

Economic Contributions of Alabama Agriculture and Forestry

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Table 1, Acronyms

<u>Acronym</u>	<u>Description</u>
USDA	United States Department of Agriculture
USDA/NASS	United States Department of Agriculture, National Agricultural Statistics Service
USDA/ERS	United States Department of Agriculture, Economic Research Service
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
GDP	Gross Domestic Product

Executive Summary

The State of Alabama has abundant natural resources and forests in addition to a diverse agricultural industry, which is strong in poultry, cattle, peanuts and catfish production. This study on the Economic Contributions of Alabama Agriculture and Forestry quantifies agriculture, forestry and related industries and their importance to the State of Alabama.

This study is based on a combination of datasets from the IMPLAN modeling system, the 2012 Census of Agriculture, and other USDA/NASS datasets. This study looks at the economic activity derived by Alabama's economy from many industries related to production agriculture, forestry, processing, and support activities. All 99 industries included in this analysis are outlined in Appendix A. When comparing to the 2013 study completed for Alabama¹, there are some differences in how agriculture is defined. Specifically, the Food and Kindred Products Distribution group of industries were not included in this study. Full details are in the methodology section.

The results of this study show that the removal or diminishment of agriculture production, forestry, and related industries would have a negative impact on a wide variety of industries across Alabama. Given Alabama's plentiful natural resources and importance of forestry and agriculture to its economy, it is reasonable to assume that Alabama will continue to rely on these industries for the foreseeable future.

Key Findings

In 2016, agriculture, forestry and related economic activity in Alabama contributed:

- **\$54.9 billion** in sales². Furthermore, for every million dollars in sales by Alabama agriculture and forestry, an additional **\$320,000** is generated.
 - **\$17.9 billion** in added value beyond the cost of inputs (\$37.0 billion)
- **233,793 jobs**. Furthermore, for every million dollars in sales by Alabama agriculture and forestry, an additional **4.3 jobs** are generated.
- **\$4.3 billion** in state and local taxes
- **\$5.2 billion** in federal taxes

Of the **\$54.9 billion in sales** from agriculture, forestry and related economic activity:

- Crops, Livestock, Forestry and Fisheries Production contributed **\$9.8 billion**
- Agriculture Inputs and Services contributed **\$8.6 billion**
- Food and Kindred Products Manufacturing contributed **\$19.5 billion**
- Forestry Products Manufacturing contributed: **\$17.0 billion**

Total direct employment from the agriculture, forestry and related industries that were included in both the 2013 and 2016 studies increased **2.4% from 149,126 to 152,696**.³

In addition to analyzing agriculture, forestry and related economic activity at the state level, county level and congressional district results are also available in separate reports. These can be found at <http://www.decision-innovation.com/economic-impact/alabama-agriculture-forestry/>.

¹ <http://www.aces.edu/pubs/docs/A/ANR-1456/ANR-1456.pdf>

² **Sales**: The broadest measure of economic activity – sometimes referred to as “output”; **Employment (Jobs)**: A measure of job positions without regard to whether they are full-time equivalents; **Value-Added**: Sales (output) minus the cost of inputs

³ Further explanation of direct jobs versus total jobs can be found on pages 28-29 in Appendix B, Differing Methodology Implications.

Background

The State of Alabama has abundant natural resources and forests in addition to a diverse agricultural industry, which is strong in poultry, cattle, peanuts and catfish production. This study on the Economic Contributions of Alabama Agriculture and Forestry quantifies agriculture, forestry and related industries and their importance to the State of Alabama.

This study relies heavily on data from the IMPLAN modeling system, the United States Department of Agriculture (USDA) 2012 Census of Agriculture, and other USDA/National Agricultural Statistics Service datasets. This 2016 Economic Contributions of Alabama Agriculture and Forestry is patterned in principle after similar Decision Innovation Solutions (DIS) studies for Iowa in 2009 and 2014, as well as for South Dakota in 2014 and Illinois in 2015. The following subsections provide important context for agriculture and forestry in the State of Alabama.

Alabama Agriculture

According to the 2012 Census of Agriculture, Alabama is ranked in the top ten states for:

- Broilers and other meat-type chickens inventory (#2)
- Quail inventory (#2)
- Poultry and eggs sales (#4)
- Aquaculture (including catfish) sales (#4)
- Cotton acres, all (#7)
- Pullets for laying flock replacement inventory (#9)

Additionally, other important agriculture production in Alabama includes:

- Layers inventory (#12)
- Cattle and Calves inventory (#26)
- Grains, oilseeds, dry beans, dry peas (#33)

Alabama Farm Demographics

According to the 2012 USDA Census of Agriculture, the number of farms in Alabama is currently 43,223. The average Alabama farm size is 206 acres, which is up from 191 acres in 1997, but well below the U.S. average of 434 acres. The 2012 average market value of all machinery and equipment per farm is \$71,211, which is more than double the value of \$34,420 in 1997. Additionally, the average market value of land and buildings per farm is \$547,524, which has increased steadily since 1997.

Table 2, Alabama Farm Demographics

	<u>1997</u>	<u>2002</u>	<u>2007</u>	<u>2012</u>
Number of Farms	49,872	45,126	48,753	43,223
Average Size of Farms (acres)	191	197	185	206
Estimated market value of all machinery and equipment, average per farm	\$34,420	\$42,705	\$60,810	\$71,211
Estimated market value of land and buildings, average per farm	\$282,304	\$335,217	\$424,674	\$547,524
Average age of principal operator	54	56	57	59

The average age of Alabama farmers has increased from 54 years in 1997 to 59 years in 2012. Figure 1 shows that a large share of farmers in Alabama are 70 years and over, which indicates that the aging farmer population will be an issue moving forward. Interestingly however, is the number of farmers 45-54 years of age are not far fewer in number than the 70 and over age category. A large number of farmers in the 45-54 category suggests that they have substantial production experience and are poised to help Alabama agriculture navigate an increasingly complex world.

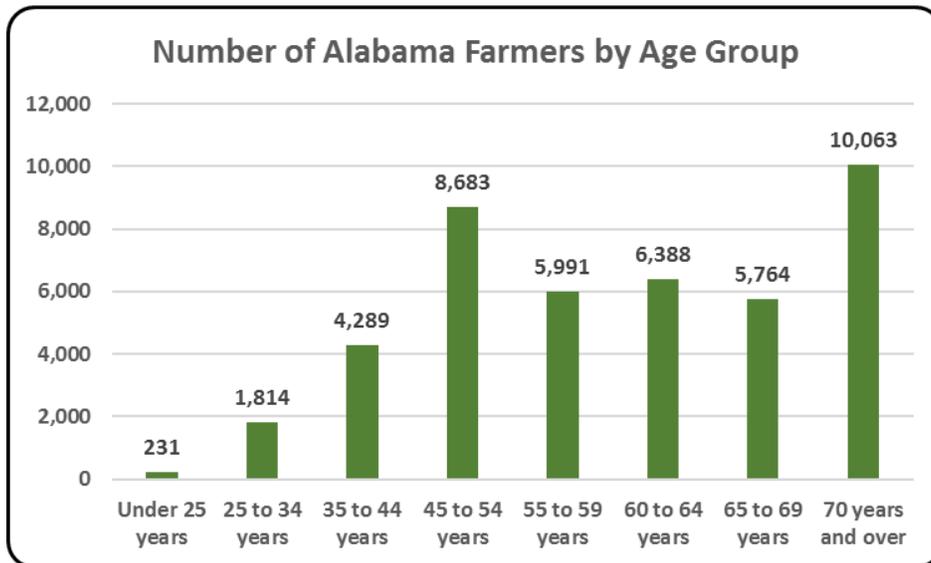


Figure 1, Number of Alabama Farmers by Age Group

Figure 2 shows the breakdown of Alabama farms by size. As shown, the most common size of farm ranges from 50 to 179 acres, and only 1,490 farms (of the 43,223 total farms) are 1,000 acres or more in size.

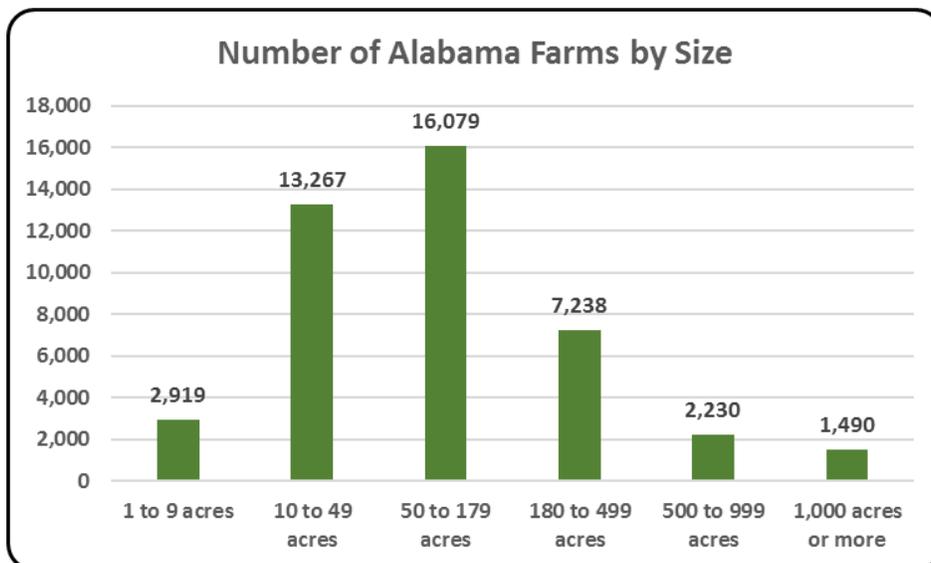


Figure 2, Number of Alabama Farms by Size

The majority of the 43,223 farms in the State of Alabama are owned by families or individuals (39,417 farms), and only 139 are owned by non-family corporations (see Figure 3).

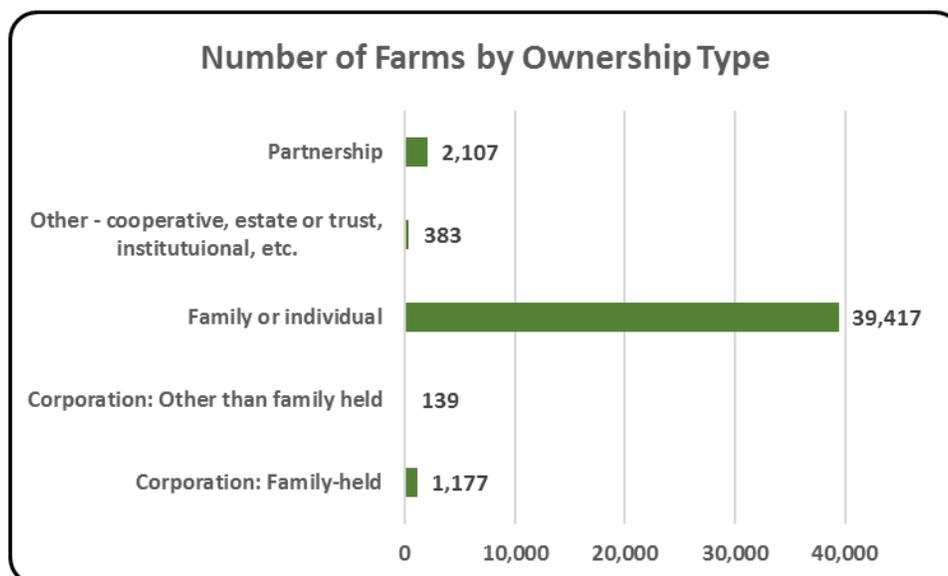


Figure 3, Number of Farms by Ownership Type

Total farm sales by source are shown below in Table 3. Livestock, poultry and their products account for the majority (79.4%) of total farm sales in Alabama. Of livestock, poultry and their products sales, the majority comes from the poultry and eggs category.

