

Economic Analysis of Animal Agriculture 2005-2015

MASSACHUSETTS

A Report for
United Soybean Board



September 2016



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Massachusetts Executive Summary

The use of soybean meal as a key feed ingredient is a small part of Massachusetts 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 Massachusetts. The success of Massachusetts animal agriculture in turn has a small impact on the rest of the state and regional economies. For example, in the State of Massachusetts during 2015 animal agriculture contributed:

- \$195.7 million in economic output
- 926 jobs
- \$40.5 million in earnings
- \$10.4 million in income taxes paid at local, state, and federal levels
- \$38.0 million in the form of property taxes

Plus, from 2005-2015 animal agriculture in Massachusetts has increased economic output by over \$12.0 million, boosted household earnings by \$2.2 million, contributed 66 additional jobs and paid \$0.6 million in additional tax revenues.

Massachusetts's animal agriculture consumed almost 19,800 tons of soybean meal in 2015. This soybean meal was fed primarily to:

- Turkeys (7,600 tons)
- Companion Animals (4,800 tons)
- Egg-Laying Hens (3,700 tons)

This report examines animal agriculture in Massachusetts 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 Massachusetts, many opportunities and challenges will arise. It is expected that animal agriculture will continue to be a minor contributor to the economic well-being of the people of Massachusetts and beyond.

Massachusetts Economic Impact of Animal Agriculture

Animal agriculture is a small part of Massachusetts's economy. In 2015, Massachusetts's animal agriculture contributed the following to the economy:

- About \$195.7 million in economic output
- \$40.5 million in household earnings
- 926 jobs
- \$10.4 million in income taxes

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

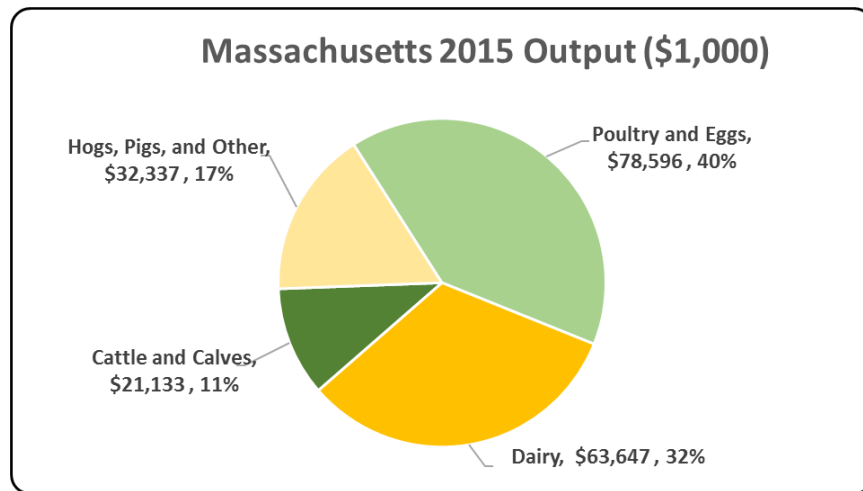
- Increased economic output by \$12.0 million
- Boosted household earnings by \$2.2 million
- Added 66 jobs
- Paid an additional \$0.6 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2015	Change 2005-2015	% Change 2005-2015
Output (\$1,000)	\$ 195,712	\$ 12,025	6.55%
Earnings (\$1,000)	\$ 40,543	\$ 2,168	5.65%
Employment (Jobs)	926	66	7.65%
Income Taxes Paid (\$1,000)	\$ 10,371	\$ 555	5.65%
Property Taxes Paid in 2012 (\$1,000)	\$ 37,954		

