,000)	\$ 25,314	\$ 19,611	\$ 29,244	\$ 29,877	\$ 25,778	\$ 26,938	\$ 23,584	\$ 17,268	\$ 21,041	\$ 22,074	\$ 19,257
	Turkeys (\$1,000)	\$ 6,596	\$ 7,798	\$ 11,404	\$ 9,842	\$ 8,964	\$ 11,280	\$ 12,546	\$ 12,072	\$ 9,559	\$ 10,816	\$ 11,517
	Eggs (\$1,000)	\$ 3,300	\$ 4,031	\$ 8,059	\$ 9,567	\$ 6,890	\$ 6,619	\$ 8,682	\$ 8,642	\$ 10,705	\$ 12,965	\$ 22,477
	Milk (\$1,000)	\$ 56,916	\$ 46,374	\$ 62,271	\$ 59,470	\$ 43,654	\$ 48,841	\$ 57,312	\$ 53,820	\$ 55,726	\$ 66,220	\$ 44,551
	Other	\$ 24,076	\$ 18,395	\$ 18,714	\$ 17,026	\$ 18,453	\$ 22,522	\$ 18,936	\$ 18,671	\$ 18,405	\$ 18,140	\$ 17,875
	Sheep and Lambs (\$1,000)	\$ 23,774	\$ 18,101	\$ 18,427	\$ 16,747	\$ 18,182	\$ 22,259	\$ 18,680	\$ 18,423	\$ 18,165	\$ 17,908	\$ 17,651
	Aquaculture (\$1,000)	\$ 302	\$ 294	\$ 287	\$ 279	\$ 271	\$ 263	\$ 256	\$ 248	\$ 240	\$ 232	\$ 225
	Total (\$1,000)	\$ 1,150,915	\$ 988,714	\$ 1,166,180	\$ 1,037,184	\$ 910,918	\$ 1,201,592	\$ 1,283,141	\$ 1,432,405	\$ 1,535,858	\$ 1,977,752	\$ 1,834,986

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,373	9,859	9,804	8,703
	Cattle feedlots (112112)	265	355	244	162
	Dairy cattle and milk production (11212)	128	136	138	75
	Hog and pig farming (1122)	163	142	118	88
	Poultry and egg production (1123)	68	131	398	206
	Sheep and goat farming (1124)	726	687	606	576
	Animal aquaculture and other animal production (1125,1129)	1,982	4,500	5,294	5,261
Value of Sales (\$1,000)	Cattle and Calves	831,621	1,015,169	1,368,699	1,783,908
	Hogs and Pigs	33,029	26,531	36,331	54,091
	Poultry and Eggs	5,665	5,243	7,975	withheld
	Milk and Other Dairy Products	36,528	41,842	54,761	44,671
	Aquaculture	withheld	4,185	3,188	3,172
	Other (calculated)	62,460	55,821	58,386	31,233
	Total	969,303	1,148,791	1,529,340	1,917,075
Input Purchases	Livestock and poultry purchased	(Farms) 8,433	7,935	7,287	8,619
	\$1,000	153,915	207,332	291,561	365,896
	Breeding livestock purchased	(Farms) withheld	5,514	5,523	6,466
	\$1,000	withheld	41,400	90,394	117,977
	Other livestock and poultry purchased	(Farms) withheld	3,700	2,996	3,507
	\$1,000	withheld	165,932	201,167	247,919
Feed purchased	(Farms)	13,389	15,381	13,716	16,861
	\$1,000	153,271	192,619	219,242	439,672

	2015 Animal Agriculture				
	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2015 Animal Agriculture	Cattle and Calves	\$ 3,924,084	\$ 799,787	25,413	\$ 217,782
	Hogs, Pigs, and Other	\$ 127,917	\$ 29,562	946	\$ 8,050
	Poultry and Eggs	\$ 117,159	\$ 25,177	609	\$ 6,856
	Dairy	\$ 94,791	\$ 21,852	710	\$ 5,950
	Total	\$ 4,263,950	\$ 876,379	27,678	\$ 238,638
Change from 2005 to 2015	Cattle and Calves	\$ 1,061,081	\$ 216,264	6,872	\$ 58,889
	Hogs, Pigs, and Other	\$ 5,705	\$ 1,318	42	\$ 359
	Poultry and Eggs	\$ 23,146	\$ 4,974	120	\$ 1,354
	Dairy	\$ (52,177)	\$ (12,028)	(391)	\$ (3,275)
	Total	\$ 1,037,755	\$ 210,528	6,644	\$ 57,327
	RIMS II Multipliers				
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 2.364	\$ 0.482	15.3	
	Hogs, Pigs, and Other	\$ 1.650	\$ 0.381	12.2	
	Poultry and Eggs	\$ 2.200	\$ 0.473	11.4	
	Dairy	\$ 2.128	\$ 0.491	15.9	
Tax Rates	Federal effective income tax rate				12.7%
	Federal Social Security tax rate				7.7%
	State Effective Rate				6.9%
	Total				27.2%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax Policy Institute and Tax Foundation.