Table 3, Alabama Farm Sales by Source

	<u>1997</u>	<u>2002</u>	<u>2007</u>	<u>2012</u>
Total Sales (\$1,000)	3,198,630	3,264,949	4,415,550	5,571,173
Crops, including nursery and greenhouse (\$1,000)	656,185	590,268	676,987	1,314,971
Cotton and cottonseed (\$1,000)	181,285	125,232	104,632	254,506
Cut Christmas trees and short-rotation woody crops (\$1,000)		1,200	1,036	
Fruits, tree nuts, and berries (\$1,000)	8,273	20,543	27,610	23,872
Grains, oilseeds, dry beans, and dry peas (\$1,000)		62,949	120,656	435,465
Nursery, greenhouse, floriculture, and sod (\$1,000)		251,463	264,807	242,589
Other crops and hay (\$1,000)		87,535	124,344	307,345
Tobacco (\$1,000)	831	698		
Vegetables, melons, potatoes, and sweet potatoes (\$1,000)		40,649	33,902	50,332
Livestock, Poultry and their products (\$1,000)	2,542,444	2,674,681	3,738,563	4,256,202
Aquaculture (\$1,000)		80,976	99,504	117,920
Cattle and Calves (\$1,000)	292,784	348,253	408,276	429,349
Hogs and Pigs (\$1,000)	34,480	39,441	54,618	33,424
Horses, ponies, mules, burros, and donkeys (\$1,000)		13,851	13,434	13,402
Milk and Other Dairy Products from cows (\$1,000)	52,573	46,129	38,270	28,113
Other Animals and their products (\$1,000)		7,198	8,140	3,467
Poultry and Eggs (\$1,000)	2,093,768	2,137,299	3,113,194	3,624,852
Sheep, goats, and their products (\$1,000)		1,534	3,128	5,675

According to USDA/NASS⁴, the State of Alabama is home to the following livestock and poultry:

Table 4, Alabama Livestock, Poultry and Catfish

Cattle, Including Calves - Inventory	1,250,000		Hogs - Inventory	100,000
Cattle, Cows, Milk - Inventory	7,000		Chickens, Layers – Inventory	9,267,000
Cattle, Cows, Beef - Inventory	673,000		Chickens, Broilers – 2015 Production (# of birds)	1,082,900,000
Goats, Milk - Inventory	3,800		Catfish (acreage)	17,768
Goats, Meat & Other - Inventory	47,000			

According to the 2012 USDA Census of Agriculture, there were over 2.3 million acres dedicated to harvested cropland and specialty crops.

Table 5, Alabama Cropland Acres

	Alabama Cropland Acres
Forage	807,058
Cotton, all	376,464
Soybeans	334,831
Corn for grain	285,328
Peanuts	217,940
Wheat	189,390
Fruits & Nuts	55,696
Land in orchards	19,675
Vegetables harvested for sale	16,522
Oats for grain	15,069
Corn for silage or greenchop	8,371
Sorghum	7,044
Barley	653
Sunflower seed	604
Total harvested cropland & specialty crops	2,334,645

Forestry

According to the 2012 USDA Forest Resources of the United States report⁵, forest land is estimated to make up about 70 percent (nearly 22.9 million acres) of Alabama's land area, which is the sixth highest state for forest acres behind Texas, California, Oregon, Montana, and Georgia. About 93% of the estimated forest land in Alabama is privately held, while the other 7% is publicly held. Alabama saw a slight increase in forest land, increasing from an estimated 22.7 million acres in 2007 to 22.9 million acres in 2012.

Table 6, Alabama Forestry Acres

	Land Area (thousand acres)
Total Land Area	32,413
Total Forest Land	22,877
Total Timberland	22,800
Timberland - Planted	6,966
Timberland – Natural origin	15,835
Forest Land – Reserved	71
Forest Land – Other	6
Other Land	9,536

⁴ http://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=ALABAMA

⁵ http://www.srs.fs.usda.gov/pubs/gtr/gtr_wo091.pdf

Methodology

The 2016 Alabama Agriculture and Forestry Economic Contribution Study was completed with a combination of the 2014 Alabama IMPLAN dataset, data from the USDA 2012 Census of Agriculture, and other USDA/NASS sources. The IMPLAN modeling system and Microsoft Excel were used for calculating and tabulating the results of this analysis. While the 2014 IMPLAN dataset was used to calculate the economic contribution results, they have been adjusted forward to 2016 dollars using inflation factors within the IMPLAN modeling system. Results shown throughout this report are presented using these common economic modeling terms:

- **Sales (Output)**
 - The broadest measure of economic activity – sometimes referred to as “output”
- **Employment (Jobs)**
 - A measure of job positions without regard to whether they are full-time equivalents
- **Value-Added**
 - Sales (output) minus the cost of inputs

Defining Agriculture and Forestry

When completing an economic contribution study, there are generally questions as to how far up and down the value chain should be included for a particular industry. Outlined below is the process used in this study for defining agriculture, and the same guidelines have been applied to the forestry industry.

There is usually considerable discussion regarding the blurred lines between production agriculture, processing, and retail, and how agriculture should be defined. Agriculture can be defined as: 1) including only farm-level production, 2) including farm-level production, input manufacturing, and food processing, or 3) from the “farm to fork” perspective, which would also include distribution and retail.

While there is room for discussion as to what rightly should and should not be included as part of the agriculture sector, there are few arguments that its inclusion should be limited to strictly the production of crops and livestock. This is because in its most basic form, the crop and livestock processing, slaughtering, meat, and rendering industries depend nearly completely upon economic activities that produce primary agricultural commodities (crops, livestock, etc.), which takes place at the farm level.

To move beyond the production and processing of agricultural products (i.e., to include grocery stores) opens an analysis up to criticism related to whether the inclusion of additional layers of the value chain inflate the numbers associated with the agriculture industry. For example, if one were to include grocery stores as a component of agriculture, what would be the appropriate method to separate agricultural products from other products within a typical grocery store? The fact that grocery stores also sell household goods, often house banks, and offer personal services add to the precarious nature of including them as part of agriculture.

To strike middle (and defensible) ground between including more than just farm level production and seeking to attribute excess economic activity to the animal agriculture industry, this analysis includes production agriculture plus the first round of value added to the process. For example, in addition to the

production of livestock and poultry, we have also included the industries that process them (i.e., production, processing, slaughtering, and rendering). As mentioned above, we have followed this same pattern of analyzing other agricultural industries (e.g., crops), forestry production and further processing (sawmills, etc.).

Using the above rationale as a guide, the IMPLAN models were created and analyzed using the recommended methodology for a Multi-Industry Contribution Analysis⁶. The IMPLAN modeling system uses more than 20,000 industries and classifies them according to the North American Industry Classification System (NAICS) and groups them into 536 industries. The 99 IMPLAN sectors identified for this analysis to represent agriculture, forestry, and related economic activities are shown in Appendix A. While not all results for all study areas are included in this report, this project produced results for 75 study areas: 67 counties, 7 congressional districts, and the State of Alabama. Additional resources related to the overall project can be found at <http://www.decision-innovation.com/economic-impact/alabama-agriculture-forestry/>.

State Level Results

After identifying the 99 IMPLAN sectors to be studied, they were then aggregated into four main categories to provide an overview of the economic contribution of these industries.

- Crops, Livestock, Forestry, and Fishery Production
- Agriculture Inputs and Services (used to support production)
- Food and Related Products Manufacturing
- Forestry Products Manufacturing

The state level results for these four aggregated categories are presented below. County and congressional level results are available in separate reports and can be found at <http://www.decision-innovation.com/economic-impact/alabama-agriculture-forestry/>.

⁶ http://www.implan.com/index.php?option=com_content&view=article&id=366&Itemid=1797

State Sales

“Total sales” refers to the total value of all of the sales (also known as production or output) of a study area and/or industry(ies) within a study area. This is a total number that does not make deductions for the cost or origination of inputs that were used in the production process. Figure 4 illustrates the contribution of agriculture, forestry and related industries to Alabama’s economy. This figure shows the contribution in both actual amounts and the percent share of total agriculture, forestry and related industries. As shown, Alabama’s agriculture, forestry and related economic activities contribute significantly to the state economy at about \$54.9 billion in total sales. Of this amount 35.5% comes from food and related products manufacturing, 31.0% from forestry products manufacturing, 17.8% from crops, livestock, forestry and fisheries production, and 15.7% from agricultural inputs and services.

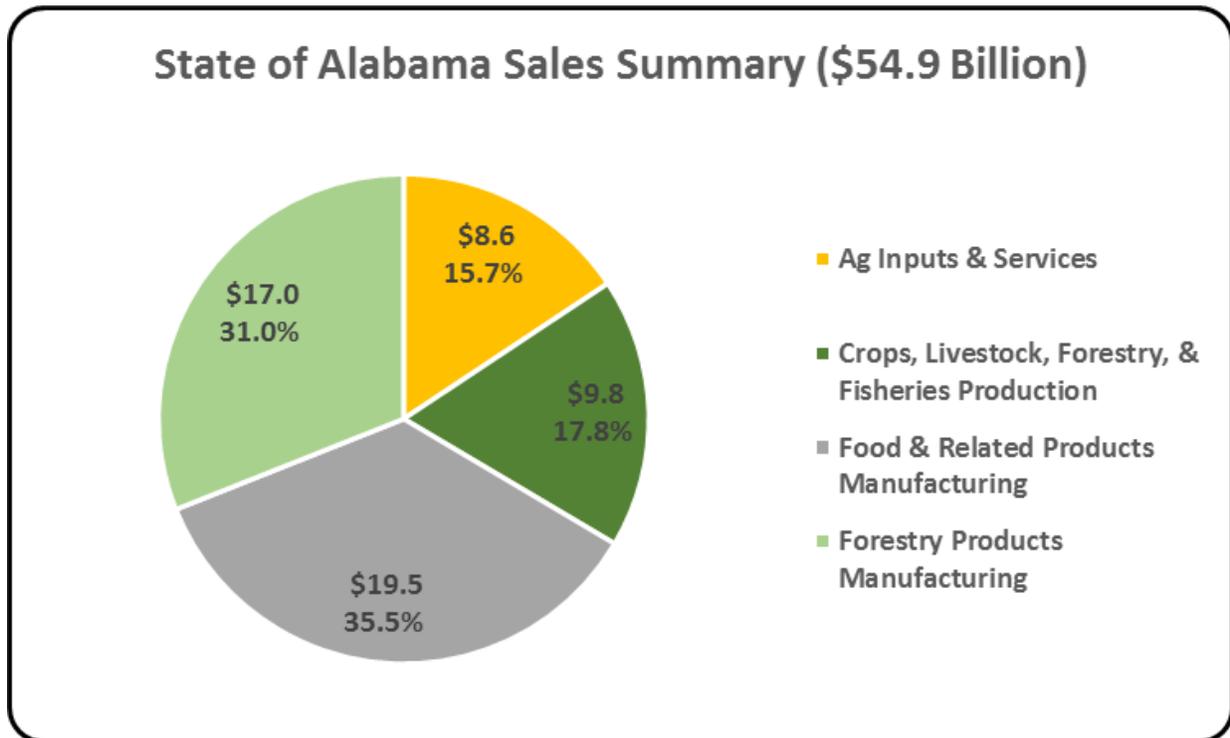


Figure 4, State of Alabama Sales Summary (\$B)

While agriculture, forestry, and related industries play an important role all across Alabama, certain counties rely more heavily on these industries. As shown below in Figure 5, Mobile County has the greatest amount of sales derived from these industries at nearly \$5.6 billion. Other top counties include Jefferson, Morgan, and Marshall at \$3.8 billion, \$3.2 billion, and \$2.9 billion, respectively. Detailed county and congressional district statistics are presented in separate reports, which can be found by clicking [here](#).

