

# Economic Contribution of the Agricultural Sector to the Arkansas Economy in 2009



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# Executive Summary

Agriculture and associated agricultural activities are major contributors to the Arkansas economy. Agriculture is defined as the sum of agricultural production and processing activities, unless otherwise specified, and includes crop and animal production and processing, agricultural support industries, forestry and forest products, and textile goods. Agriculture contributes to the economy through direct agricultural production and value-added processing, and also leads to economic activity in other parts of the economy.

This report<sup>1</sup> is the sixth in a series of reports examining agriculture's economic contribution on the Arkansas economy. Utilizing data from the United States Bureau of Economic Analysis (BEA), USDA Economic Research Service (ERS), USDA National Agricultural Statistics Service (NASS), and Minnesota IMPLAN Group, Inc. (MIG), the economic contribution of agriculture on the Arkansas economy was estimated for the most recent year available, 2009. Gross Domestic Product (GDP) by State information for Arkansas in 2009 was compared with those of other states in the southeast U.S. to give a measure of the relative importance of agriculture in Arkansas.<sup>2</sup> The total economic contribution of agriculture (direct, indirect, and induced effects) on value added, employment, and labor income was estimated by employing the Impact Analysis for Planning System (IMPLAN). The economic contributions of agricultural production and processing were estimated for agriculture as a whole and also separately for the Crops Sector, the Animal Agriculture Sector, and the Forestry Sector. Key findings of the IMPLAN analysis are as follows:

- When comparing the GDP contributions of agriculture, forestry and many food related industries, Arkansas Agriculture and Food accounts for a larger percentage of total economic activity in the state than any other state in the southeast U.S. – 10.4% of total GDP by State or \$10.2B.<sup>3</sup>
- Aggregate Agriculture contributed \$17.0B in total value added to the state economy; this is \$0.17 of every \$1 in value generated in the state.
- Aggregate Agriculture accounted for 275,435 jobs, which is 18% of all jobs in the state. Over one-half of these (149,315), or 10% of all state employment, are in the agriculture production, processing and agriculture-related industries.
- *Poultry and Egg Production* and *Poultry Processing* alone continued to provide over one in four of the state's agricultural jobs.
- Aggregate Agriculture paid \$10.7B in labor income, or 17% of the state's total labor income, including agriculture payrolls, which totaled \$8.3B, or 15% of total state wages.
- Aggregate Agriculture generates value added, employment, and income in all 20 of the 2-digit NAICS aggregated industries in the state. Almost half of agriculture's contribution to value added occurs in industries closely tied to agriculture but not defined as part of the agriculture sector, such as *Wholesale Trade*, *Real Estate and Rental*, and *Transportation and Warehousing*.
- The direct contribution of the Crops Sector included \$3.0B in value added, 61,422 jobs and \$2.0B in labor income. *Grain Farming*, *Oilseed Farming*, and *Cotton Farming* together represented 70% of jobs, 52% of labor income, and 46% of value added in the Crops Sector.
- In direct contributions, the Animal Agriculture Sector generated \$2.2B in value added, 51,684 jobs and \$1.9B in labor income. *Poultry and Egg Production* and *Poultry Processing* provided 74% of jobs, 83% of income, and 74% of value added in the Animal Agriculture Sector.
- The direct contribution of the Forestry Sector included \$2.6B in value added, 27,886 jobs, and \$1.5B in income. Within the Forestry Sector, *Paper Mills*, *Sanitary Paper Product Manufacturing*, *Paperboard Mills*, *Sawmills and Wood Preservation*, and *Paperboard Container Manufacturing* contribute 47% of forestry jobs, almost two-thirds of forestry income, and 64% of value added.