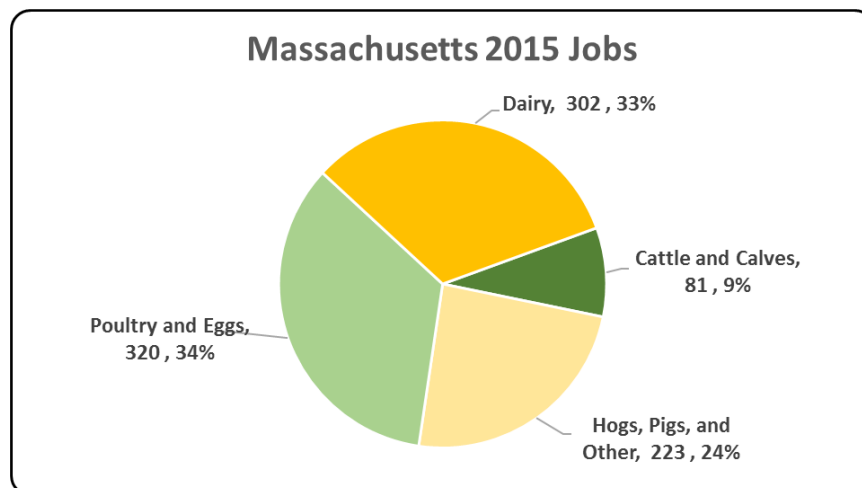
Massachusetts Output

“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 Massachusetts economy. Animal agriculture’s impact on Massachusetts total economic output is about \$195.7 million.



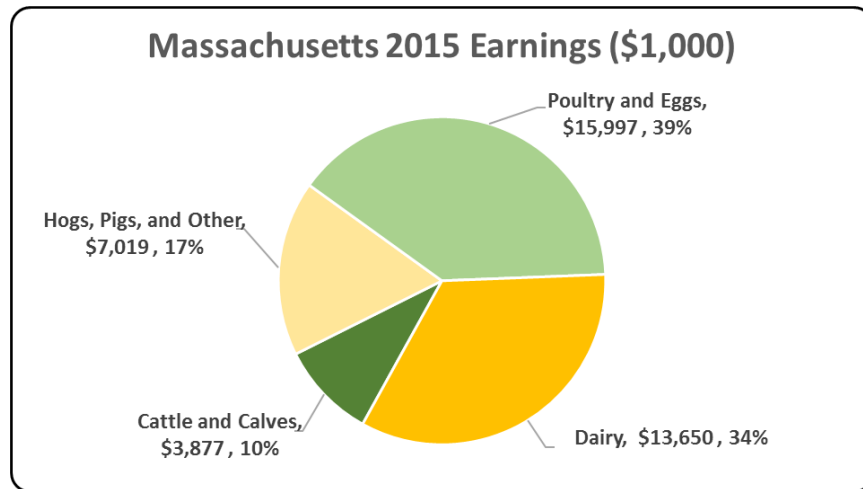
Massachusetts Jobs

“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 Massachusetts in terms of animal agriculture jobs. As shown, animal agriculture contributes about 926 jobs within and outside of animal agriculture in Massachusetts.



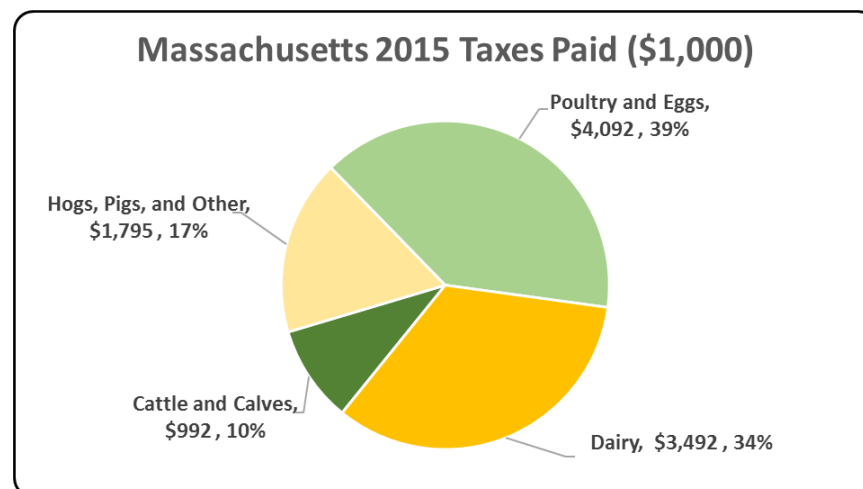
Massachusetts Earnings

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 Massachusetts economy in terms of earnings. Massachusetts's animal agriculture contributed about \$40.5 million to household earnings in 2015.