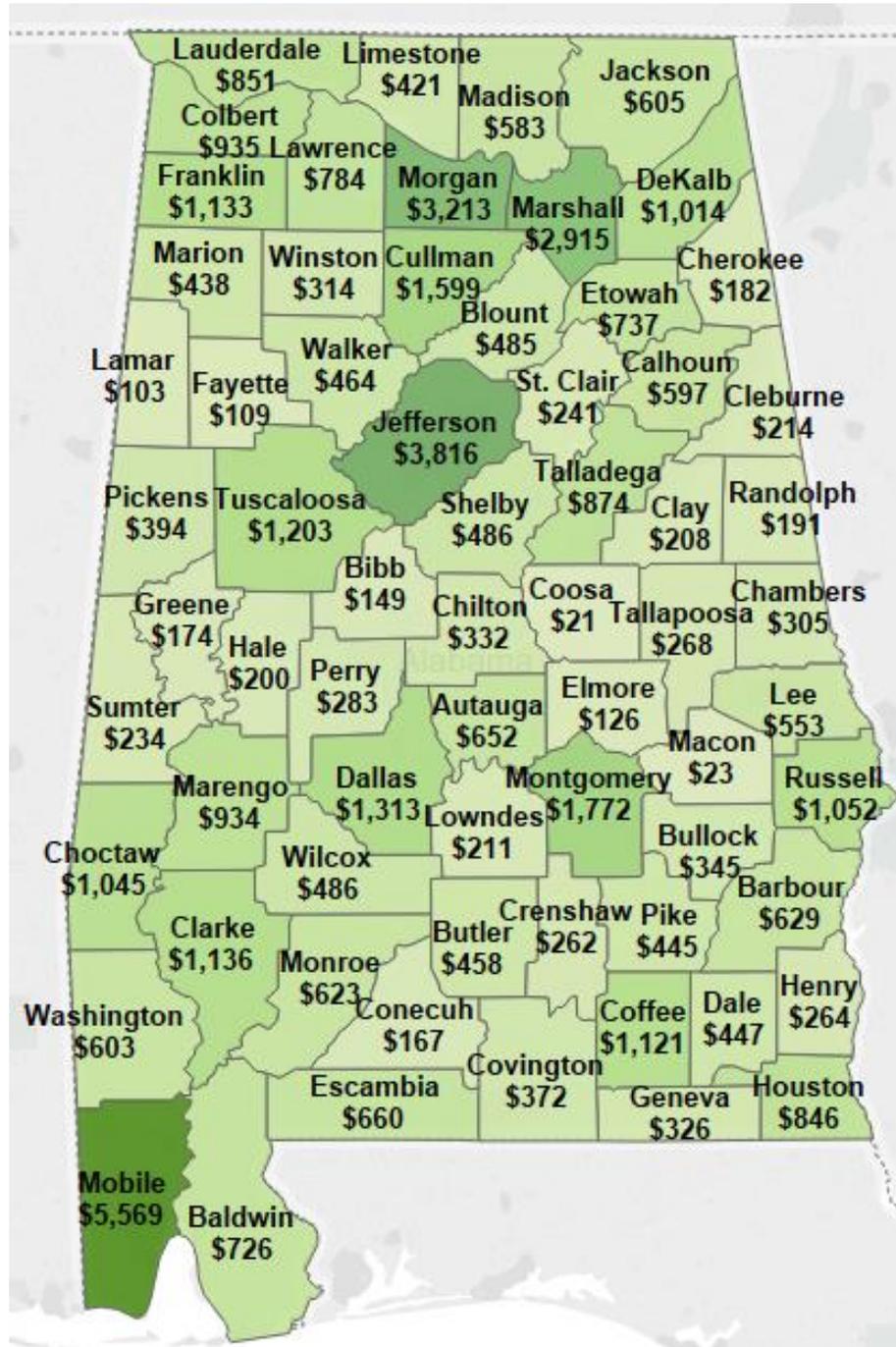


Figure 5, Agriculture, Forestry and Related Industries - Total Sales by County (\$M)

State Jobs

“Jobs” represents an estimate of the number of positions (jobs) currently filled in an area and/or industry. The estimates provided here originate with the IMPLAN input-output model database. “Jobs” includes positions whether they are full or part time, so care must be used in making comparisons. “Jobs” does not count positions that are unfilled. All of the jobs in an area are generally referred to as “Total jobs.” Where “Jobs” are preceded by an industry name (such as “Agriculture Inputs and Services”) the number is an estimate of the number of jobs filled within that industry in the area specified.

As shown in Figure 6, Alabama’s agriculture, forestry and related economic activity contribute significantly to Alabama’s total jobs with about 233,793 jobs. Of this, 31.1% comes from crops, livestock, forestry and fisheries production, 26.4% from food and related products manufacturing, 23.3% from forestry products manufacturing, and 19.2% from agriculture inputs and services.

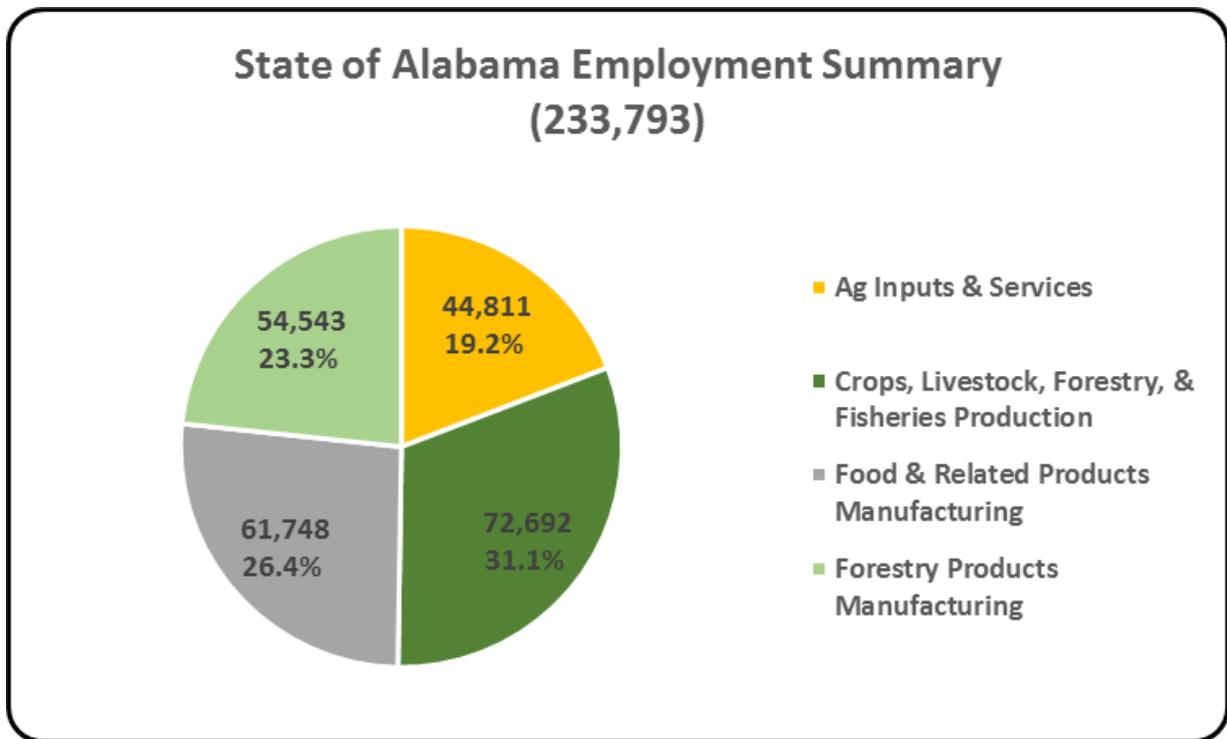


Figure 6, State of Alabama Employment Summary

⁷ Jobs do not refer to the number of people working or to full-time-equivalent employment. Jobs can be full or part time. A single individual can hold multiple jobs. In short, jobs cannot be looked upon as interchangeable or comparable across industries, businesses, or locations.

Agriculture, forestry, and related industries provide jobs all across Alabama. The number of agriculture and forest jobs are closely tied to agriculture and forestry sales in a county. As shown below in Figure 7, Mobile County has the largest number of jobs from these industries at 16,814 with Jefferson County and Marshall County having 15,183 and 11,299 jobs, respectively. Detailed county and congressional district statistics are presented in separate reports, which can be found at <http://www.decision-innovation.com/economic-impact/alabama-agriculture-forestry/>.