Arkansas agriculture continues to be a critical component of Arkansas' economy. The Agriculture and Food Sector in Arkansas contributes a larger share to the state's economy than does agriculture in its neighboring states and in the U.S. Including direct, indirect and induced effects, agriculture generates over one in six jobs and 17% of value added in the state. The diversity of the state's agriculture helps to mitigate the effects of low world market prices or trade embargoes for a particular commodity. Crops, animal agriculture, and forestry production and processing are all major contributors to agriculture and to the state's economy. The large and diverse natural resource base of the state provides the opportunity for agriculture to change and develop new value added and bio-energy industries. The size and diversity of the state's agriculture contribute greatly to the well-being of Arkansans and to the stability of the state's economy.

# Definitions and Styles

## Agricultural Sectors

**Aggregate Agriculture** consists of the Crops, Animal Agriculture, and Forestry Sectors' production and processing industries, plus the Agriculture-Related Sector. See Appendix A, Tables 1-4 for a complete listing of the sectors included.

**Crops Sector** comprises those industries directly involved in crop production and processing. See Appendix A, Table 1 for a complete listing of the industries included.

**Animal Agriculture Sector** comprises those industries directly involved in livestock production and processing. See Appendix A, Table 2 for a complete listing of the industries included.

**Forestry Sector** comprises those industries directly involved in forestry production and processing. See Appendix A Table 3, for a complete listing of the industries included.

**Agriculture-Related Sector** comprises those industries that support the Crops, Animal Agriculture, and Forestry Sectors. See Appendix A, Table 4 for a complete listing of the industries included.

**Note:** The Agriculture and Food Sector terminology used in Part 1 consists of the Aggregate Agriculture Sector plus agricultural retail. This terminology is used only in Part 1, and not in Part 2 for the computation of direct agricultural contributions reported elsewhere in this publication. See "Gross Domestic Product" discussion under "Style Notes" (page 7) for further explanation.

## Economic Contribution

The **total economic contribution** of the Aggregate Agriculture Sector includes three areas of wealth and job generation:

1. **Direct Contributions** are the sum of the contributions of farm production and processing of farm products. Only direct contributions are reported in the Crops, Animal Agriculture and Forestry Sector discussions.
2. **Indirect Contributions** result when agricultural firms purchase raw materials and services from other Arkansas businesses to produce their products.
3. **Induced Contributions** result when employees of agricultural firms and employees of the raw material and service firms spend a portion of their income on local purchases.

These contributions are reported in terms of **Employment**, **Labor Income**, and **Value Added**:

1. **Employment** includes all wage and salary employees, as well as self-employed workers (owner-operators) in a given sector.
2. **Labor Income** consists of two parts: proprietary income and wages. Proprietary income includes all income received by self-employed individuals, such as private business owners, doctors, lawyers or other professionals. Wages include all worker salaries, payments, and fringe benefits paid by employers.
3. **Value Added** includes labor income plus indirect taxes and other property-type income such as payments for rents, royalties, and dividends. Value added and Gross Domestic Product (GDP) are equivalent measures in theory but are estimated using different methods and data sources.



## Style Notes

This report consists of two parts. In Part 1, information about Arkansas agriculture is presented in a historical context. These data are available for 1999 through 2009. Also presented in Part 1 are crops and animal production data that are available from 1987 to 2010. In Part 2, the contributions of agriculture to the Arkansas economy are presented for 2009. Throughout the report, agriculture is defined in terms of agricultural sectors, NAICS sectors, industries, and general descriptive terms that can be applied to agriculture. Different font styles are used throughout the text to distinguish these terms.

**Agricultural Sectors.** These comprise the areas of focus in our study. Sectors are capitalized throughout the report. Part 1 of the report refers to the Agriculture and Food Sector. Part 2 of the report refers to the four areas of analysis: Crops Sector, Animal Agriculture Sector, Forestry Sector, and Aggregate Agriculture Sector. The Agriculture-Related Sector is included in the analysis of the Aggregate Agriculture Sector, but is not analyzed individually. These terms are capitalized and underlined throughout the text.

