Economic Analysis of Animal Agriculture 2005-2015

WEST VIRGINIA

A Report for

United Soybean Board

September 2016

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Contents

West Virginia Executive Summary

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

- $945.1 million in economic output
- 4,123 jobs
- $185.2 million in earnings
- $48.8 million in income taxes paid at local, state, and federal levels
- $21.0 million in the form of property taxes

Plus, from 2005-2015 animal agriculture in West Virginia has increased economic output by over $223.3 million, boosted household earnings by $41.9 million, contributed 933 additional jobs and paid $11.0 million in additional tax revenues.

West Virginia's animal agriculture consumed almost 152.3 thousand tons of soybean meal in 2015. This soybean meal was fed primarily to:

- Broilers (110.8 thousand tons)
- Turkeys (25.4 thousand tons)
- Egg-Laying Hens (7.4 thousand tons)

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

West Virginia Economic Impact of Animal Agriculture

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

- About $945.1 million in economic output
- $185.2 million in household earnings
- 4,123 jobs
- $48.8 million in income taxes

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

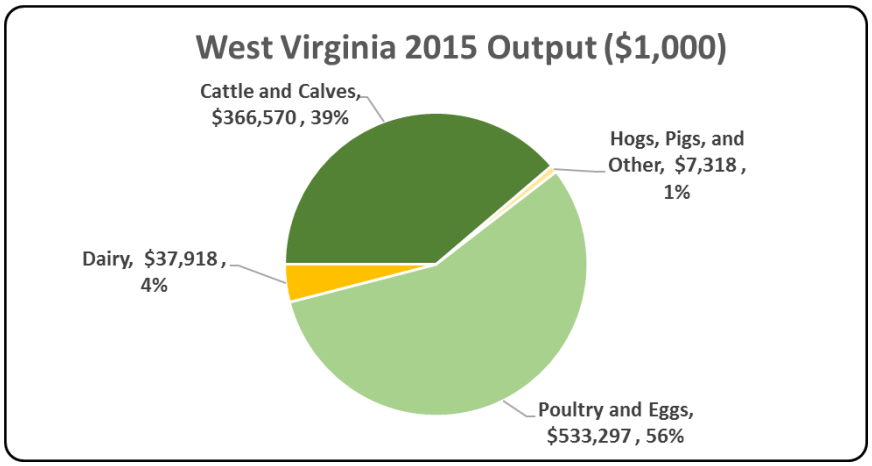
- Increased economic output by $223.3 million
- Boosted household earnings by $41.9 million
- Added 933 jobs
- Paid an additional $11.0 million in income taxes

Below is a table which demonstrates this decade of change.

Measure		2015		Change 2005-2015	% Change 2005-2015
Output ($1,000)	$	945,103	$	223,347	30.95%
Earnings ($1,000)	$	185,240	$	41,939	29.27%
Employment (Jobs)		4,123		933	29.25%
Income Taxes Paid ($1,000)	$	48,774	$	11,043	29.27%
Property Taxes Paid in 2012 ($1,000)	$	21,036			

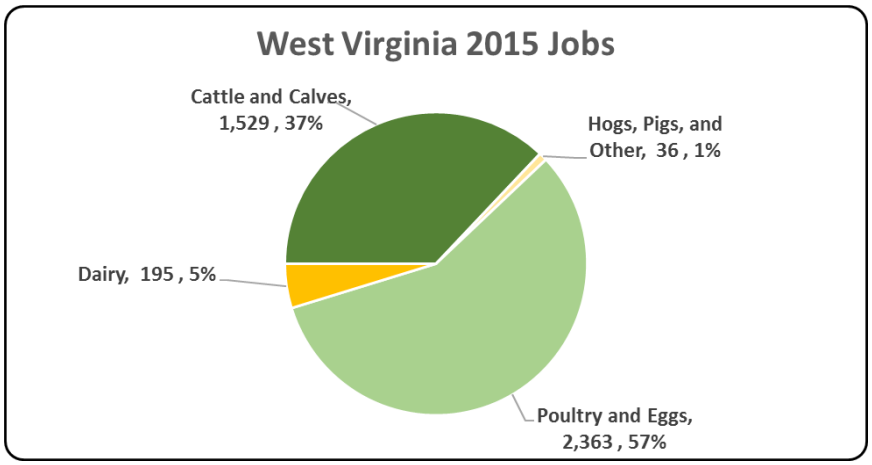
West Virginia Output

"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 West Virginia economy. Animal agriculture's impact on West Virginia total economic output is about $945.1 million.