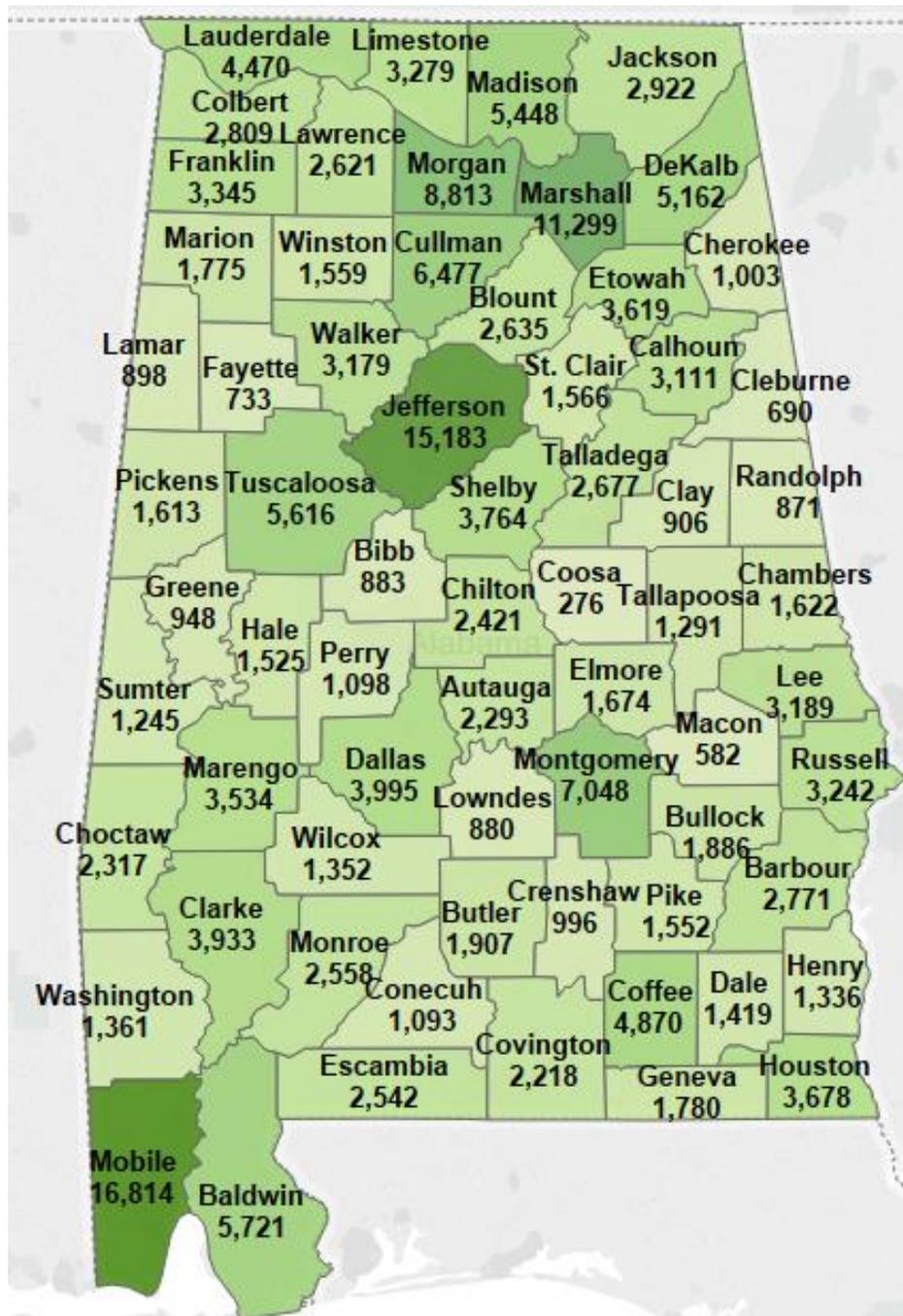


Figure 7, Agriculture, Forestry and Related Industries – Total Jobs by County

State Value-Added

“Total value-added” refers to that portion of the value of total sales that was actually created by the economic activity in an area and/or industry. Total value-added for an industry represents the value of the industry’s total sales minus the value of any inputs used in the production process from other industries. Key components of value-added are employee compensation (hired labor) and proprietor’s income (self-employed), which is collectively called “labor income”.

Agriculture, forestry and related economic activity make a significant contribution to the economy in Alabama with about \$17.9 billion in value-added. Of this amount, 31.7% comes from forestry products manufacturing, 28.5% comes from crops, livestock, forestry and fisheries production, 24.3% from food and related products manufacturing, and 15.4% from agriculture inputs and services.

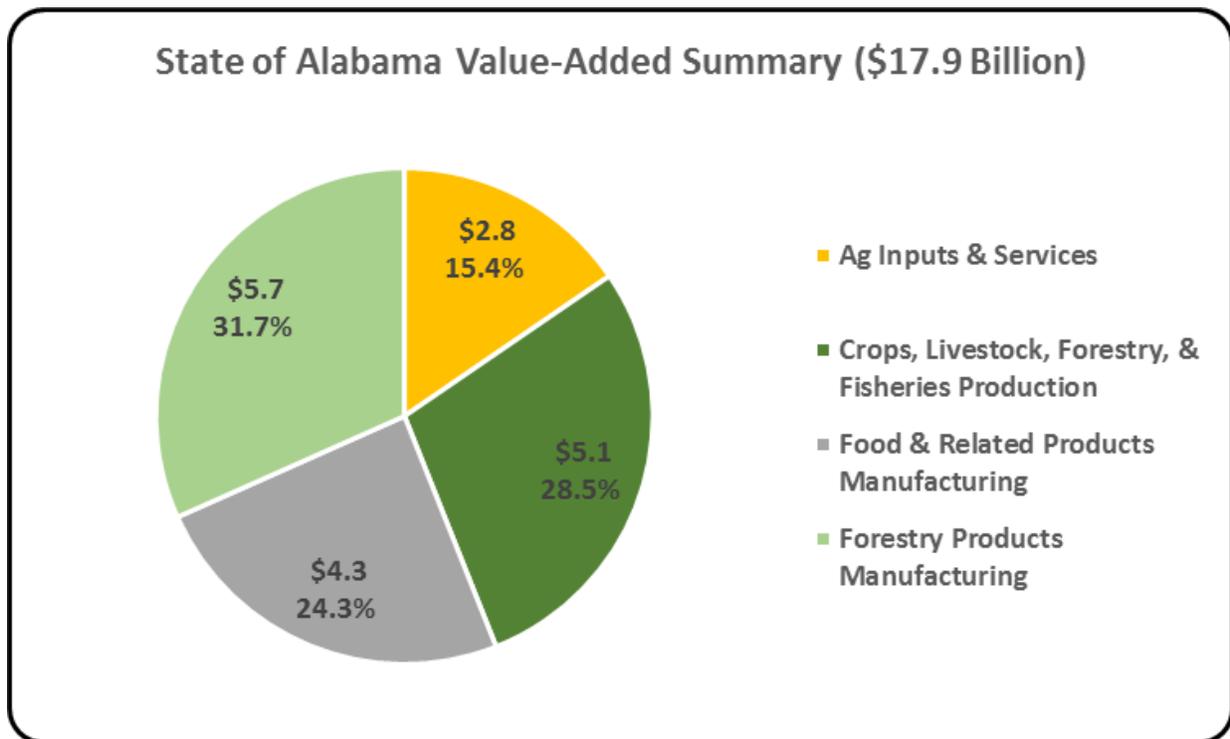


Figure 8, State of Alabama Value-Added Summary (\$B)

Value-added from agriculture, forestry and related industries is shown by county in Figure 5 below. Mobile County has the greatest amount of value-added derived from these industries at nearly \$1.6 billion. Jefferson County adds \$1.2 billion in value to its economy. Detailed county and congressional district statistics are presented in separate reports, which can be found at <http://www.decision-innovation.com/economic-impact/alabama-agriculture-forestry/>.

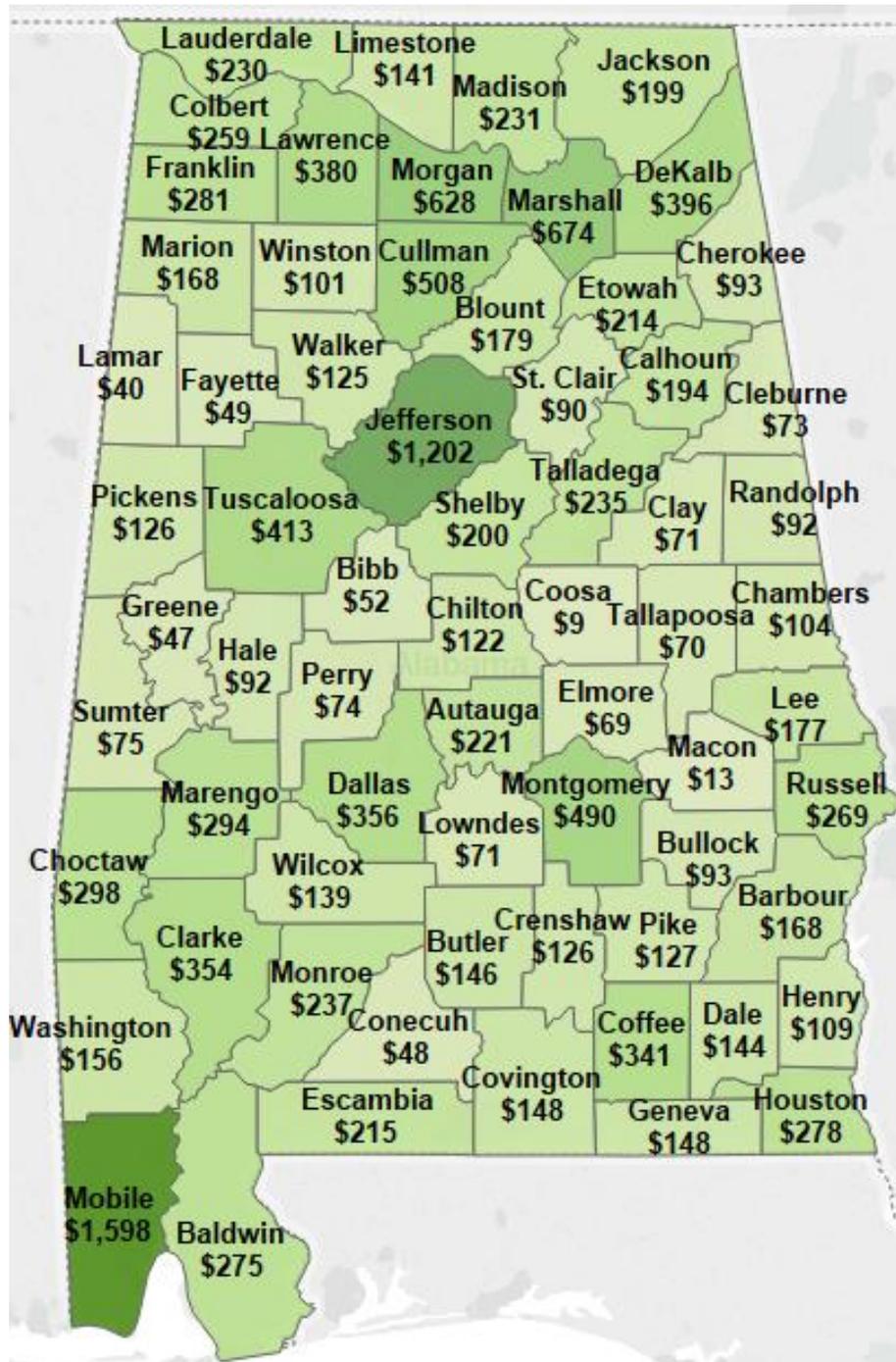


Figure 9, Agriculture, Forestry and Related Industries – Total Value-Added by County (\$M)

Tax Summary

Alabama’s agriculture, forestry and related economic activities are also a significant source of tax revenue, contributing \$9.5 billion in taxes at all taxing levels. About \$4.3 billion of that figure goes to the state and local level, as well as about \$5.2 billion at the federal level. Estimates of taxes paid by Alabama agriculture, forestry, and related industries are shown in Figure 10.