**NAICS Sectors.** The North American Industry Classification Scheme (NAICS) is “...the standard for use by Federal statistical agencies in classifying business establishments for the collection, tabulation, presentation, and analysis of statistical data describing the U.S. economy....For statistical purposes, a business establishment is assigned one NAICS code, based on its primary business activity” (USCB, 2011a). Agricultural activities are classified under, or can impact, multiple sectors. Throughout the document, capitalization of sectors is used when referring to NAICS sectors. Examples include Food Manufacturing, Paper Manufacturing, and Wood Product Manufacturing.

**Industries.** These are defined as individual IMPLAN industries that are defined by aggregating NAICS sectors into the larger IMPLAN industries used in our analysis. These industries are capitalized and italicized. Examples include *Poultry and Egg Production* and *Paperboard Mills*.

**Gross Domestic Product by State, formerly Gross State Product.** This is the state equivalent of the national measure of GDP, the most comprehensive measure of U.S. economic activity. Gross Domestic Product by State is derived as the sum of the GDP originating in all the industries in a state (USDC BEA, 2011b). As described in Kemper, Popp, and Miller (2009), BEA’s 2009 revisions to GDP by state made it necessary for us to include two additional industries to bring this study in line with that new methodology used by ERS to measure agriculture and food’s contribution to GDP (USDA ERS, 2008a). One NAICS industry was added to agricultural processing (Apparel, Leather, and Allied Products Manufacturing), and agricultural retail was newly added and consists of the NAICS industry Food Services and Drinking Places. It is important to note that agriculture retail is included as a direct effect in the GDP by State portion of the report, but not in the contribution analysis. Some retail activity is picked up as part of the induced effect and included in the total economic contribution.

**General Descriptive Terms.** These are terms used throughout the text to describe agriculture that is not related to established industry classification schemes or specific agricultural sector titles used in this analysis. These terms are presented in lowercase. Examples include agricultural production, agricultural processing, and agricultural retail.

**Note:** In some cases, numbers reported in this research report may be different than numbers reported in its companion documents, the pocket guide *Economic Contribution of Arkansas Agriculture* (McGraw, Popp and Miller 2011a) and the fact sheet “Economic Contribution of Agriculture to the Arkansas Economy in 2009” (McGraw, Popp and Miller, 2011b), due to rounding.

# 1: The Economic Contribution of Agriculture and Food to Arkansas' GDP

## 1.1: Introduction

Agricultural production, processing and support industries are major contributors to the Arkansas economy. While agriculture contributes to the economy through direct agricultural production, value-added processing, and agricultural services and support activities, it also plays an important role through its interactions with other sectors. The use of non-agricultural goods and services as inputs into the agricultural sector promotes diversified growth in Arkansas' economy; thus agriculture remains a vital part of Arkansas' economy. Part 1 of the report compares the relative size of the Agriculture and Food Sector in Arkansas with those of neighboring states, the southeastern region of the United States, and the nation; provides an overview of Arkansas' economy and discusses Arkansas' agricultural sector in relation to the state economy; and examines components of agricultural production and processing, including a review of historical sales trends for raw and processed agricultural output.

## 1.2: Methods

For the GDP by State portion of this report, the most recent estimates (2009 data) from BEA for agricultural production, processing and retail are reported. BEA's GDP by State data set includes the following eight sectors as part of the Agriculture and Food Sector: 1) Agriculture, Forestry, Fishing, and Hunting; 2) Wood Product Manufacturing; 3) Furniture and Related Products Manufacturing; 4) Food Manufacturing; 5) Textile and Textile Product Mills; 6) Apparel, Leather, and Allied Products Manufacturing; 7) Paper Manufacturing; and 8) Food Services and Drinking Places. This terminology is used to emphasize the important differences in what is being measured in the GDP portion of this report in comparison to the economic contribution analysis portion. Furthermore, in part 1, "contribution" is used to describe percent or dollar values' portion of the whole, e.g., the part of agricultural processing attributable to Paper Manufacturing.