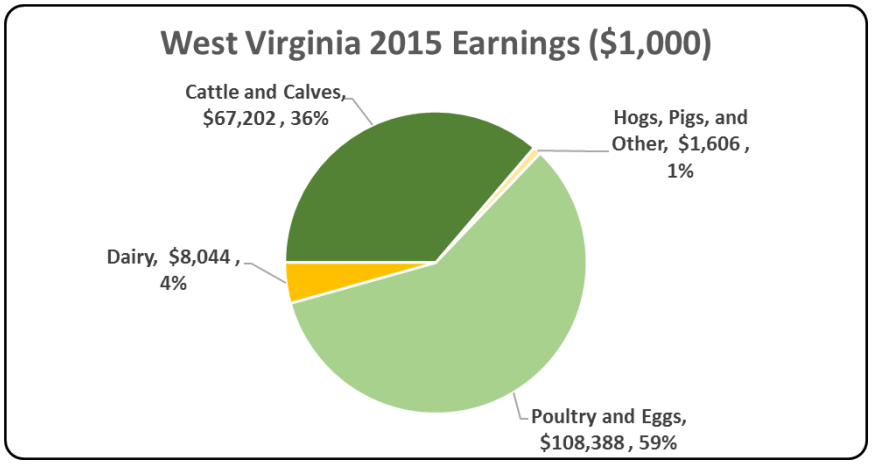
West Virginia Jobs

"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 West Virginia in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to West Virginia total jobs, contributing 4,123 jobs within and outside of animal agriculture.



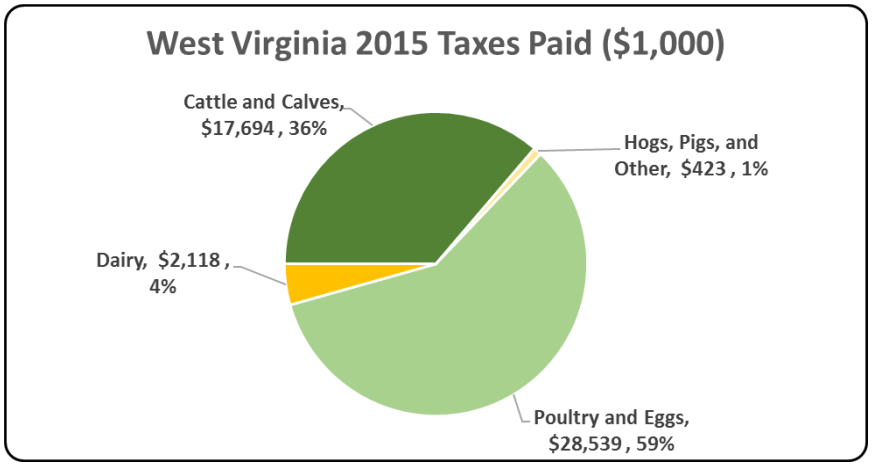
West Virginia Earnings

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 West Virginia economy in terms of earnings. West Virginia's animal agriculture contributed about $185.2 million to household earnings in 2015.



West Virginia Taxes Paid by Animal Agriculture

West Virginia's animal agriculture is also a source of tax revenue. In 2015, the state's animal agriculture industry paid about $48.8 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated $21.0 million in property taxes paid by all of West Virginia agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