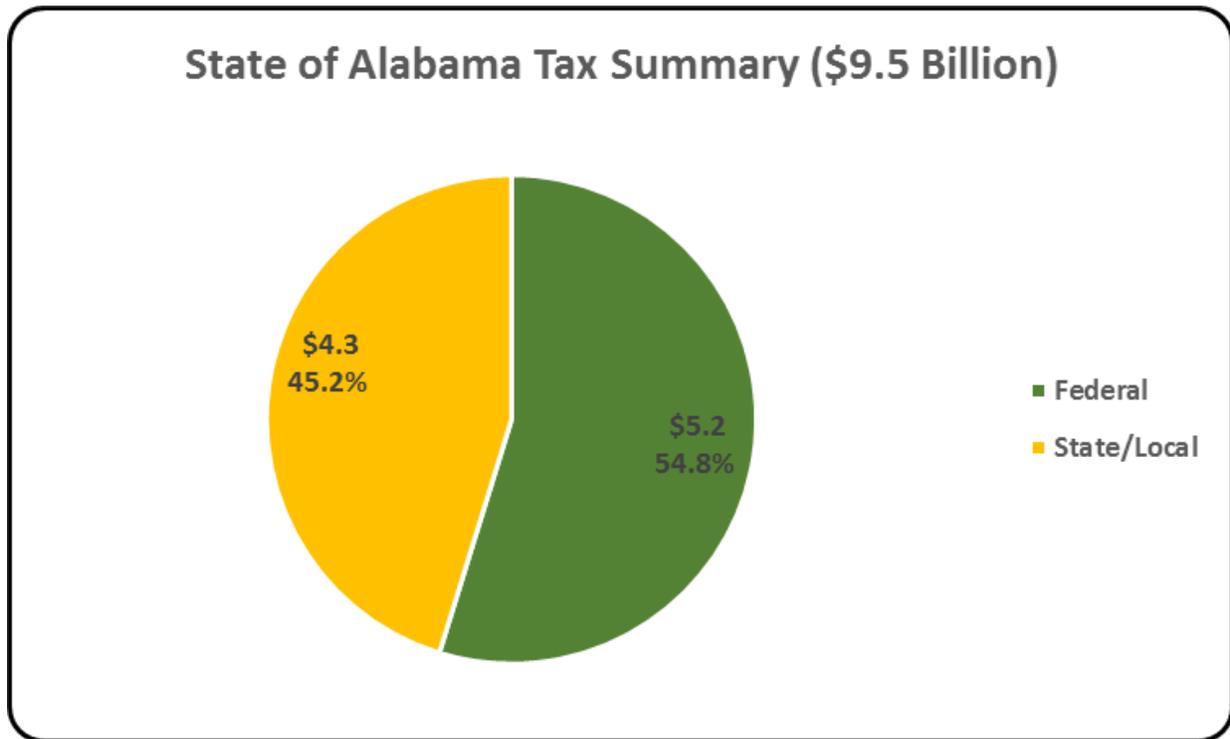


Figure 10, State of Alabama Tax Summary (\$B)

Results by Industry

The previous section of this study reported the state level results for these four broad categories: 1) Crops, Livestock, Forestry and Fishery Production, 2) Agriculture Inputs and Services, 3) Food and Related Products Manufacturing, and 4) Forestry Products Manufacturing. The following results by industry drills down further to show what specific industries are the major contributors to economic activity in each of the four aggregated categories. Goods and services used by the agriculture and forestry industries such as banking and insurance are not specifically shown, but they are embedded as required inputs for the agriculture and forestry industries.

Crops, Livestock, Forestry and Fishery Production

The crops, livestock, forestry and fishery production category includes industries such as crop and livestock farming, commercial logging, commercial fishing, support activities for agriculture and forestry, and more. For the full list, see Table 7 in Appendix A. Total sales derived by the Alabama economy from crops, livestock, forestry and fishery production in Alabama was \$9.8 billion, with the largest contributor being broiler production at nearly \$5.1 billion (see Figure 11). This category only includes the production side – for example, poultry processing is shown separately in the Food and Related Products Manufacturing below. Crops, livestock, forestry and fishery production also accounted for 72,692 jobs, and \$5.1 billion in value-added. Further industry detail for all of sales, employment and value-added are shown in Table 7 in Appendix A.

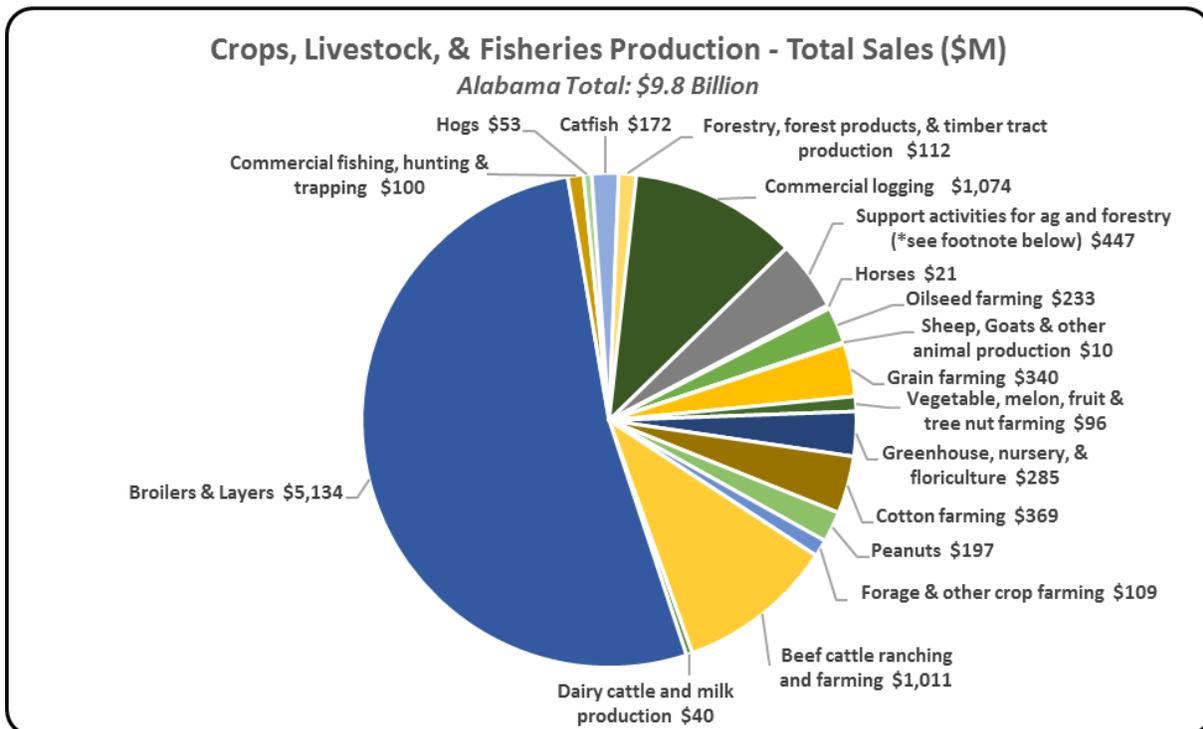


Figure 11, Alabama Crops, Livestock, Forestry and Fisheries Production – Total Sales (\$M)

⁸ *Support activities for ag and forestry includes, but is not limited to: aerial dusting or spraying, animal semen banks, branding, cotton ginning, detasseling, forest firefighting and prevention, fruit sorting/grading/packing, horseshoeing, nut hulling and shelling, pruning of orchard trees and vines, reforestation, showing of livestock, etc.

Agriculture Inputs and Services

The agriculture inputs and services category includes industries such as nitrogen fertilizer manufacturing, pesticide and other agricultural chemical manufacturing, farm machinery and equipment manufacturing, veterinary services, landscape and horticulture services, and more. For the full list, see Table 8 in Appendix A. Total sales derived by the economy from agriculture inputs and services in Alabama was \$8.6 billion, with the largest contributor in this category being “Other basic organic chemical manufacturing” at nearly \$3.4 billion (see Figure 12). Agriculture inputs and services also accounted for 44,811 jobs and nearly \$2.8 billion in value-added. Further industry detail for all of sales, employment and value-added are shown in Table 8 in Appendix A.

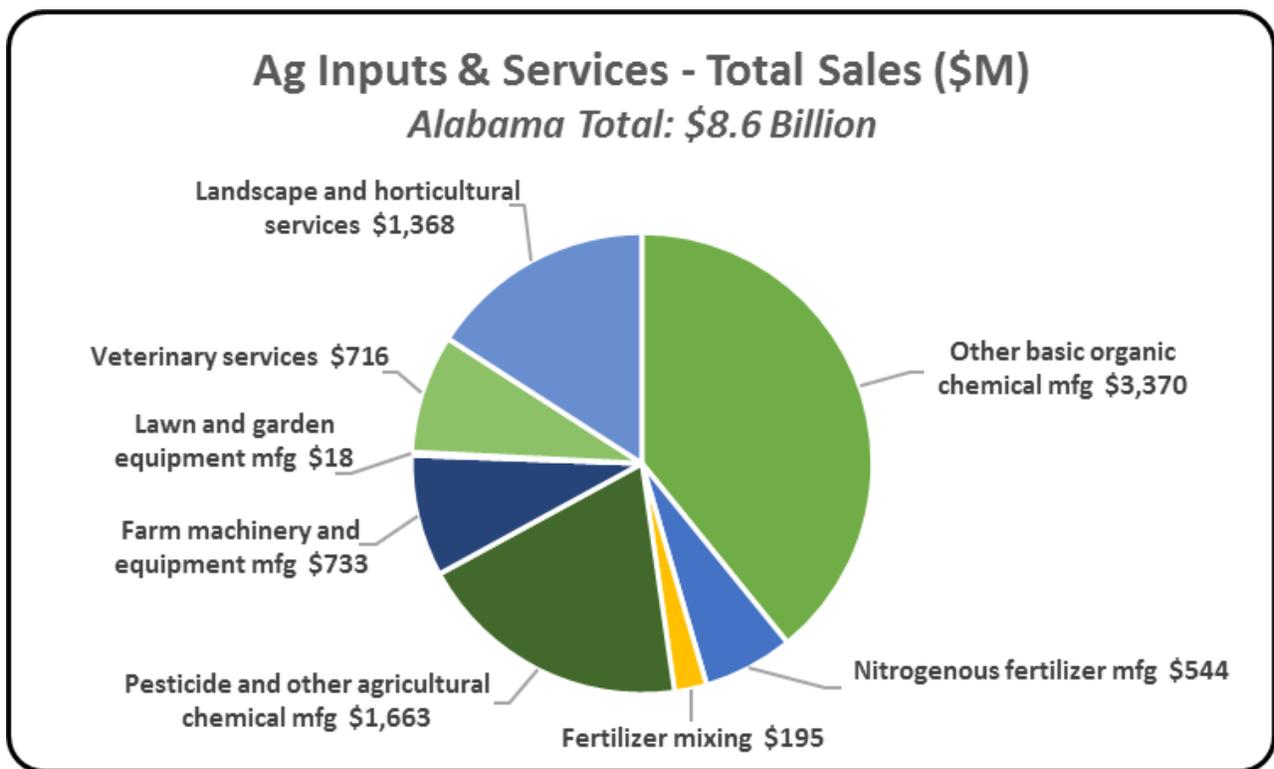


Figure 12, Alabama Agriculture Inputs and Services - Total Sales (\$M)

Food and Related Products Manufacturing

The food and related products manufacturing category includes industries such as animal slaughtering, various food manufacturing, soybean and other oilseed processing, flour milling, food product machinery manufacturing, breweries, and many more. For the full list, see Table 10 in Appendix A. Total sales derived by the economy from food and related products manufacturing in Alabama was nearly \$19.5 billion, with the largest contributor in this category being poultry processing at almost \$7.5 billion (see Figure 13). Food and related products manufacturing also accounted for 61,748 jobs and \$4.3 billion in value-added. Full results including further detail for all of sales, employment and value-added are shown in Table 10 in Appendix A. This table also lists the industries included in the 'Other' category.