It is important to note that agricultural retail is included as a component of the Agriculture and Food Sector in the GDP comparisons but is not included as a direct economic contribution when estimating the contribution of agriculture to the state economy. No input providers (fertilizer, pesticide and equipment manufacturers) or retail locations (restaurants, grocery stores, lawn and garden centers, etc.) are considered as direct contributors to the Aggregate Agriculture Sector in the contribution analysis. However, much or some of the economic activity in these firms is picked up as indirect and induced effects and reported as part of the total economic contribution.

This report builds upon previous reports (Goodwin et al., 2002; Popp, Vickery, and Miller, 2005; Popp, Kemper, and Miller, 2007; Kemper, Popp, and Miller, 2009; Popp et al., 2010) and utilizes data for 2009, the most recent year that relevant GDP and IMPLAN data were available. Production amounts, values, and cash receipts data were also available for 2010. All dollar values in Part 1 are expressed in 2009 constant dollar terms, unless otherwise noted. Data in Figs. 6 and 7 and their corresponding sections are expressed in constant 1990-1992 dollars. Constant dollar values were calculated using deflators derived from the value of "All industry total" for Arkansas in BEA's chained 2005 dollar GDP by State series, except for the data presented in figs. 6 and 7. For figs. 6 and 7 data, deflators from NASS's data series "Annual Average Index Numbers of Prices Received" are used to calculate constant dollar values (USDA NASS, 2011a). Percentages presented are *percentage* changes, not *absolute* changes. For example, a change from 15% in 2004 to 11% in 2009 results in a 27% decrease, not a 4% decrease. Likewise, a change from \$11M in 2004 to \$15M in 2009 results in a 36% increase.

### **1.2.1: A Note Regarding Presentation of GDP by State (Formerly Gross State Product) Estimates**

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Gross Domestic Product by State is the state-level analog to national GDP. Early reports (Goodwin et al., 2002; Popp, Vickery, and Miller, 2005) made comparisons of historical gross state product (GSP)<sup>4</sup> data from the BEA using a starting year of 1986. However, there is a discontinuity in the GSP (now known as GDP by State) time series at 1997. This discontinuity results from the BEA's change in methods for classifying data from the Standard Industrial Classification (SIC) to the North American Industrial Classification System (NAICS) scheme. Gross Domestic Product by State data estimates for 1997 forward are now prepared for 81 NAICS industries. Estimates for earlier data years remain in only the 63 SIC industry format. The differences between SIC- and NAICS-based industries are many, including the facts that these estimates are based on different source data and different estimation methodologies.<sup>5</sup> Additionally, the NAICS-based GDP by State estimates are consistent with U.S. gross domestic product (GDP), while the SIC-based GSP estimates were consistent with U.S. gross domestic income (GDI). The data discontinuity affects the dollar values, industry categories—particularly with respect to manufacturing components and growth rates of the GDP by State estimates. The BEA strongly cautions analysts using the GDP by State estimates against appending the two data series in an attempt to construct a single time series of GDP by State estimates for 1977 to the present (USDC BEA, 2011b). Therefore, following Kemper, Popp, and Miller (2009), this study reports only GDP by State estimates since 1997.

## 1.3: Agriculture and Food—The Regional Context

In the following GDP by State discussion, the Agriculture and Food Sector is defined as the sum of agricultural production, processing, and retail, unless otherwise stated.<sup>6</sup> Arkansas' Agriculture and Food Sector, expressed as a percentage of total GDP, has exceeded those of contiguous states since at least 1969, when the BEA began publishing regional GDP information. In 2009, the Agriculture and Food Sector accounted for 10% of Arkansas' GDP (Table 1), which represented a 0.6% decrease from 2008. The Agriculture and Food Sector in the Southeast region<sup>7</sup> only experienced a miniscule decrease as a percentage of real GDP from 2008 to 2009. Arkansas' agricultural production, processing, and retail as percentage of GDP is two times greater than that of the U.S. and one and a half times greater than that of the Southeast agricultural sector as a percentage of their respective GDPs in 2009.