Massachusetts Taxes Paid by Animal Agriculture

Massachusetts's animal agriculture is also a small source of tax revenue. In 2015, the state's animal agriculture industry paid about \$10.4 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$38.0 million in property taxes paid by all of Massachusetts agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



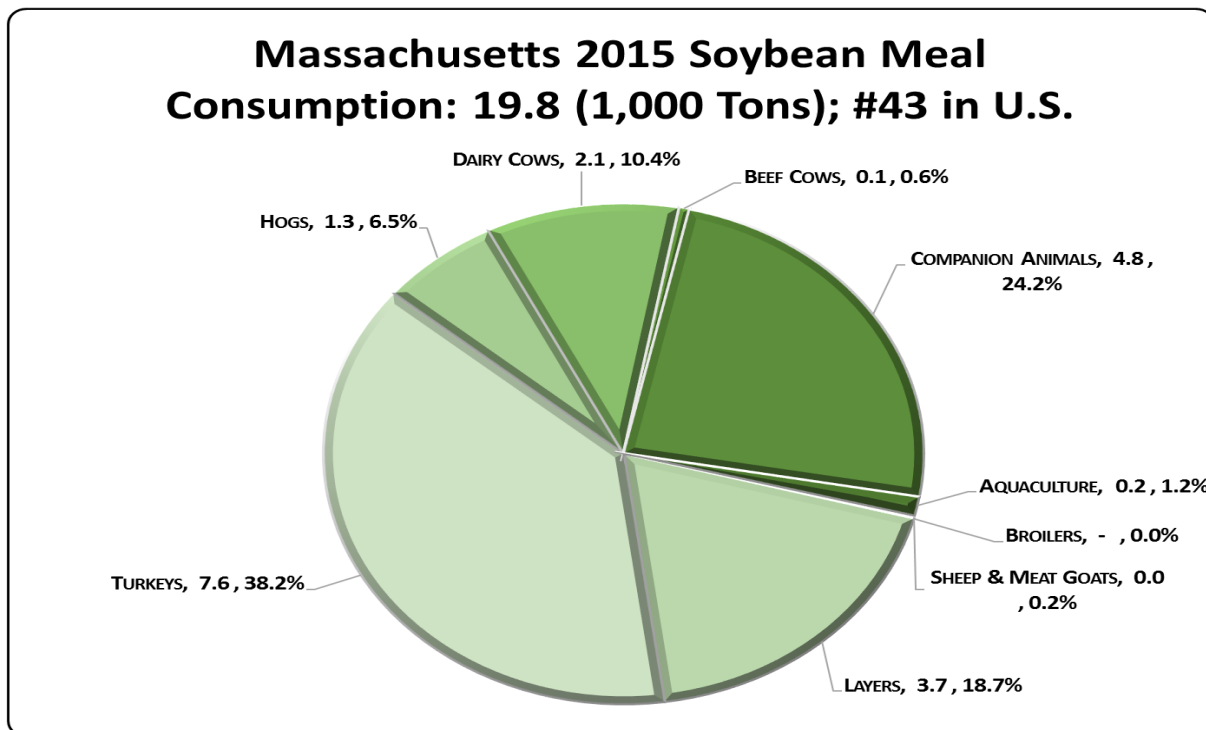
Massachusetts Animal Agriculture Soybean Meal Consumption

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.

Massachusetts’s animal agriculture consumed almost 19,800 tons of soybean meal in 2015, placing the state as #43 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:

- Turkeys (7,600 tons)
- Companion Animals (4,800 tons)
- Egg-Laying Hens (3,700 tons)