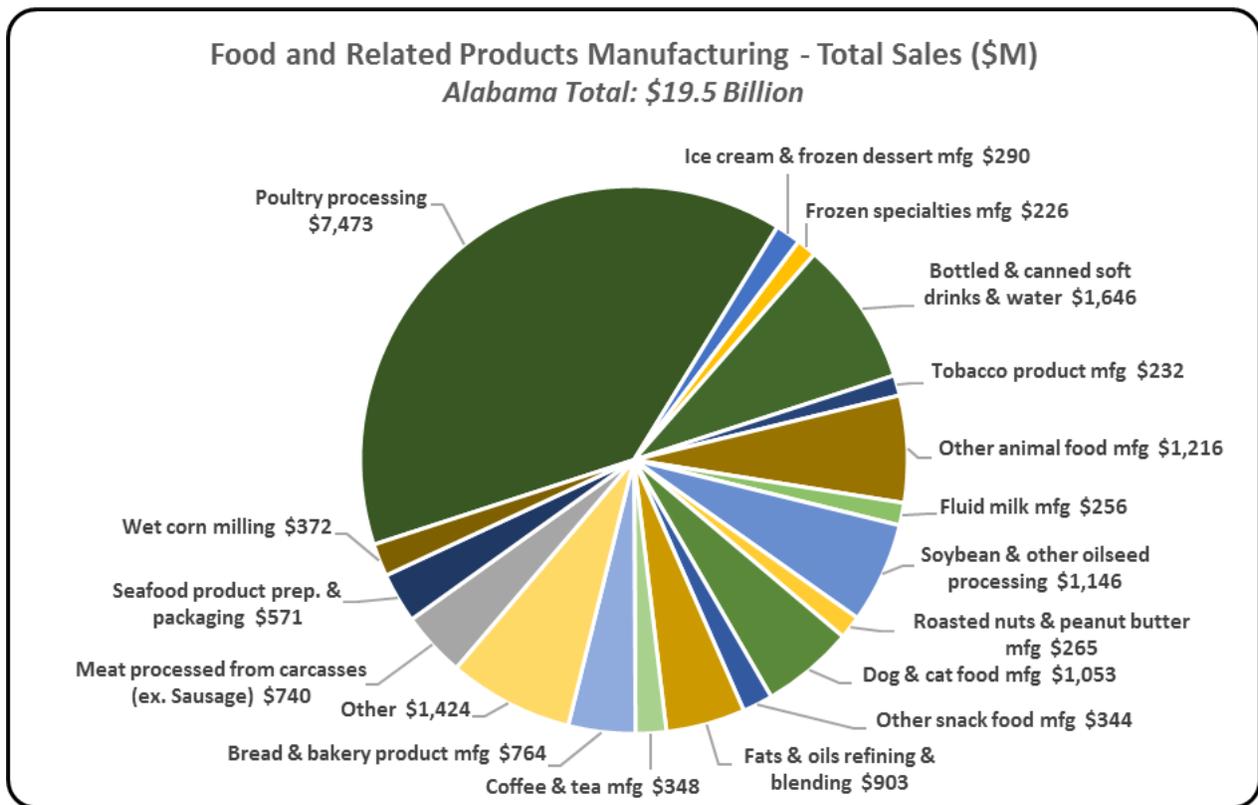


Figure 13, Food and Related Products Manufacturing - Total Sales (\$M)

Forestry Products Manufacturing

The forestry products manufacturing category includes industries such as sawmills, veneer and plywood manufacturing, paper mills, sawmill/woodworking and paper machinery, and many more. Total sales contributed to the economy from forestry products manufacturing in Alabama was \$17.0 billion, with the largest contributors in this category being paper mills at nearly \$5 billion and paperboard mills at \$4.0 billion (see Figure 14). Forestry products manufacturing industries also accounted for 54,543 jobs and almost \$5.7 billion in value-added. Further industry detail for all of sales, employment and value-added are shown in Table 9 in Appendix A.

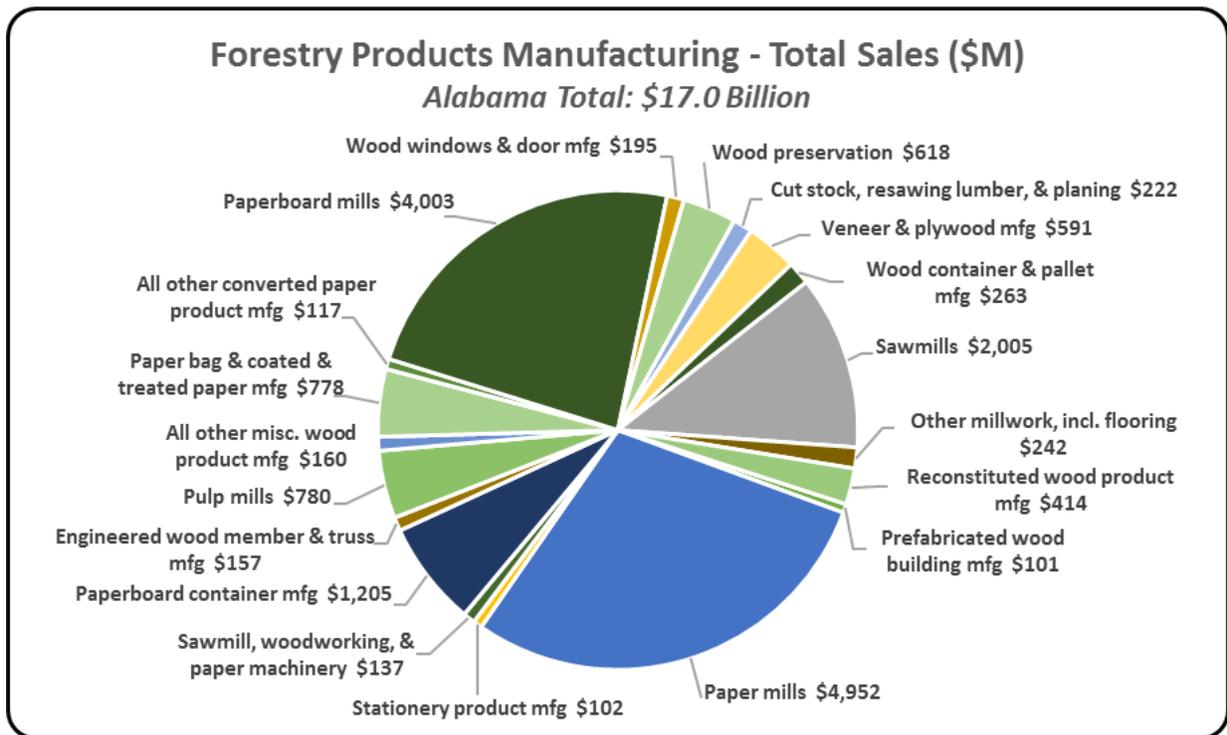


Figure 14, Forestry Products Manufacturing - Total Sales (\$M)

Looking Ahead

This study has been conducted to help quantify the economic contribution of agriculture, forestry, and related industries in the State of Alabama. Understanding the importance of these industries is crucial and also helps plan for the future. As shown throughout this report, agriculture, forestry, and related industries are very important to the overall health of Alabama's economy. Furthermore, its health should be maintained, if not improved, to continue to provide benefits to those who reside in the state. Below are a few additional points to consider as Alabama continues to press forward.

Forestry

With such an abundance of forest area in Alabama (70% of Alabama is forested), it is important to understand the current state of the industry, as well as plan for anticipated challenges. Despite large forests being impacted in the western United States from pest pressures, the forests of Alabama have been holding steady. This is an important note, given forestry and its related industries provide a wide variety of job opportunities and economic activity. It will be important to plan for the management of these forests moving forward, as well as continuing to build on the strengths of this industry.

Age Implications for Young Farmers

The 2012 USDA Census of Agriculture reports the average age of farmers in Alabama as 59 years, which leaves many farmers looking to transition their farm to a younger generation in the near future. Since row crop farming generally requires large capital investments, livestock and poultry farming is often times a good transition step to help young farmers get started in agriculture. Engaging in animal agriculture is generally a more physically-intense occupation than other portions of agriculture. This characteristic also lends itself to appeal to a younger generation.

Fruit and Vegetable Production Opportunities for a New Generation

Rapidly rising urban growth in major Alabama cities and a state population over 4.8 million creates a greater-than-ever need for fruit and vegetable production to meet the rising demand for locally-grown produce among consumers. The fruit and vegetable industry is growing at an estimated annual rate of 14% which surpasses any other crop grown in-state. The I-65 and I-85 corridors cut across many major specialty crop production areas, marketing, and distribution centers. Today, producers can choose between conventional specialty crop production methods or the rapidly rising organic food production methods. They can find support from research at universities, consultation by ACES Regional Extension Agents, and special government support programs. Some popular marketing channels include farmers markets (off-site retail), on-farm markets (on-site retail), farm-to-school, and super markets. All of these marketing systems are available to beginning farmers and are great starting points for the new generation in agriculture.

Appendix A, Detailed Results

Table 7, Alabama Crops, Livestock, Forestry and Fishery Production - Detailed Results⁹

<u>Industry</u>	<u>Inputs (\$M)</u>	+	<u>2016 Value-Added</u>	=	<u>2016 Total Sales</u>	<u>2016 Total Jobs</u>
Poultry and egg production	\$2,825.8		\$2,308.2		\$5,134.0	16,142
Broilers	\$2,799.4		\$2,286.7		\$5,086.1	15,991
Layers	\$26.4		\$21.5		\$47.9	151
Commercial logging	\$444.1		\$630.1		\$1,074.2	9,529
Beef cattle ranching and farming	\$504.9		\$506.1		\$1,011.0	15,302
Support activities for agriculture and forestry	\$120.1		\$326.9		\$447.1	5,948
Cotton farming	\$124.7		\$244.0		\$368.7	2,233
Grain farming	\$253.8		\$86.7		\$340.4	2,223
All other crop farming	\$103.9		\$202.6		\$306.5	9,484
Peanuts	\$66.8		\$130.2		\$197.0	6,095
Forage	\$36.2		\$70.5		\$106.6	3,300
Other crop farming	\$1.0		\$1.9		\$2.8	88
Greenhouse, nursery, and floriculture production	\$74.0		\$211.0		\$285.0	2,530
Animal production, except cattle and poultry and eggs	\$56.3		\$199.2		\$255.5	4,408
Catfish	\$11.6		\$41.1		\$52.8	911
Hogs	\$37.9		\$134.0		\$171.9	2,966
Horses	\$4.6		\$16.2		\$20.7	358
Goats	\$0.8		\$3.0		\$3.8	65
Sheep	\$0.9		\$3.2		\$4.1	71
Other animal production	\$0.5		\$1.7		\$2.2	38
Oilseed farming	\$67.3		\$166.2		\$233.4	977
Forestry, forest products, and timber tract production	\$45.8		\$66.1		\$111.9	904
Commercial fishing	\$35.4		\$36.0		\$71.3	1,414
Vegetable and melon farming	\$14.1		\$45.1		\$59.2	444
Dairy cattle and milk production	\$17.6		\$22.1		\$39.7	174
Fruit farming	\$5.9		\$24.1		\$30.0	459
Commercial hunting and trapping	\$13.2		\$15.7		\$28.9	445
Tree nut farming	\$1.0		\$5.4		\$6.4	77
Crops, Livestock, Forestry and Fishery Production Total	\$4,707.9		\$5,095.2		\$9,803.1	72,692