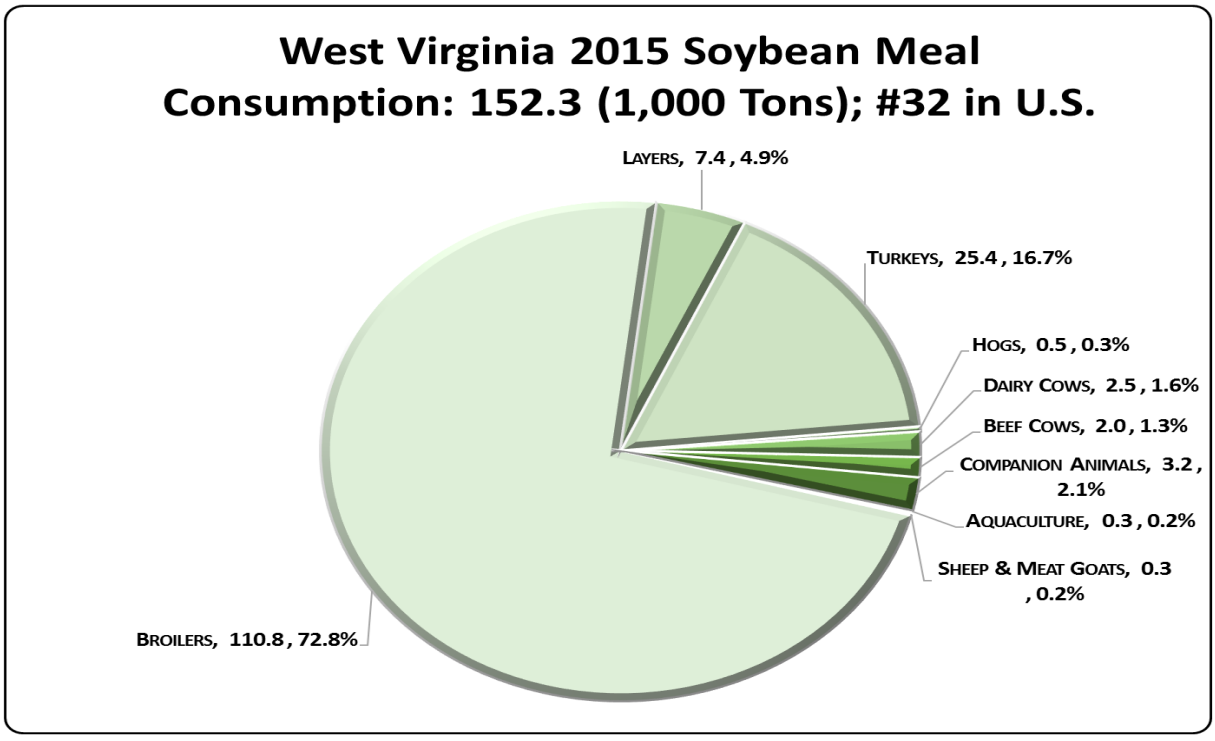
West Virginia Animal Agriculture Soybean Meal Consumption

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.

West Virginia's animal agriculture consumed almost 152.3 thousand tons of soybean meal in 2015, placing the state as #32 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:

- Broilers (110.8 thousand tons)
- Turkeys (25.4 thousand tons)
- Egg-Laying Hens (7.4 thousand tons)

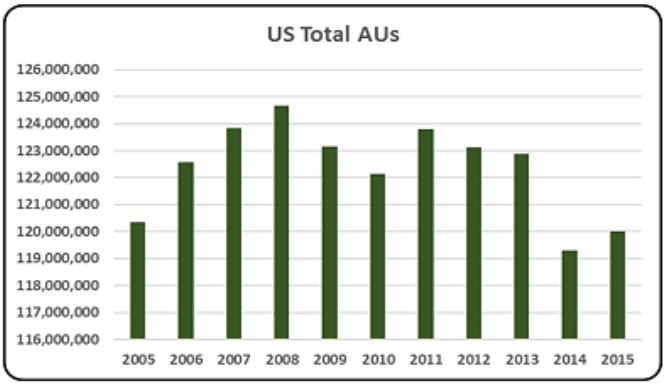


West Virginia Animal Unit (AU) Trends

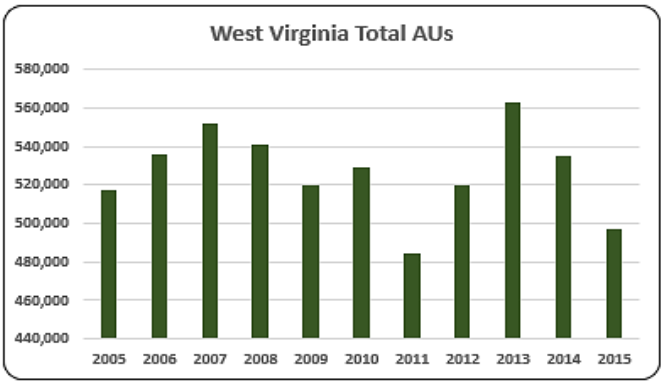
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of West Virginia. Due to this reality, using a single year as a measure of the presence and strength of a sector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

