

Economic Analysis of Animal Agriculture 2005-2015

COLORADO

**A Report for
United Soybean Board**



September 2016



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Colorado Executive Summary

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

- \$8.5 billion in economic output
- 50,483 jobs
- \$1.8 billion in earnings
- \$459.6 million in income taxes paid at local, state, and federal levels
- \$96.2 million in the form of property taxes

Plus, from 2005-2015 animal agriculture in Colorado has increased economic output by almost \$1.4 billion, boosted household earnings by \$302.7 million, contributed 8,140 additional jobs and paid \$75.5 million in additional tax revenues.

Colorado's animal agriculture consumed almost 225.2 thousand tons of soybean meal in 2015. This soybean meal was fed primarily to:

- Hogs (135.3 thousand tons)
- Egg-Laying Hens (26.5 thousand tons)
- Beef Cows (23.3 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. It is expected that animal agriculture will continue to be a major contributor to the economic well-being of the people of Colorado and beyond.

Colorado Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Colorado's economy. In 2015, Colorado's animal agriculture contributed the following to the economy:

- About \$8.5 billion in economic output
- \$1.8 billion in household earnings
- 50,483 jobs
- \$459.6 million in income taxes

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

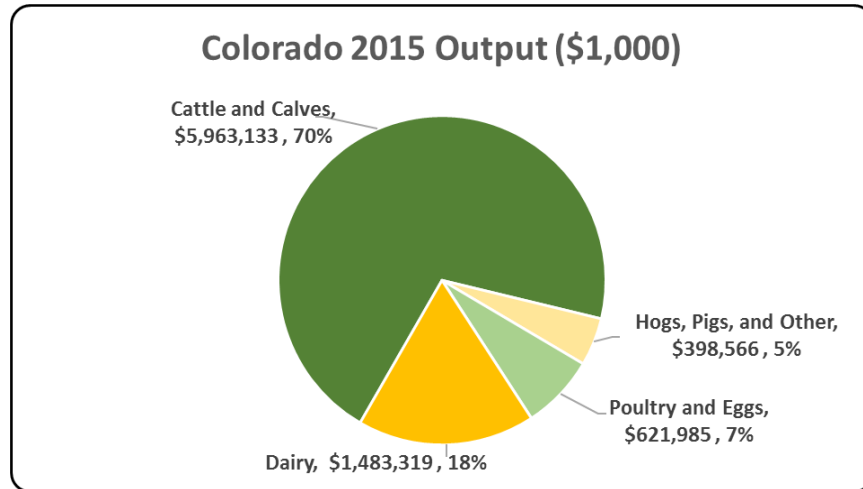
- Increased economic output by \$1.4 billion
- Boosted household earnings by \$302.7 million
- Added 8,140 jobs
- Paid an additional \$75.5 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2015	Change 2005-2015	% Change 2005-2015
Output (\$1,000)	\$ 8,467,002	\$ 1,366,135	19.24%
Earnings (\$1,000)	\$ 1,841,160	\$ 302,664	19.67%
Employment (Jobs)	50,483	8,140	19.22%
Income Taxes Paid (\$1,000)	\$ 459,553	\$ 75,545	19.67%
Property Taxes Paid in 2012 (\$1,000)	\$ 96,212		