⁹ **Sales:** The broadest measure of economic activity – sometimes referred to as “output”; **Employment (Jobs):** A measure of job positions without regard to whether they are full-time equivalents; **Value-Added:** Sales (output) minus the cost of inputs

Table 8, Alabama Agriculture Inputs & Services - Detailed Results

Industry	Inputs (\$M)	+	2016 Value-Added (\$M)	=	2016 Total Sales (\$M)	2016 Total Jobs
Other basic organic chemical manufacturing	\$2,689.7		\$680.2		\$3,369.9	5,069
Pesticide and other agricultural chemical manufacturing	\$1,067.5		\$595.3		\$1,662.8	2,839
Landscape and horticultural services	\$626.6		\$741.3		\$1,368.0	26,092
Farm machinery and equipment manufacturing	\$536.1		\$196.4		\$732.5	2,018
Veterinary services	\$363.7		\$352.5		\$716.2	7,239
Nitrogenous fertilizer manufacturing	\$408.3		\$136.1		\$544.4	1,013
Fertilizer mixing	\$143.1		\$52.1		\$195.2	491
Lawn and garden equipment manufacturing	\$15.0		\$3.4		\$18.4	49
Agriculture Inputs & Services Total	\$5,850.0		\$2,757.3		\$8,607.3	44,811

Table 9, Alabama Forestry Products Manufacturing - Detailed Results

Industry	Inputs (\$M)	+	2016 Value-Added (\$M)	=	2016 Total Sales (\$M)	2016 Total Jobs
Paper mills	\$3,266.9		\$1,685.0		\$4,952.0	11,893
Paperboard mills	\$2,716.4		\$1,286.1		\$4,002.5	10,100
Sawmills	\$1,367.8		\$637.3		\$2,005.2	8,857
Paperboard container manufacturing	\$871.3		\$333.5		\$1,204.8	4,136
Pulp mills	\$521.4		\$258.4		\$779.9	2,259
Paper bag and coated and treated paper manufacturing	\$507.2		\$271.0		\$778.2	2,311
Wood preservation	\$425.9		\$192.0		\$617.9	1,848
Veneer and plywood manufacturing	\$394.4		\$196.8		\$591.3	2,592
Reconstituted wood product manufacturing	\$288.0		\$126.0		\$414.0	1,169
Wood container and pallet manufacturing	\$155.4		\$108.1		\$263.5	1,904
Other millwork, including flooring	\$148.2		\$94.1		\$242.3	1,444
Cut stock, re-sawing lumber, and planing	\$139.1		\$83.1		\$222.2	1,072
Wood windows and door manufacturing	\$117.7		\$77.2		\$194.9	1,078
All other miscellaneous wood product manufacturing	\$84.9		\$74.6		\$159.6	886
Engineered wood member and truss manufacturing	\$102.4		\$54.7		\$157.1	928
Sawmill, woodworking, and paper machinery	\$85.5		\$51.6		\$137.1	704
All other converted paper product manufacturing	\$76.9		\$40.5		\$117.4	455
Stationery product manufacturing	\$68.2		\$33.9		\$102.1	366
Prefabricated wood building manufacturing	\$51.4		\$49.9		\$101.3	540
Forestry Products Manufacturing Total	\$11,389.2		\$5,653.8		\$17,043.1	54,543

Table 10, Alabama Food and Related Products Manufacturing - Detailed Results

Industry	Inputs (\$M)	+	2016 Value-Added (\$M)	=	2016 Total Output (\$M)	2016 Total Jobs
Poultry processing	\$5,787.9		\$1,685.2		\$7,473.1	30,448
Bottled and canned soft drinks & water	\$1,222.8		\$422.7		\$1,645.6	4,000
Other animal food manufacturing	\$1,053.7		\$161.9		\$1,215.6	1,913
Soybean and other oilseed processing	\$1,032.8		\$112.9		\$1,145.7	1,142
Dog and cat food manufacturing	\$773.5		\$280.0		\$1,053.5	1,839
Fats and oils refining and blending	\$808.1		\$94.5		\$902.6	976
Bread and bakery product, except frozen, manufacturing	\$424.3		\$339.9		\$764.1	6,208
Meat processed from carcasses	\$609.3		\$131.0		\$740.2	1,980
Seafood product preparation and packaging	\$441.6		\$129.4		\$571.1	2,345
Wet corn milling	\$288.1		\$84.3		\$372.4	708
Coffee and tea manufacturing	\$254.3		\$93.2		\$347.5	1,026
Other snack food manufacturing	\$249.7		\$94.1		\$343.7	732
Ice cream and frozen dessert manufacturing	\$201.0		\$89.0		\$290.0	1,005
Roasted nuts and peanut butter manufacturing	\$185.2		\$79.8		\$265.0	737
Fluid milk manufacturing	\$205.4		\$50.2		\$255.5	571
Tobacco product manufacturing	\$148.3		\$83.4		\$231.7	312
Frozen specialties manufacturing	\$184.0		\$41.7		\$225.6	833
Breweries	\$165.4		\$48.8		\$214.2	510
Mayonnaise, dressing, and sauce manufacturing	\$156.2		\$36.0		\$192.2	470
Spice and extract manufacturing	\$122.7		\$34.8		\$157.5	482
All other food manufacturing	\$110.2		\$38.6		\$148.8	587
Animal, except poultry, slaughtering	\$116.5		\$13.7		\$130.2	299
Rendering and meat byproduct processing	\$79.2		\$28.3		\$107.5	385
Dry pasta, mixes, and dough manufacturing	\$53.6		\$26.0		\$79.6	225
Non-chocolate confectionery manufacturing	\$62.8		\$13.7		\$76.5	294
Distilleries	\$41.9		\$25.7		\$67.6	135
Sugar cane mills and refining	\$55.0		\$10.2		\$65.2	150
Flour milling	\$47.7		\$10.1		\$57.7	118
Flavoring syrup and concentrate manufacturing	\$39.1		\$12.8		\$51.9	78
Cookie and cracker manufacturing	\$37.2		\$14.0		\$51.2	209
Manufactured ice	\$23.5		\$10.8		\$34.3	266
Breakfast cereal manufacturing	\$22.5		\$10.2		\$32.8	72
Food product machinery manufacturing	\$20.6		\$10.6		\$31.2	146
Frozen cakes and other pastries manufacturing	\$19.2		\$11.7		\$30.9	208
Cheese manufacturing	\$26.5		\$2.9		\$29.5	54
Canned fruits and vegetables manufacturing	\$22.7		\$3.8		\$26.5	75
Frozen fruits, juices and vegetables manufacturing	\$15.5		\$3.6		\$19.1	63
Wineries	\$11.5		\$5.3		\$16.8	78
Confectionery manufacturing from purchased chocolate	\$14.4		\$2.0		\$16.4	71
Food and Related Products Manufacturing Total	\$15,133.9		\$4,346.8		\$19,480.7	61,748

Appendix B, Comparability to 2013 Study

As demonstrated with a simple internet search, there are several ways to conduct an economic analysis such as has been done here. In our experience, the adoption of certain methodology is more appropriate in some cases than others. Our experience also suggests that some differences (large or small) can be traced to an analyst's personal preference or common practice within certain research groups. Differing methodology is not necessarily a negative thing, as differences in results can be, and often are, negligible. Other instances, where methodology is misapplied (e.g., using economic *impact* rather than economic *contribution* methodology), can lead to a large overstatement of the contribution of a given industry. The Decision Innovation Solutions research team goes to great lengths to avoid misapplying methodology.

Given the prior analysis was completed in 2013¹⁰, readers will naturally want to compare results from this analysis to the prior one. Given our experience in conducting these analyses in other U.S. states, we certainly appreciate the value in understanding and drawing conclusions from trends. The information below will aid readers in understanding the appropriate way to compare this updated analysis with the one published in 2013.

2013 Study Methodology

The 2013 study was conducted by Alan W. Hodges (University of Florida), Deacue Fields (Auburn University) and Zhimei Guo (Auburn University). Similar to this study, the 2013 study also used the IMPLAN modeling system, the difference being that it relied upon the 2010 dataset (the most current at the time). In conducting the analysis in 2013, the authors adopted an "economic base theory" framework. This theory suggests that the ability of a study area to produce goods and services beyond its local need (exports) is where economic growth is largely derived. This is a commonly applied theory, but differs from how we handled the analysis in 2016.

One difference in methodology between 2013 and 2016 is the number and type of "institutions" included in the IMPLAN models. Institutions include Households, Federal Government, State/Local Government, and several others. The 2013 study included Federal and State/Local governments and a few other institutions that the 2016 study did not. Each institution you include in the model implies that those expenditures were paid for out of local value added, which is not the case since federal expenditures are not evenly distributed across states. Including these institutions may lead to an overstatement of economic activity derived from the industry(ies) under study.

A second difference, which is due to the underlying theory supporting the 2013 study, is that much of the analysis was done external to the IMPLAN software. Direct output, direct jobs, direct value-added, net exports, and multipliers for each industry were exported to Microsoft Excel. Sales (output) impacts for a given industry were calculated by adding direct sales values to the indirect and induced impacts of exports. These indirect and induced impacts were calculated by factoring the indirect and induced multipliers for a given industry by its net exports. Results in this 2016 report were estimated entirely

¹⁰ <http://www.aces.edu/pubs/docs/A/ANR-1456/ANR-1456.pdf>

within the IMPLAN modeling system and followed the IMPLAN recommended methodology outlined previously.

Differences Due to IMPLAN Data Year

As expected, the year in which data are collected has implications on contribution analyses. Due to a few updates to data sources which underlie the IMPLAN modeling system there are a few that are worthy of mention. Additional context can be provided by contacting the authors of this study.

- Incorporating Bureau of Economic Analysis (BEA) data into the farm sectors
- Updates to the way IMPLAN estimates Labor Income and Employment
- Beginning with the 2013 dataset (this analysis used the 2014 dataset), a new Census of Agriculture, additional NASS data, and a new BEA Input-Output Benchmark were incorporated into the underlying IMPLAN data

Due to a changes in data years, the number of industries (sectors) considered agriculture and forestry changed. The 2010 IMPLAN dataset used in the 2013 study had 440 industries, but the updated 2014 data used in this study has further broken down industries to 536 to include more detail in some agricultural and forestry industries. While essentially all industries used in the 2013 study are also in the 2016 study, an exact comparison of individual industries cannot be done in some instances.