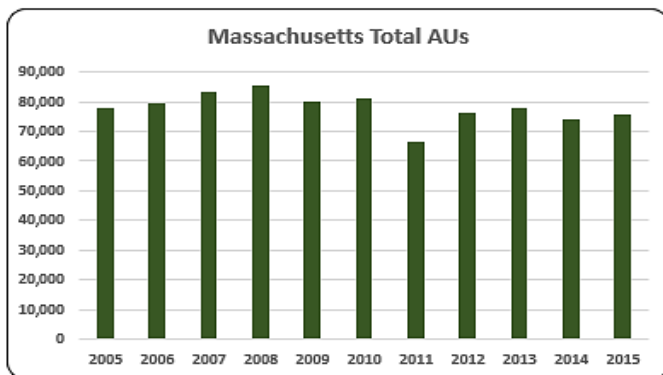
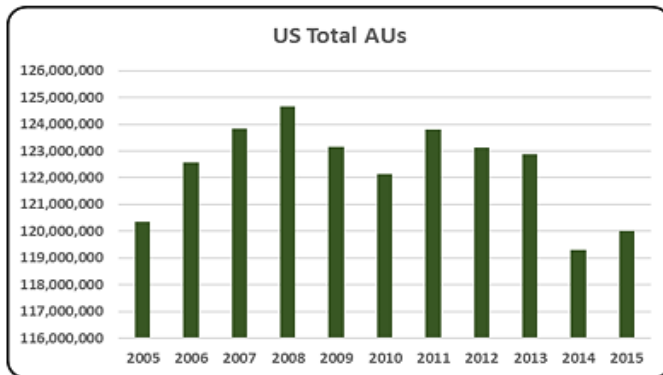


Massachusetts Animal Unit (AU) Trends

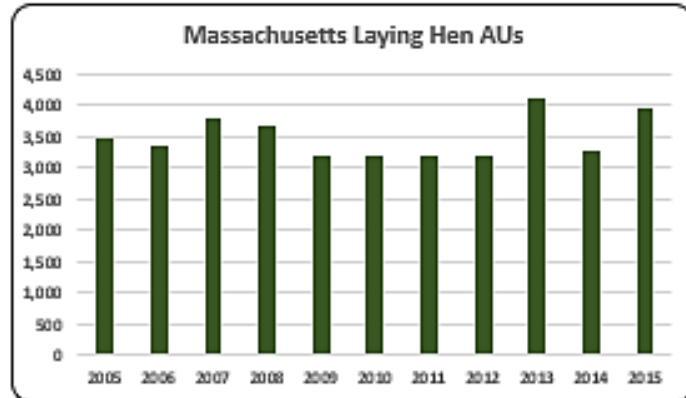
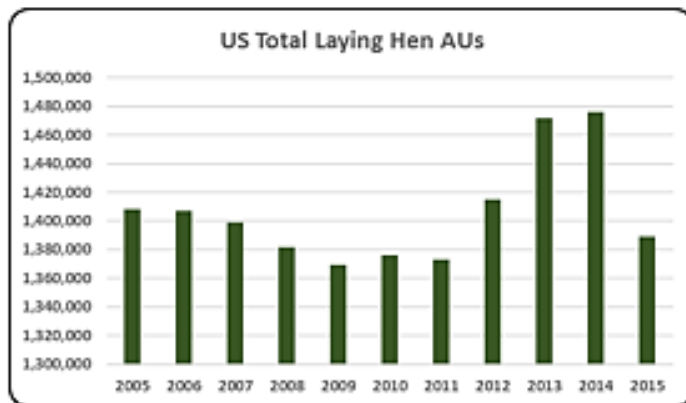
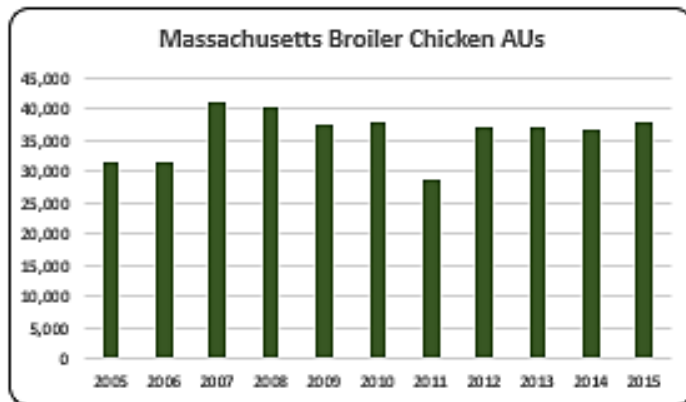
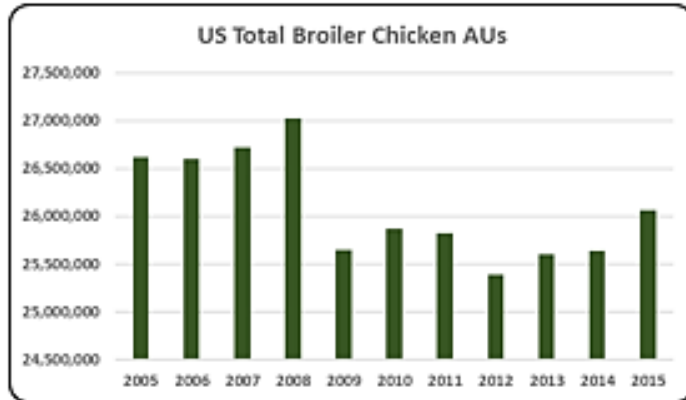
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Massachusetts. Due to this reality, using a single year as a measure of the presence and strength of a sector 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 Massachusetts and to give perspective on Massachusetts’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 Massachusetts, the largest three segments of animal agriculture in terms of AUs during 2015 were: Broilers (37,826 AUs), Dairy Cows (17,500 AUs), and Beef Cows (12,645 AUs). Total animal units in Massachusetts during 2015 were 75,598 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.
- Overall animal agriculture in Massachusetts is very small representing only 0.06% (75,598) of all AUs in the country in 2015.