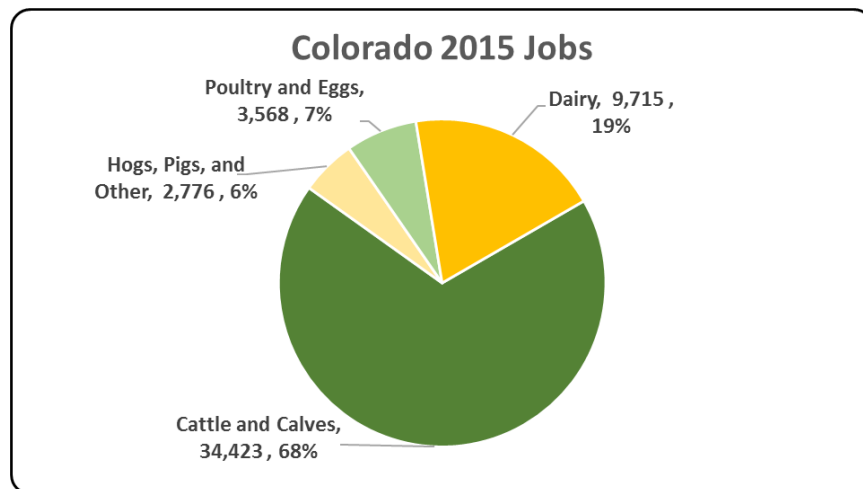
Colorado Output

“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 chart illustrates the impact of animal agriculture to the Colorado economy. Animal agriculture’s impact on Colorado total economic output is about \$8.5 billion.



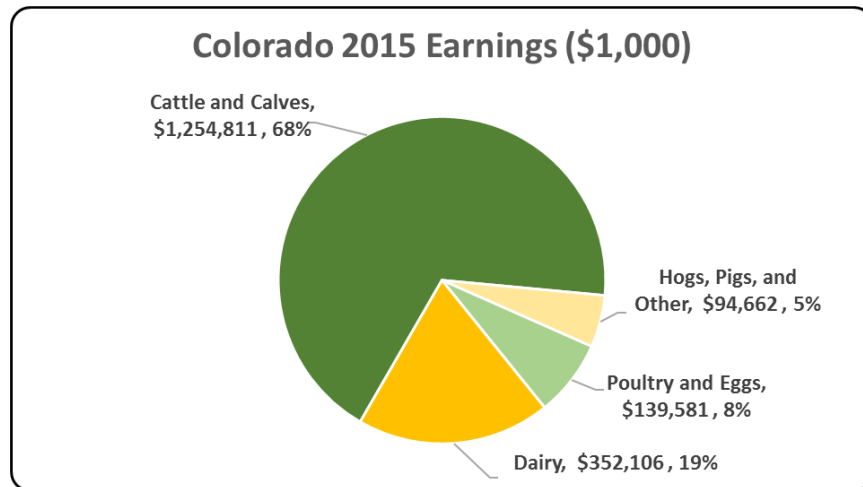
Colorado Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The chart illustrates the contribution to Colorado in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Colorado total jobs, contributing 50,483 jobs within and outside of animal agriculture.



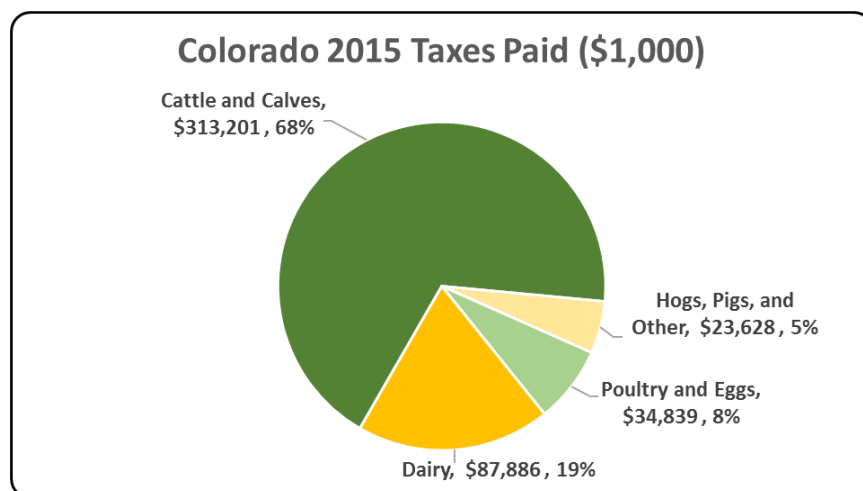
Colorado Earnings

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 Colorado economy in terms of earnings. Colorado’s animal agriculture contributed about \$1.8 billion to household earnings in 2015.