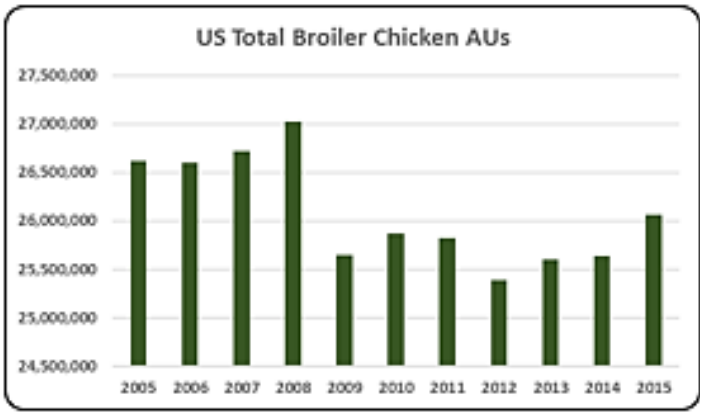
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In West Virginia, the largest three segments of animal agriculture in terms of AUs during 2015 were: Broilers (281,623 AUs), Beef Cows (151,125 AUs), and Turkeys (44,608 AUs). Total animal units in West Virginia during 2015 were 497,165 AUs.



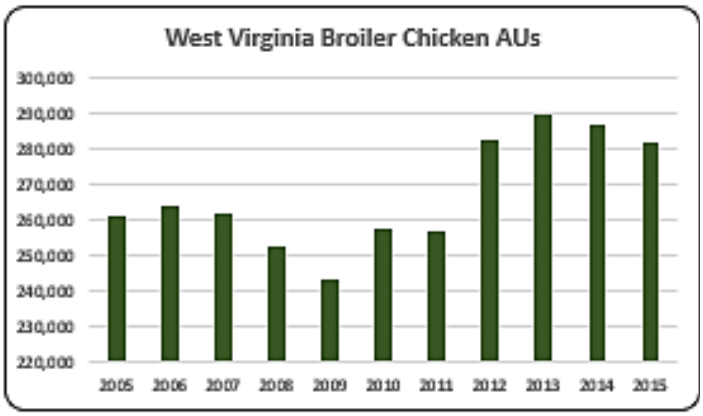
- Overall U.S. total AUs have varied from 2005 to 2015. In 2014 AUs were at an all-time low reflecting, in part, the impact of severe weather on cattle production in some parts of country. During the 2005-15 time period, total AUs in the nation peaked in 2008.



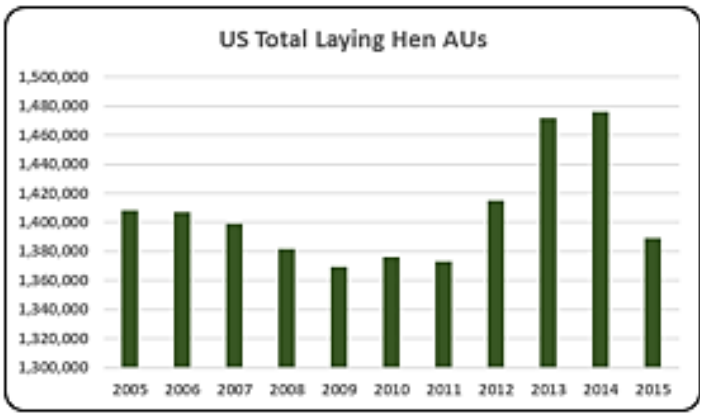
- There were 497,165 AUs in West Virginia in 2015 representing only 0.42% of the U.S. total.



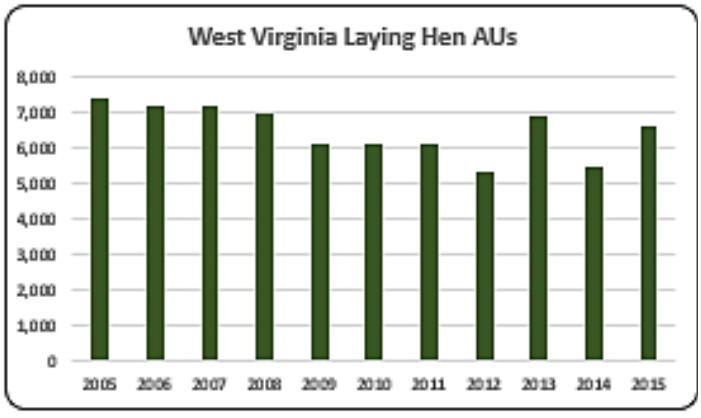
- U.S. broiler production is clustered in a number of states, with Georgia being the largest producer. On average from 2005 to 2015, broiler chicken AUs were about 26.0 million. In 2015, AUs rebounded 3% from the low AUs numbers in 2012 (25.4 million AUs).