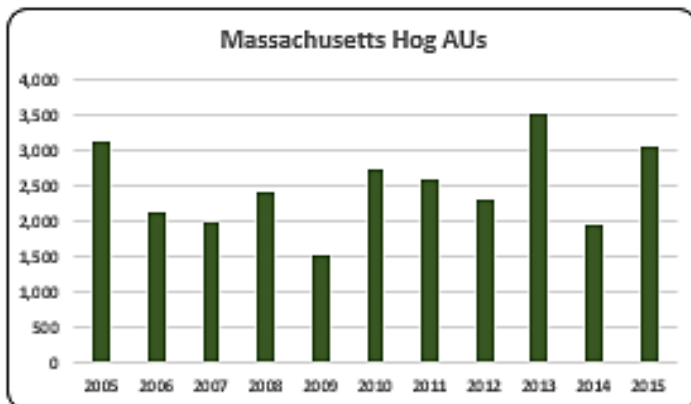
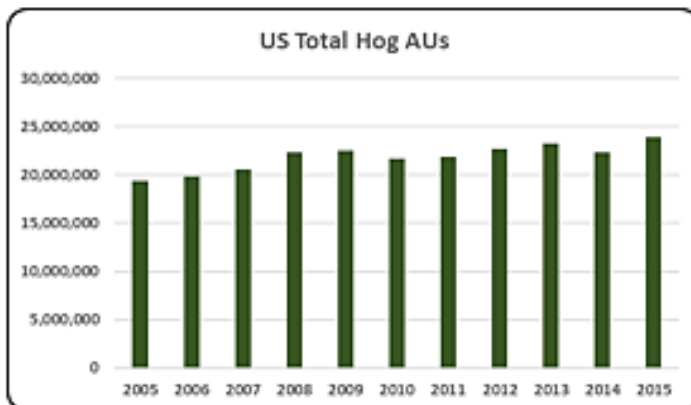
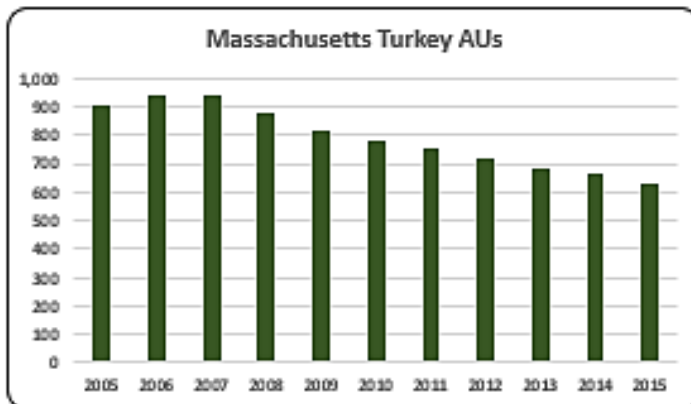
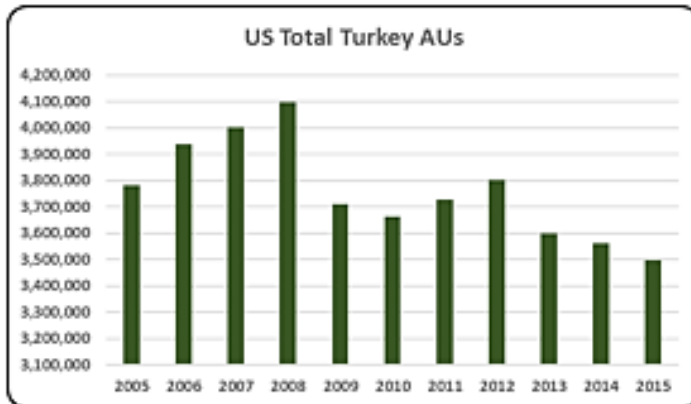