Colorado Taxes Paid by Animal Agriculture

Colorado’s animal agriculture is also a source of tax revenue. In 2015, the state’s animal agriculture industry paid about \$459.6 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$96.2 million in property taxes paid by all of Colorado agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



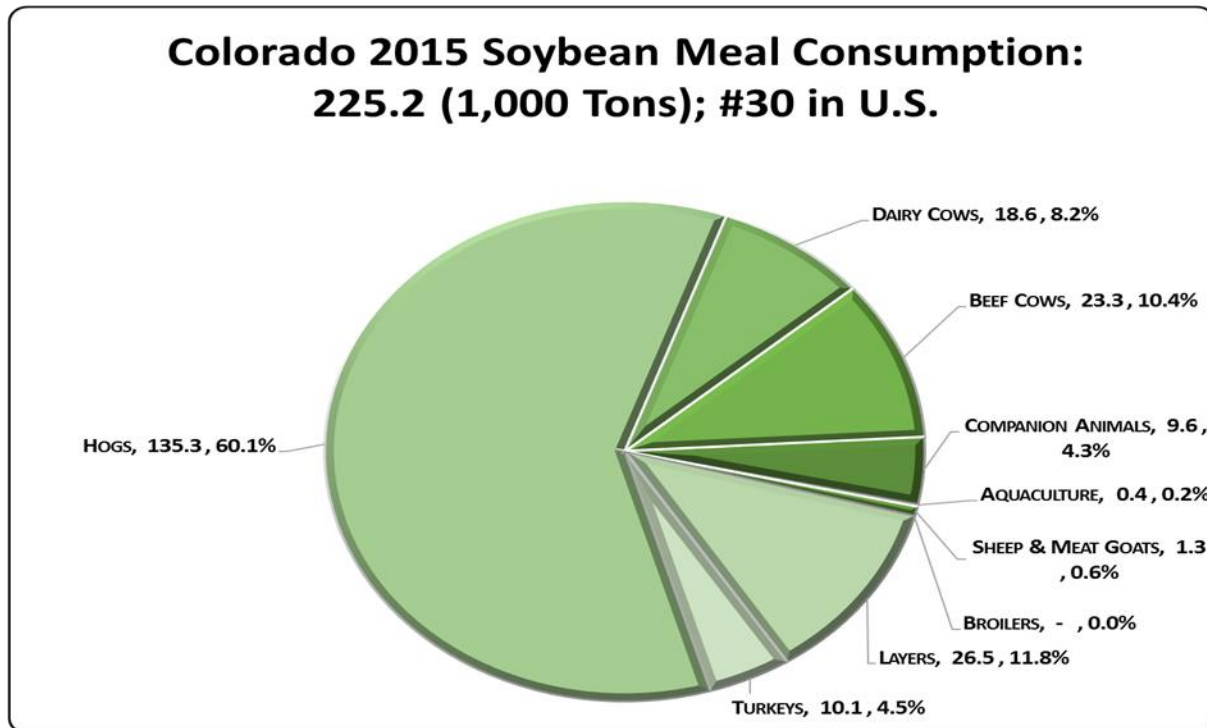
Colorado Animal Agriculture Soybean Meal Consumption

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.

Colorado’s animal agriculture consumed almost 225.2 thousand tons of soybean meal in 2015, placing the state as #30 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 (135.3 thousand tons)
- Egg-Laying Hens (26.5 thousand tons)
- Beef Cows (23.3 thousand tons)

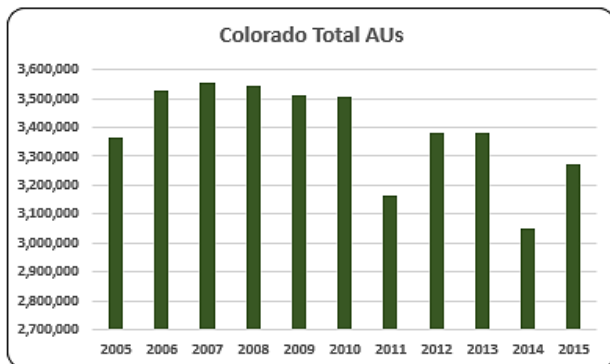
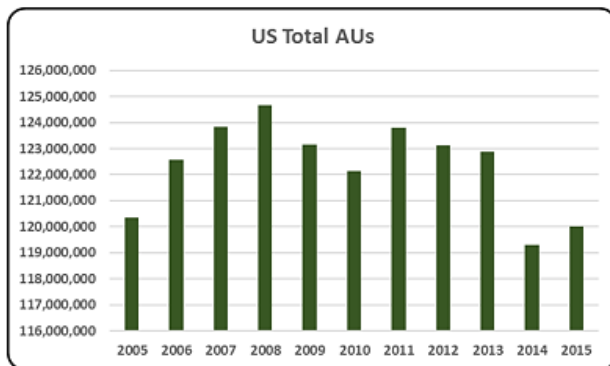