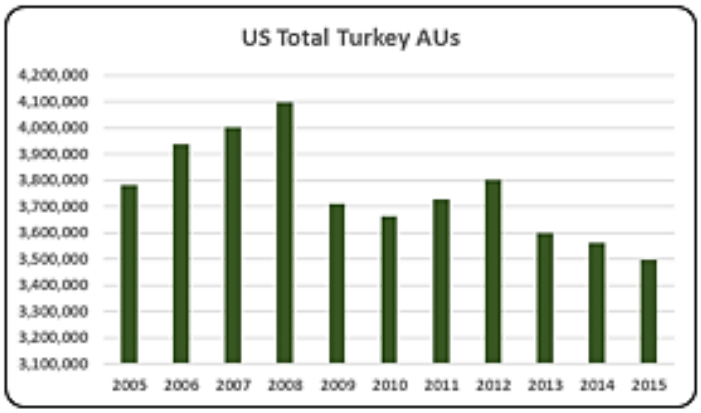
- On average, there were 266,991 broiler AUs from 2005 to 2015. Broiler production fell 2% in 2015 compared to the previous year.



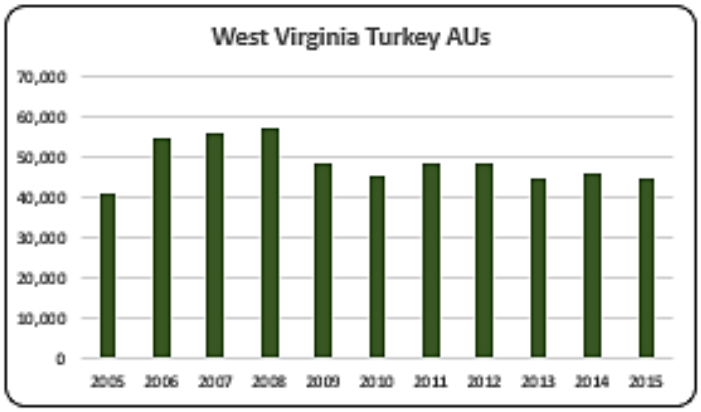
- On average, the layer AUs during 2005-2015 were 1.4 million. In 2015 layer AUs were 1.3 million, down 6% from the 2014 decade high (1.4 million AUs). This drastic decrease in 2015 was due to the losses in major egg laying states from the avian influenza outbreak.



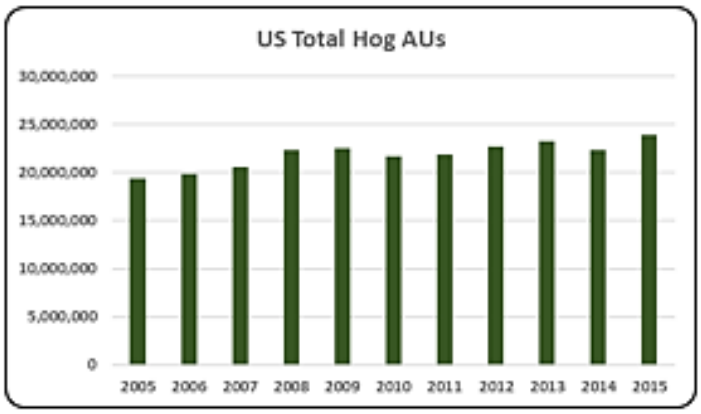
- Layer production declined 11% from 7,387 layer AUs in 2005 to 6,579 layer AUs in 2015.