- U.S. broiler production is clustered in a number of states, with Georgia being the largest producer. On average from 2005 to 2015, broiler chicken AUs were about 26.0 million. In 2015, AUs rebounded 3% from the low AUs numbers in 2012 (25.4 million AUs).

- About half (37,826) of all AUs in Massachusetts in 2015 were broiler AUs. Broiler numbers have fluctuated throughout the decade but in 2015 broiler numbers remained below the record levels of 2007-2008 which averaged 40,623 broiler AUs.

- 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.

- Layer AUs dropped in 2009 to 3,203 and averaged 3,488 over the ten year period.

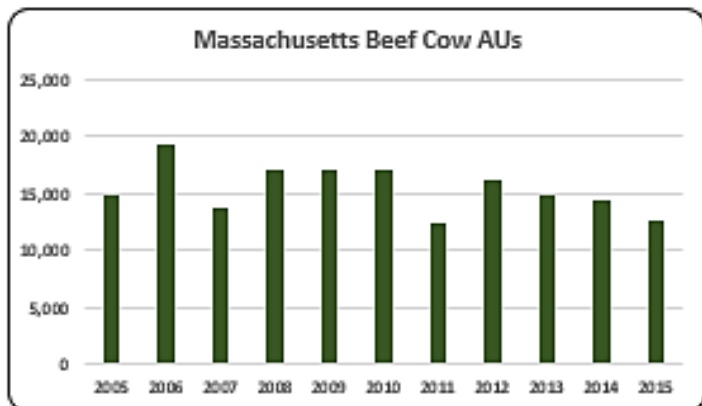
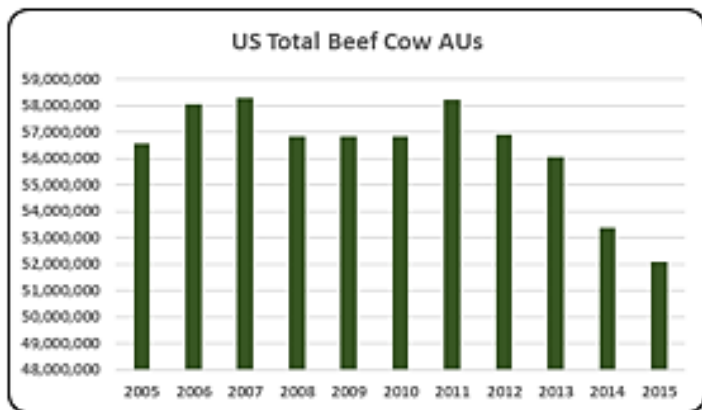
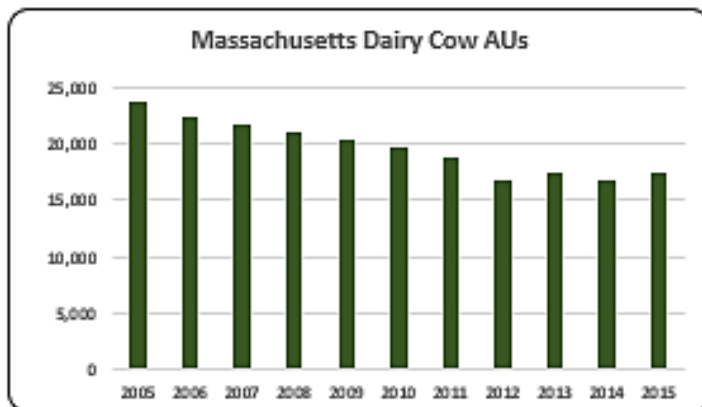
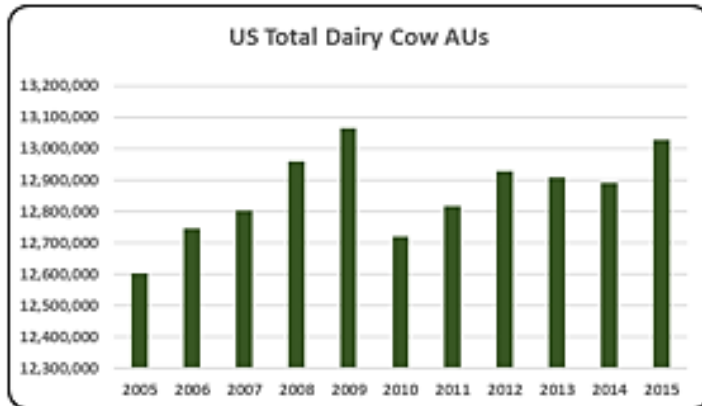