Colorado Animal Unit (AU) Trends

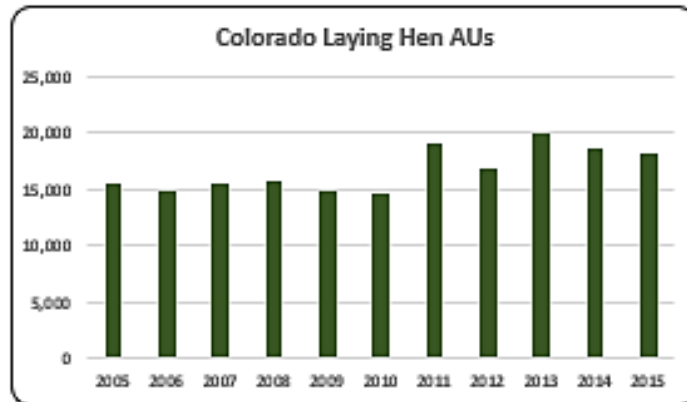
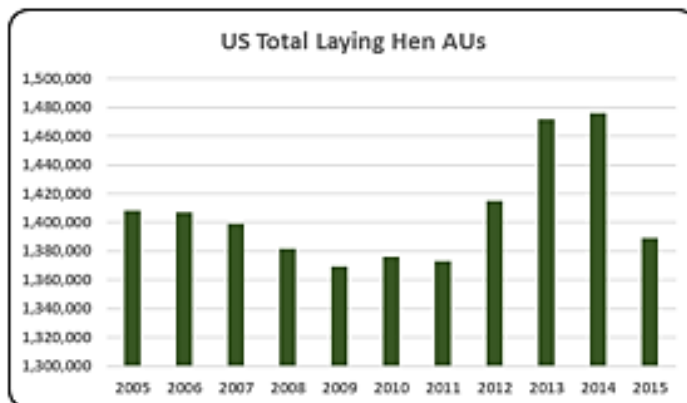
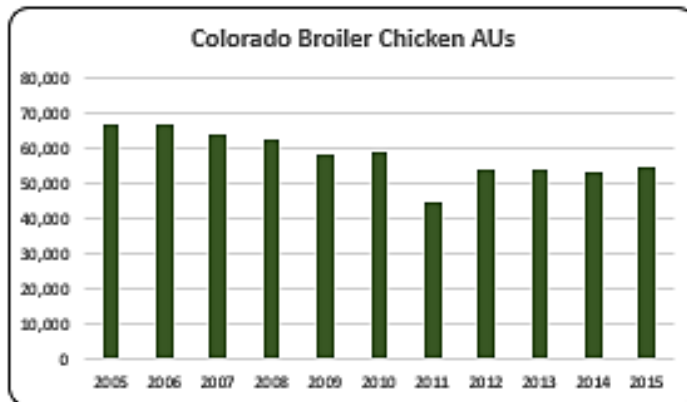
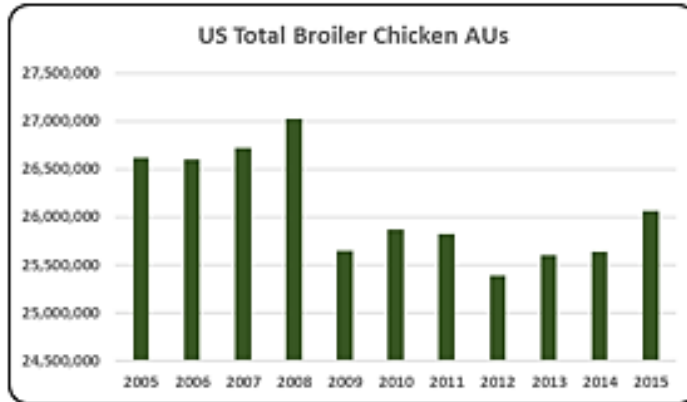
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Colorado. Due to this reality, using a single year as a measure of the presence and strength of a sector can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