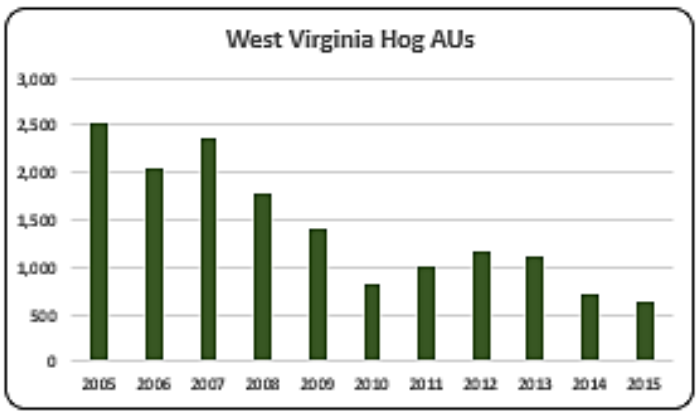
- In 2015 turkey AUs were the lowest of the decade at 3.5 million, decreasing 15% compared to 2008 (4.1 million turkey AUs) the largest turkey AUs of the decade. The most recent contributor to this decline has been avian influenza.



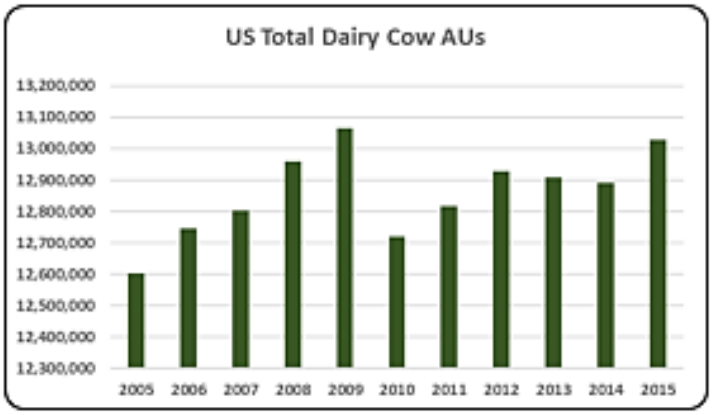
- Turkey production varied from a low in 2005 of 40,714 turkey AUs to high of 57,369 turkey AUs in 2008. There were 44,608 turkey AUs in 2015.



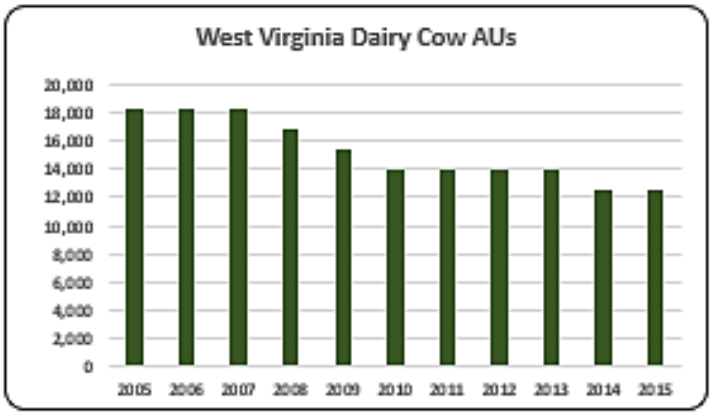
- On average from 2005 to 2015, hog AUs were about 21.8 million. Hog AUs in 2015 increased 24% to 23.9 million AUs compared to the decade low in 2005 (19.4 million AUs). Despite the fluctuation in AUs, the pork supply was relatively stable.



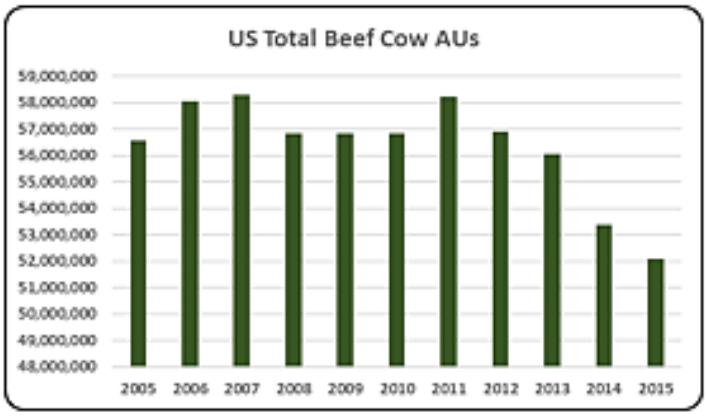
- Hog production declined 75% from the high level of hog production at the beginning of the decade (2,535 hog AUs) to the lowest level of production in 2015 (630 hog AUs).