- In 2015 turkey AUs were the lowest of the decade at 3.5 million, decreasing 15% compared to 2008 (4.1 million turkey AUs) the largest turkey AUs of the decade. The most recent contributor to this decline has been avian influenza.

- Turkey represents less than 1% of the animal production in the state. Turkey numbers have been declining since the beginning of the decade from 905 turkey AUs in 2005 to 633 turkey AUs in 2015.

- 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 AUs in 2015 were at 3,045 AUs. Hog numbers have almost caught up to the 2013 AUs (3,495), the highest of the decade.



- 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.
- Almost 23% (17,500) of all AUs in Massachusetts in 2015 were dairy cows.
- 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 16.7% (12,645) of total AUs in Massachusetts were from beef. The average number of beef cow AUs was 15,370 during the decade.

Massachusetts Additional Information and Methodology

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

Massachusetts 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 Massachusetts'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 Massachusetts, \$1.38 to \$1.58 million in total economic activity, \$0.26 to \$0.34 in household wages and 5 to 10 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.392	\$ 0.255	5.4
	Hogs, Pigs, and Other	\$ 1.384	\$ 0.301	9.6
	Poultry and Eggs	\$ 1.501	\$ 0.306	6.1
	Dairy	\$ 1.577	\$ 0.338	7.5

Appendix

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Animal Units (AUs)	Beef Cattle AUs	14,850	19,200	13,800	16,950	16,950	16,950	12,450	16,065	14,790	14,415	12,645
	Hog and Pig AUs	3,135	2,130	1,995	2,415	1,530	2,730	2,580	2,295	3,495	1,935	3,045
	Broiler AUs	31,689	31,475	40,943	40,304	37,473	37,977	28,616	37,215	37,085	36,874	37,826
	Turkey AUs	905	935	936	876	818	784	751	719	681	667	633
	Egg Layer AUs	3,474	3,352	3,770	3,662	3,203	3,182	3,201	3,181	4,118	3,282	3,949
	Dairy AUs	23,800	22,400	21,700	21,000	20,300	19,600	18,900	16,800	17,500	16,800	17,500
	Total Animal Units	77,852	79,492	83,144	85,207	80,274	81,224	66,498	76,274	77,669	73,973	75,598
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 8,053	\$ 7,811	\$ 7,677	\$ 6,816	\$ 5,118	\$ 5,197	\$ 7,792	\$ 10,692	\$ 11,174	\$ 12,577	\$ 15,186
	Hogs and Pigs (\$1,000)	\$ 1,887	\$ 974	\$ 984	\$ 1,296	\$ 656	\$ 1,652	\$ 1,911	\$ 1,526	\$ 2,816	\$ 2,199	\$ 2,704
	Broilers (\$1,000)	\$ 26,629	\$ 20,629	\$ 31,597	\$ 32,281	\$ 27,852	\$ 29,106	\$ 25,482	\$ 37,081	\$ 45,183	\$ 47,400	\$ 41,352
	Turkeys (\$1,000)	\$ 2,333	\$ 2,393	\$ 2,891	\$ 3,137	\$ 3,244	\$ 3,539	\$ 3,816	\$ 4,088	\$ 4,293	\$ 4,809	\$ 5,089
	Eggs (\$1,000)	\$ 3,591	\$ 3,875	\$ 4,288	\$ 3,718	\$ 2,603	\$ 2,010	\$ 2,321	\$ 2,583	\$ 3,496	\$ 3,842	\$ 5,921
	Milk (\$1,000)	\$ 47,850	\$ 40,032	\$ 53,550	\$ 51,308	\$ 35,178	\$ 43,560	\$ 48,400	\$ 43,800	\$ 50,140	\$ 60,813	\$ 40,362
	Other	\$ 9,342	\$ 10,432	\$ 11,523	\$ 12,613	\$ 13,704	\$ 14,794	\$ 15,884	\$ 16,975	\$ 18,065	\$ 19,155	\$ 20,246
	Sheep and Lambs (\$1,000)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Aquaculture (\$1,000)	\$ 9,342	\$ 10,432	\$ 11,523	\$ 12,613	\$ 13,704	\$ 14,794	\$ 15,884	\$ 16,975	\$ 18,065	\$ 19,155	\$ 20,246
	Total (\$1,000)	\$ 99,685	\$ 86,147	\$ 112,510	\$ 111,169	\$ 88,354	\$ 99,857	\$ 105,606	\$ 116,745	\$ 135,167	\$ 150,796	\$ 130,860