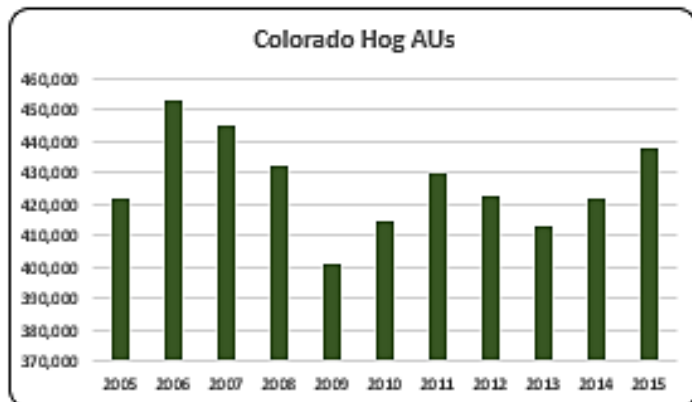
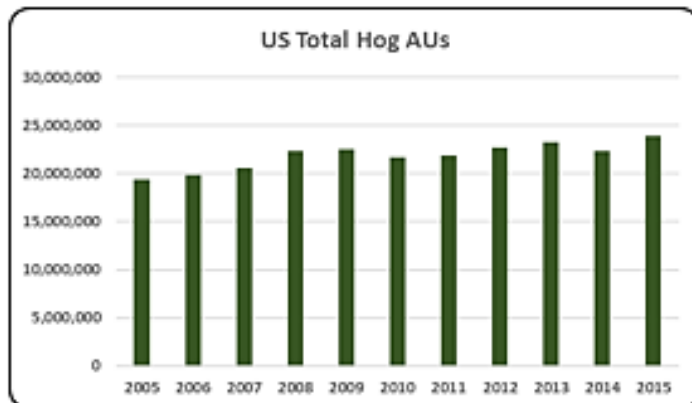
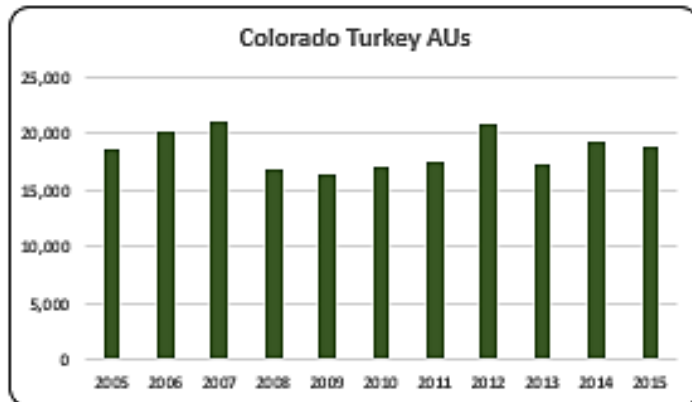
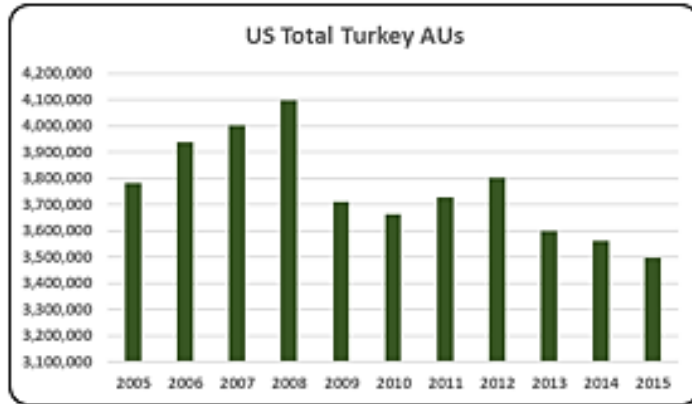
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Colorado, the largest three segments of animal agriculture in terms of AUs during 2015 were: Beef Cows (2.5 million AUs), Hogs (438,150 AUs), and Dairy Cows (203,000 AUs). Total animal units in Colorado during 2015 were 3.3 million AUs.