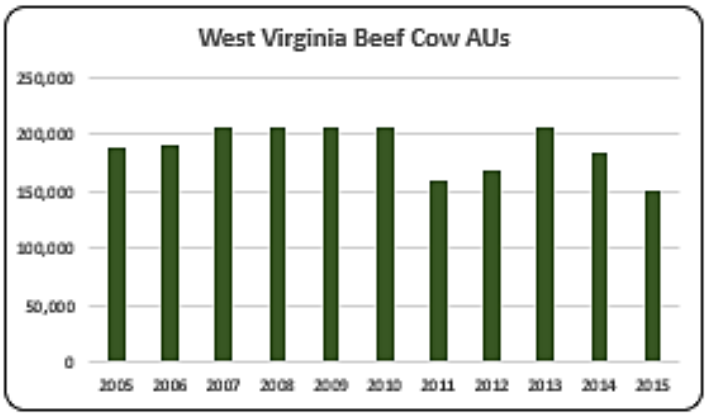
- From 2005 to 2015 dairy cow AUs averaged 12.8 million. In 2015, dairy cow AUs (13.0 million) finally reached near the 2009 high of 13.1 million AUs. Milk supplies have steadily risen.



- There were 12,600 dairy cow AUs in West Virginia in 2015. Dairy cow AUs in 2015 were 31% blow 2005 (18,200 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.



- 30.5% (151,125 beef cow AUs) of all animal production in West Virginia in 2015 was concentrated in beef cow production. Beef cow production decreased 27% in 2015 compared to 2013.

West Virginia Additional Information and Methodology

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

West Virginia 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 West Virginia'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 West Virginia, $1.34 to $1.67 million in total economic activity, $0.29 to $0.34 in household wages and 7 to 8 additional jobs are generated in the economy at large.

	Animal Type	Output($)	Earnings ($)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	$ 1.664	$ 0.305	6.9
	Hogs, Pigs, and Other	$ 1.342	$ 0.295	6.6
	Poultry and Eggs	$ 1.672	$ 0.340	7.4
	Dairy	$ 1.537	$ 0.326	7.9

Appendix

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Animal Units (AUs)	Beef Cattle AUs	187,350	189,750	206,700	205,350	205,350	205,350	158,850	168,330	206,385	183,750	151,125
	Hog and Pig AUs	2,535	2,055	2,370	1,785	1,410	825	1,020	1,170	1,125	705	630
	Broiler AUs	260,765	264,232	261,460	252,694	243,337	257,790	256,587	282,544	289,444	286,427	281,623
	Turkey AUs	40,714	54,298	55,867	57,369	48,356	45,349	48,202	48,206	44,897	46,185	44,608
	Egg Layer AUs	7,387	7,128	7,183	6,978	6,104	6,063	6,099	5,300	6,862	5,468	6,579
	Dairy AUs	18,200	18,200	18,200	16,800	15,400	14,000	14,000	14,000	14,000	12,600	12,600
	Total Animal Units	**516,951**	**535,663**	**551,781**	**540,977**	**519,956**	**529,377**	**484,758**	**519,550**	**562,713**	**535,135**	**497,165**
Value of Production ($1,000)	Cattle and Calves ($1,000)	$ 99,889	$ 103,729	$ 97,904	$ 103,023	$ 100,171	$ 106,340	$ 141,611	$ 170,343	$ 170,384	$ 219,366	$ 220,334
	Hogs and Pigs ($1,000)	$ 1,750	$ 1,679	$ 1,630	$ 1,193	$ 1,117	$ 699	$ 1,298	$ 1,497	$ 1,184	$ 961	$ 787
	Broilers ($1,000)	$ 163,305	$ 132,756	$ 160,020	$ 161,644	$ 151,176	$ 166,772	$ 156,794	$ 188,000	$ 233,816	$ 236,773	$ 191,582
	Turkeys ($1,000)	$ 30,868	$ 43,239	$ 49,746	$ 57,461	$ 44,202	$ 50,517	$ 60,595	$ 61,801	$ 50,797	$ 60,129	$ 73,427
	Eggs ($1,000)	$ 30,473	$ 32,210	$ 32,723	$ 30,275	$ 28,183	$ 38,911	$ 39,398	$ 40,760	$ 46,209	$ 55,887	$ 53,872
	Milk ($1,000)	$ 30,264	$ 26,800	$ 38,610	$ 34,028	$ 20,898	$ 26,533	$ 32,656	$ 29,260	$ 30,856	$ 34,160	$ 24,675
	Other	$ 2,968	$ 3,046	$ 3,449	$ 3,361	$ 3,227	$ 4,099	$ 3,969	$ 4,143	$ 4,318	$ 4,492	$ 4,667
	Sheep and Lambs ($1,000)	$ 1,823	$ 1,844	$ 2,189	$ 2,044	$ 1,852	$ 2,667	$ 2,480	$ 2,597	$ 2,714	$ 2,831	$ 2,948
	Aquaculture ($1,000)	$ 1,145	$ 1,202	$ 1,260	$ 1,317	$ 1,375	$ 1,432	$ 1,489	$ 1,547	$ 1,604	$ 1,661	$ 1,719
	Total ($1,000)	**$ 359,517**	**$ 343,460**	**$ 384,082**	**$ 390,986**	**$ 348,973**	**$ 393,871**	**$ 436,321**	**$ 495,804**	**$ 537,564**	**$ 611,768**	**$ 569,344**