The nature of this study is to quantify the economic contribution of agriculture, forestry, and related industries. While wholesale trade and retail stores do tie back to agriculture and forestry, they also include a lot of other products and services that are not logically connected to agriculture or forestry (e.g., banking and personal services located within grocery stores). In order to maintain a disciplined definition of agriculture and forestry, the industries which were part of the “Food and Kindred Products Distribution” from the prior study are not included in this 2016 update. The other four broad categories, however, closely match what was done in 2013.

Differing Methodology Implications

When looking at some of the numerical differences between the prior study and this update, the number of direct employment (jobs) associated with each of the four main categories are comparable, as shown in Figure 15 below. However, the total employment impacts for this study are significantly less, which is due to changes over time in the multipliers embedded within the IMPLAN modeling system as well as the number and type of institutions included in the model (see Figure 16). The underlying data in the IMPLAN system is continually being updated to reflect the most current state of the economy for a given study area. Because of the interrelationship between jobs, sales, and value-added, comparative charts for sales and value-added show similar patterns.

Direct values for output, jobs, and value-added are the amounts from each industry before multipliers within the IMPLAN model are applied. Goods and services used by the agriculture and forestry industries such as banking and insurance are embedded as required inputs for the agriculture and forestry industries and are included within the total values once the multipliers are applied to the direct values.

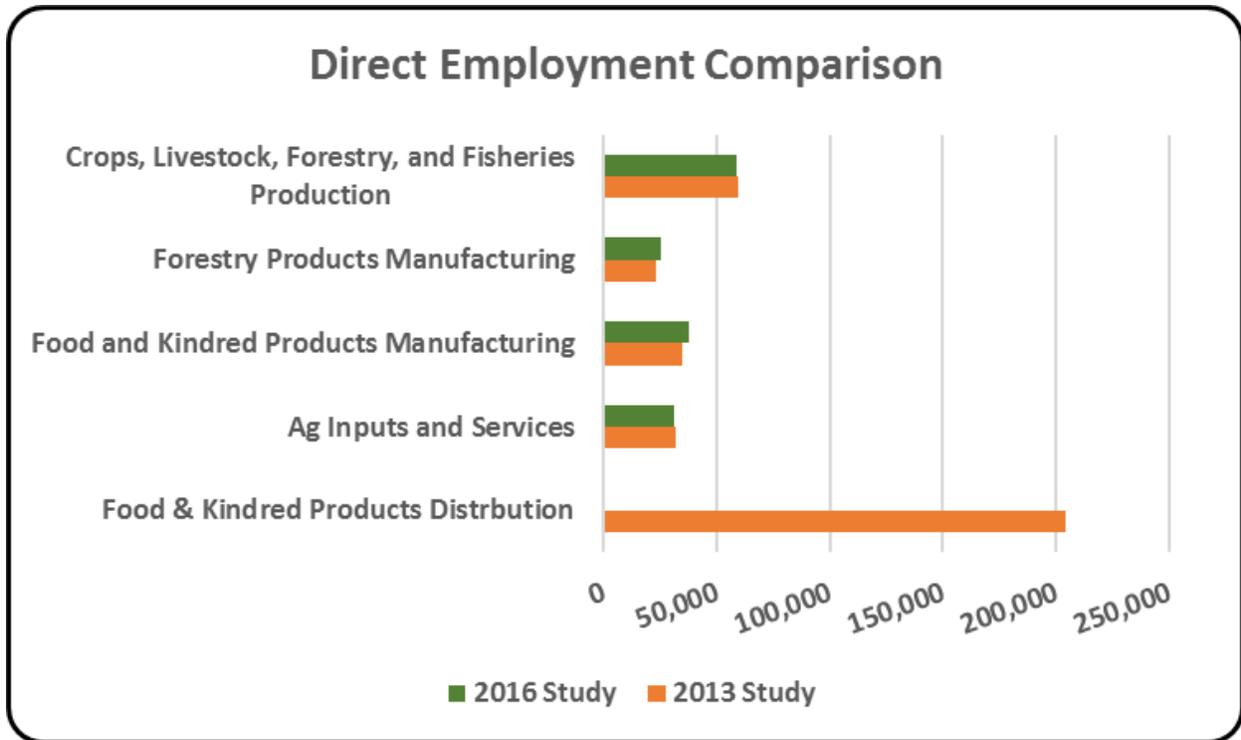


Figure 15, Direct Employment Comparison

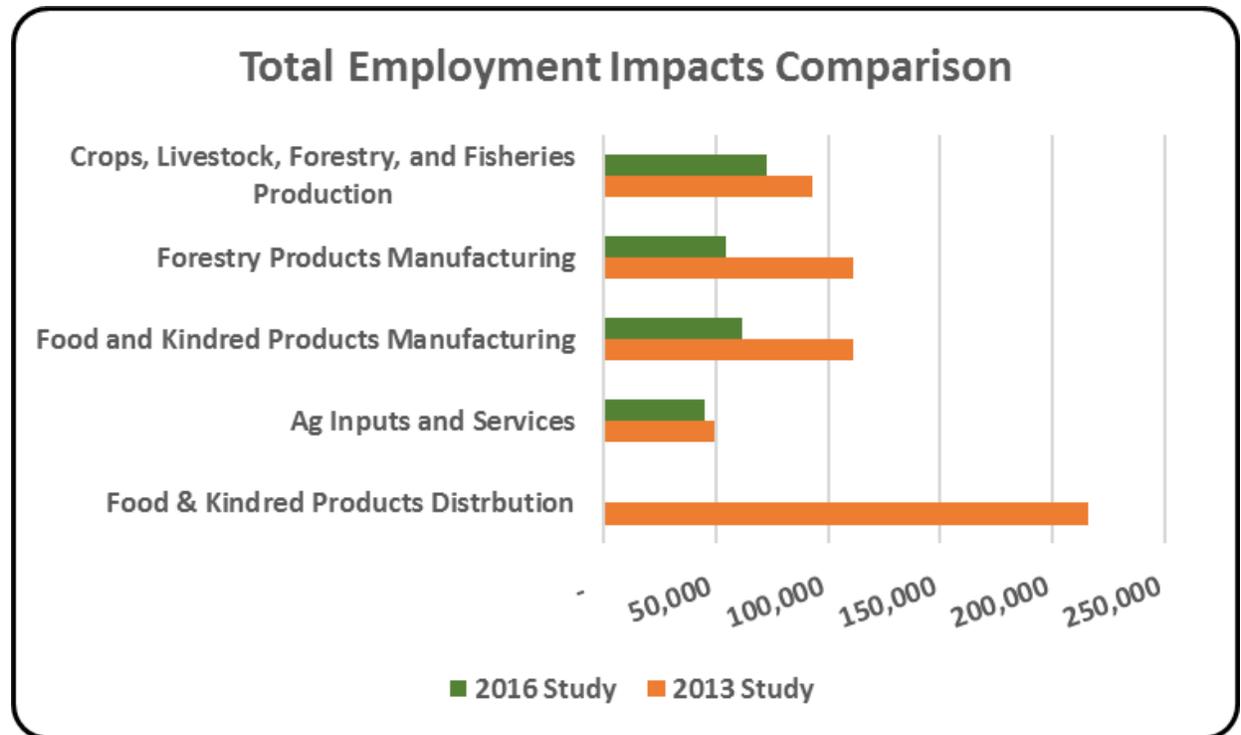


Figure 16, Total Employment Impacts Comparison

Through a productive dialogue with Dr. Alan Hodges, the person responsible for the 2013 analysis, we have been able to determine what the effect would have been had we adopted similar methodology to what was done in 2013. Table 11 shows how differing methodology has an impact on estimates of the economic contribution of the Alabama agriculture and forestry industries.

Using the four categories common to both the 2013 and 2016 studies, there are differences in the contribution estimates of Alabama agriculture and forestry. For example, output for the three 2016 methods ranges from \$54.9 billion to \$70.3 billion. Four-category jobs range from 233,794 to 383,881. Four-category value-added ranges from \$17.9 billion to \$27.4 billion.

Table 11, Methodology Sensitivity Comparison¹¹

Output (\$M) Impacts Comparison	2013 Study (UFL)		2016 Study (UFL)		2016 Study (DIS)
Food & Kindred Products Distribution	\$	13,008	\$	18,678	
Ag Inputs and Services	\$	5,893	\$	5,744	\$ 8,607
Food and Kindred Products Manufacturing	\$	21,653	\$	28,920	\$ 19,481
Forestry Products Manufacturing	\$	20,005	\$	23,618	\$ 17,043
Crops, Livestock, Forestry, and Fisheries Production	\$	9,819	\$	12,068	\$ 9,803
<i>4-category total</i>	\$	57,370	\$	70,349	\$ 54,934
<i>5-category total</i>	\$	70,378	\$	89,028	
Jobs Impacts Comparison	2013 Study (UFL)		2016 Study (UFL)		2016 Study (DIS)
Food & Kindred Products Distribution		215,868		250,601	
Ag Inputs and Services		49,530		56,906	44,811
Food and Kindred Products Manufacturing		111,044		126,840	61,748
Forestry Products Manufacturing		110,880		107,857	54,543
Crops, Livestock, Forestry, and Fisheries Production		92,974		92,278	72,692
<i>4-category total</i>		364,428		383,881	233,794
<i>5-category total</i>		580,296		634,482	
Value-Added (\$M) Impacts Comparison	2013 Study (UFL)		2016 Study (UFL)		2016 Study (DIS)
Food & Kindred Products Distribution	\$	7,949	\$	10,573	
Ag Inputs and Services	\$	2,596	\$	2,398	\$ 2,757
Food and Kindred Products Manufacturing	\$	6,985	\$	9,254	\$ 4,347
Forestry Products Manufacturing	\$	9,191	\$	9,490	\$ 5,654
Crops, Livestock, Forestry, and Fisheries Production	\$	4,055	\$	6,287	\$ 5,095
<i>4-category total</i>	\$	22,827	\$	27,430	\$ 17,853
<i>5-category total</i>	\$	30,776	\$	38,003	

¹¹ The 2013 study included Federal and State/Local governments and a few other institutions that the 2016 study (DIS) did not. Each institution you include in the model implies that those expenditures were paid for out of local value added, which is not the case since federal expenditures are not evenly distributed across states. Including these institutions may lead to an overstatement of economic activity derived from the industry(ies) under study. In the 2013 study, much of the analysis was done external to the IMPLAN software. Direct output, direct jobs, direct value-added, net exports, and multipliers for each industry was exported to Microsoft Excel. Output impacts for a given industry were calculated by adding direct output values to the indirect and induced impacts of exports. These indirect and induced impacts were calculated by factoring the indirect and induced multipliers for a given industry by its net exports. Results in this 2016 report were estimated entirely within the IMPLAN modeling system and followed the IMPLAN recommended methodology outlined previously. The 2016 study was also modeled with the additional institutions (UFL) to be used as a comparison to the 2013 study.

As this exercise demonstrates, there can, and often are, differences in estimates caused from adoption of differing methodology. As such, readers should take care in understanding the underlying methodology and its implications derived from its adoption. This allows for a much more productive dialogue to take place and allows one to better understand how and when to apply certain methodology.