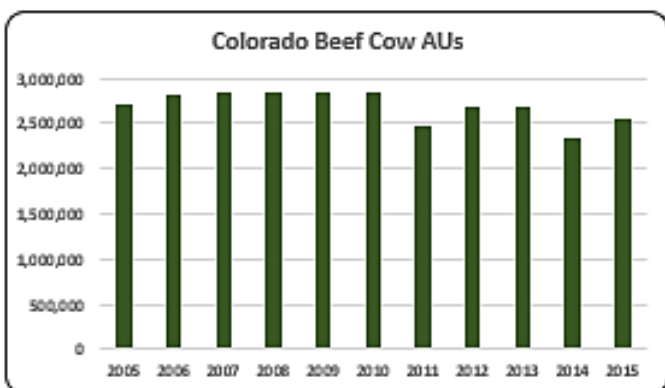
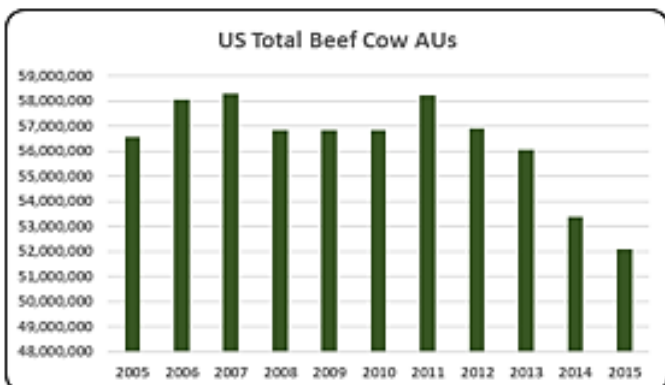
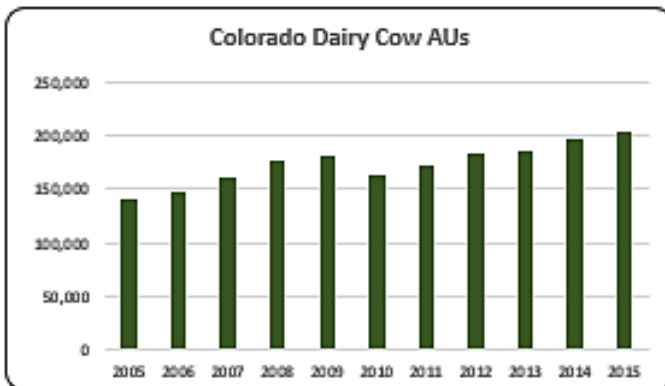
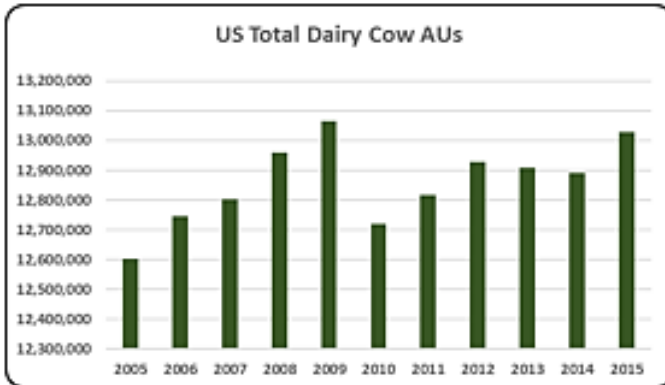
- Overall U.S. total AUs have varied from 2005 to 2015. In 2014 AUs were at an all-time low reflecting, in part, the impact of severe weather on cattle production in some parts of country. During the 2005-15 time period, total AUs in the nation peaked in 2008.
- The average number of AUs in Colorado from 2005 to 2015 was 3.4 million.