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	472	337	751	620	
	Cattle feedlots (112112)	49	87	53	8	
	Dairy cattle and milk production (11212)	338	279	258	147	
	Hog and pig farming (1122)	118	72	82	135	
	Poultry and egg production (1123)	115	163	480	380	
	Sheep and goat farming (1124)	163	211	279	365	
	Animal aquaculture and other animal production (1125,1129)	627	1,312	1,776	1,887	
Value of Sales (\$1,000)	Cattle and Calves	6,844	9,612	12,444	9,503	
	Hogs and Pigs	2,638	withheld	2,108	2,898	
	Poultry and Eggs	16,054	12,107	13,207	11,748	
	Milk and Other Dairy Products	59,497	withheld	50,485	44,250	
	Aquaculture	n/a	9,481	18,548	23,251	
	Other (calculated)	13,563	76,044	28,546	6,046	
	Total	98,596	107,244	125,338	97,696	
Input Purchases	Livestock and poultry purchased	(Farms) 1,075	1,101	1,450	1,961	
		\$1,000	7,408	6,482	5,819	7,275
	Breeding livestock purchased	(Farms) n/a	373	556	637	
		\$1,000	n/a	2,703	1,776	2,006
	Other livestock and poultry purchased	(Farms) n/a	816	1,064	1,612	
		\$1,000	n/a	3,779	4,043	5,268
	Feed purchased	(Farms) 2,161	2,698	3,821	4,276	
	\$1,000	31,880	26,253	45,134	50,732	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2015 Animal Agriculture	Cattle and Calves	\$ 21,133	\$ 3,877	81	\$ 992
	Hogs, Pigs, and Other	\$ 32,337	\$ 7,019	223	\$ 1,795
	Poultry and Eggs	\$ 78,596	\$ 15,997	320	\$ 4,092
	Dairy	\$ 63,647	\$ 13,650	302	\$ 3,492
	Total	\$ 195,712	\$ 40,543	926	\$ 10,371
Change from 2005 to 2015	Cattle and Calves	\$ 7,533	\$ 1,382	29	\$ 353
	Hogs, Pigs, and Other	\$ 13,121	\$ 2,848	91	\$ 729
	Poultry and Eggs	\$ 19,296	\$ 3,927	79	\$ 1,005
	Dairy	\$ (27,925)	\$ (5,989)	(132)	\$ (1,532)
	Total	\$ 12,025	\$ 2,168	66	\$ 555
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.392	\$ 0.255	5.4	
	Hogs, Pigs, and Other	\$ 1.384	\$ 0.301	9.6	
	Poultry and Eggs	\$ 1.501	\$ 0.306	6.1	
	Dairy	\$ 1.577	\$ 0.338	7.5	
Tax Rates	Federal effective income tax rate			12.7%	
	Federal Social Security tax rate			7.7%	
	State Effective Rate			5.3%	
	Total			25.6%	

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.