Ag Census Data Category	Animal Type		1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)		10,276	9,878	10,481	9,430
	Cattle feedlots (112112)		467	379	297	153
	Dairy cattle and milk production (11212)		249	278	165	155
	Hog and pig farming (1122)		124	217	335	170
	Poultry and egg production (1123)		428	520	1,113	680
	Sheep and goat farming (1124)		364	631	968	693
	Animal aquaculture and other animal production (1125,1129)		1,036	2,328	2,635	1,848
Value of Sales ($1,000)	Cattle and Calves		117,505	117,967	164,962	217,411
	Hogs and Pigs		2,719	1,992	2,089	withheld
	Poultry and Eggs		226,607	250,922	301,708	401,439
	Milk and Other Dairy Products		35,534	32,202	31,386	32,654
	Aquaculture		n/a	2,712	3,478	withheld
	Other (calculated)		8,058	7,326	9,734	6,410
		Total	390,423	413,121	513,357	657,914
Input Purchases	Livestock and poultry purchased	(Farms)	5,481	5,911	5,845	6,198
		$1,000	63,068	63,817	96,910	128,271
	Breeding livestock purchased	(Farms)	*n/a*	3,255	2,800	3,343
		$1,000	*n/a*	8,075	8,821	22,374
	Other livestock and poultry purchased	(Farms)	*n/a*	3,393	3,814	3,820
		$1,000	*n/a*	55,742	88,089	105,897
	Feed purchased	(Farms)	10,508	14,291	14,027	15,066
		$1,000	154,556	130,696	177,847	327,286

	Animal Type	Output ($1,000)	Earnings ($1,000)	Employment (Jobs)	Taxes Paid ($1,000)
2015 Animal Agriculture	Cattle and Calves	$ 366,570	$ 67,202	1,529	$ 17,694
	Hogs, Pigs, and Other	$ 7,318	$ 1,606	36	$ 423
	Poultry and Eggs	$ 533,297	$ 108,388	2,363	$ 28,539
	Dairy	$ 37,918	$ 8,044	195	$ 2,118
	Total	$ 945,103	$ 185,240	4,123	$ 48,774
Change from 2005 to 2015	Cattle and Calves	$ 164,886	$ 30,228	688	$ 7,959
	Hogs, Pigs, and Other	$ (365)	$ (80)	(2)	$ (21)
	Poultry and Eggs	$ 77,348	$ 15,720	343	$ 4,139
	Dairy	$ (18,523)	$ (3,929)	(95)	$ (1,035)
	Total	$ 223,347	$ 41,939	933	$ 11,043

	Animal Type	Output($)	Earnings ($)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	$ 1.664	$ 0.305	6.9
	Hogs, Pigs, and Other	$ 1.342	$ 0.295	6.6
	Poultry and Eggs	$ 1.672	$ 0.340	7.4
	Dairy	$ 1.537	$ 0.326	7.9

Tax Rates	Federal effective income tax rate	12.7%
	Federal Social Security tax rate	7.7%
	State Effective Rate	6.0%
	Total	26.3%

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.