- 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).
- At the state level, broiler AUs in 2015 reported in at 54,885 AUs in the state of Colorado. In general, broiler AUs have waned since 2005 (66,898), but have recovered from the low levels of 2011 (44,447).
- 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.
- Colorado layer AUs in 2015 (18,200) were 1.31% of all layer AUs in the U.S. Layer AUs in 2015 dropped 9% relative to the numbers in 2013, but increased 25% compared to 2010 (14,512).



- 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 average number of turkey AUs in Colorado from 2005 to 2015 was 18,515.
- 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.
- The number of hogs AUs (438,150) in 2015 represent 1.82% of all hog AUs in the country in that year. From 2005 to 2015, there have been 426,702 hog AUs, on average.



- 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.
- The third largest animal sector in Colorado is dairy with 203,000 AUs in 2015. On average, there have been 173,600 dairy cow AUs in Colorado from 2005 to 2015.
- 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.
- In 2015 there were 2.5 million beef cow AUs in Colorado with an average for the 2005-2015 decade being 2.7 million beef cow AUs.

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:

- 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 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 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 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 soybean meal in Colorado. 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.

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, \$1.73 to \$2.41 million in total economic activity, \$0.41 to \$0.53 in household wages and 12 to 15 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.411	\$ 0.507	13.9
	Hogs, Pigs, and Other	\$ 1.731	\$ 0.411	12.1
	Poultry and Eggs	\$ 2.304	\$ 0.517	13.2
	Dairy	\$ 2.222	\$ 0.528	14.6

Appendix

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Animal Units (AUs)	Beef Cattle AUs	2,700,600	2,826,600	2,850,600	2,838,600	2,838,600	2,838,600	2,482,875	2,681,250	2,692,500	2,339,550	2,541,900
	Hog and Pig AUs	422,100	453,000	445,050	432,450	400,950	414,450	430,125	422,700	413,100	421,650	438,150
	Broiler AUs	66,898	66,447	63,592	62,600	58,203	58,986	44,447	53,998	53,809	53,504	54,885
	Turkey AUs	18,600	20,211	20,993	16,780	16,437	17,121	17,426	20,813	17,361	19,166	18,753
	Egg Layer AUs	15,556	14,884	15,452	15,820	14,804	14,512	19,112	16,788	20,040	18,681	18,200
	Dairy AUs	141,400	147,000	161,000	176,400	182,000	162,400	172,200	183,400	184,800	196,000	203,000
	Total Animal Units	3,365,154	3,528,141	3,556,687	3,542,650	3,510,994	3,506,069	3,166,185	3,378,948	3,381,611	3,048,551	3,274,887
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,813,022	\$ 1,914,142	\$ 1,914,783	\$ 1,734,151	\$ 1,597,426	\$ 1,766,700	\$ 1,927,383	\$ 2,140,163	\$ 2,162,134	\$ 2,409,626	\$ 2,473,508
	Hogs and Pigs (\$1,000)	\$ 178,177	\$ 175,440	\$ 196,673	\$ 159,404	\$ 126,971	\$ 189,680	\$ 227,019	\$ 206,066	\$ 206,725	\$ 235,645	\$ 183,875
	Broilers (\$1,000)	\$ 56,217	\$ 43,551	\$ 49,077	\$ 50,139	\$ 43,259	\$ 45,207	\$ 39,578	\$ 53,804	\$ 65,559	\$ 68,777	\$ 60,001
	Turkeys (\$1,000)	\$ 17,668	\$ 20,888	\$ 23,877	\$ 20,607	\$ 18,769	\$ 23,617	\$ 26,268	\$ 34,087	\$ 26,990	\$ 30,540	\$ 32,520
	Eggs (\$1,000)	\$ 42,141	\$ 47,452	\$ 74,074	\$ 96,842	\$ 70,308	\$ 77,131	\$ 85,801	\$ 96,215	\$ 103,782	\$ 130,350	\$ 177,461
	Milk (\$1,000)	\$ 349,852	\$ 331,110	\$ 522,258	\$ 540,040	\$ 363,136	\$ 461,824	\$ 599,800	\$ 597,618	\$ 672,256	\$ 862,320	\$ 667,500
	Other	\$ 73,414	\$ 61,105	\$ 55,713	\$ 59,049	\$ 58,733	\$ 60,191	\$ 54,378	\$ 52,381	\$ 50,384	\$ 48,387	\$ 46,390
	Sheep and Lambs (\$1,000)	\$ 70,065	\$ 57,562	\$ 51,976	\$ 55,118	\$ 54,608	\$ 55,872	\$ 49,865	\$ 47,674	\$ 45,483	\$ 43,292	\$ 41,101
	Aquaculture (\$1,000)	\$ 3,349	\$ 3,543	\$ 3,737	\$ 3,931	\$ 4,125	\$ 4,319	\$ 4,513	\$ 4,707	\$ 4,901	\$ 5,095	\$ 5,289
Total (\$1,000)	\$ 2,530,491	\$ 2,593,688	\$ 2,836,455	\$ 2,660,232	\$ 2,278,601	\$ 2,624,350	\$ 2,960,227	\$ 3,180,334	\$ 3,287,830	\$ 3,785,644	\$ 3,641,255	

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,883	9,819	9,598	10,528
	Cattle feedlots (112112)	786	1,081	615	268
	Dairy cattle and milk production (11212)	301	232	267	183
	Hog and pig farming (1122)	398	445	453	343
	Poultry and egg production (1123)	150	237	742	611
	Sheep and goat farming (1124)	741	902	1,010	1,212
	Animal aquaculture and other animal production (1125,1129)	2,862	6,111	7,941	7,153
Value of Sales (\$1,000)	Cattle and Calves	2,530,329	2,632,740	3,156,348	4,321,308
	Hogs and Pigs	171,972	179,415	159,808	208,763
	Poultry and Eggs	142,256	113,256	161,320	102,175
	Milk and Other Dairy Products	188,783	247,035	456,076	559,422
	Aquaculture	4,337	28,805	11,258	14,475
	Other (calculated)	165,238	107,667	134,925	108,550
	Total	3,202,915	3,308,918	4,079,735	5,314,693
Input Purchases	Livestock and poultry purchased	(Farms) 9,954	8,174	8,517	9,728
		\$1,000 1,271,336	1,662,797	1,778,706	1,885,482
	Breeding livestock purchased	(Farms) <i>n/a</i>	4,686	4,866	5,372
		\$1,000 <i>n/a</i>	46,389	86,507	98,374
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	4,650	4,944	5,838
		\$1,000 <i>n/a</i>	1,616,409	1,692,199	1,787,108
	Feed purchased	(Farms) 15,919	18,525	18,817	21,744
	\$1,000 861,580	866,170	1,221,367	1,972,993	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2015 Animal Agriculture	Cattle and Calves	\$ 5,963,133	\$ 1,254,811	34,423	\$ 313,201
	Hogs, Pigs, and Other	\$ 398,566	\$ 94,662	2,776	\$ 23,628
	Poultry and Eggs	\$ 621,985	\$ 139,581	3,568	\$ 34,839
	Dairy	\$ 1,483,319	\$ 352,106	9,715	\$ 87,886
	Total	\$ 8,467,002	\$ 1,841,160	50,483	\$ 459,553
Change from 2005 to 2015	Cattle and Calves	\$ 658,669	\$ 138,602	3,802	\$ 34,595
	Hogs, Pigs, and Other	\$ (129,934)	\$ (30,860)	(905)	\$ (7,703)
	Poultry and Eggs	\$ 297,587	\$ 66,782	1,707	\$ 16,669
	Dairy	\$ 539,812	\$ 128,139	3,536	\$ 31,984
	Total	\$ 1,366,135	\$ 302,664	8,140	\$ 75,545
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.411	\$ 0.507	13.9	
	Hogs, Pigs, and Other	\$ 1.731	\$ 0.411	12.1	
	Poultry and Eggs	\$ 2.304	\$ 0.517	13.2	
	Dairy	\$ 2.222	\$ 0.528	14.6	
Tax Rates	Federal effective income tax rate			12.7%	
	Federal Social Security tax rate			7.7%	
	State Effective Rate			4.6%	
	Total			25.0%	

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.