The individual contributions of agricultural production and processing also comprised a greater percentage of Arkansas' GDP than agricultural production and processing did in neighboring

states' and the nation's respective economies (Fig. 1). Agricultural production contributed almost 3% to Arkansas' GDP in 2009, whereas agricultural production in Mississippi, the southern state whose contribution comes closest to Arkansas', contributed only 2% to its GDP. Similarly, agricultural processing's contribution to GDP in Arkansas is almost 6% whereas it is only 4% in Mississippi. However, Arkansas' agricultural retail contributed less than 2% to GDP by State, behind Tennessee, Missouri, Oklahoma, Missis-

sippi, Texas, the Southeast region and the U.S. GDP.

The diversity of Arkansas' Agriculture and Food Sector is the foundation of its strength. Arkansas' varied climate and terrain allows for row crops in the east, livestock and poultry in the west, and forestry in the south. For example, Arkansas was one of the top 25 states in the production of 24 different agricultural products in 2010 (USDA NASS, 2011b; USDA, 2007). Specifically, the state was the leading producer of rice, the second leading producer of broilers, and the third leading producer of upland cotton, cottonseed, and catfish in 2010 (USDA NASS, 2011b).

Forestland comprised 56% of Arkansas' total land base in 2010 (USDA Forest Service, 2011). Relatively low-valued timber is processed to produce higher-valued products (e.g., lumber, paper, and furniture). States that are more than half forested, including Arkansas, Mississippi, and Tennessee, tend to have high values of agricultural processing (Fig. 1) (Mississippi Forestry Association, 2010; Oswald et al., 2004).

Arkansas remains number one of seven contiguous states in terms of the Agriculture and Food Sector as a percentage of GDP in 2009, but the importance of the Agriculture and Food Sector has decreased slightly in terms of its share of the Arkansas GDP in 2009 and in the value of the Agriculture and Food Sector GDP.

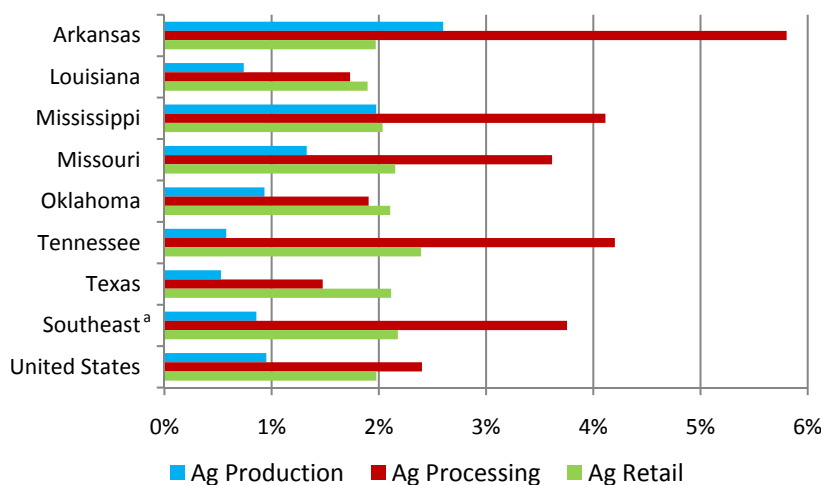
**Table 1. The Agriculture and Food Sector as a Percentage of GDP by State, 2009.**

State/Region	Percent of GDP by State
Arkansas	10.37
Louisiana	4.37
Mississippi	8.12
Missouri	7.10
Oklahoma	4.94
Tennessee	7.17
Texas	4.12
Southeast <sup>a</sup>	6.79
U.S.	5.33

Source: USDC, BEA (2011b).

<sup>a</sup> The BEA includes Ala., Ark., Fla., Ga., Ky., La., Miss., N.C., S.C., Tenn., Va., and W. Va. in the Southeast region.

**Fig. 1. Production, Processing, and Retail as a Percentage of Arkansas GDP, 2009.**

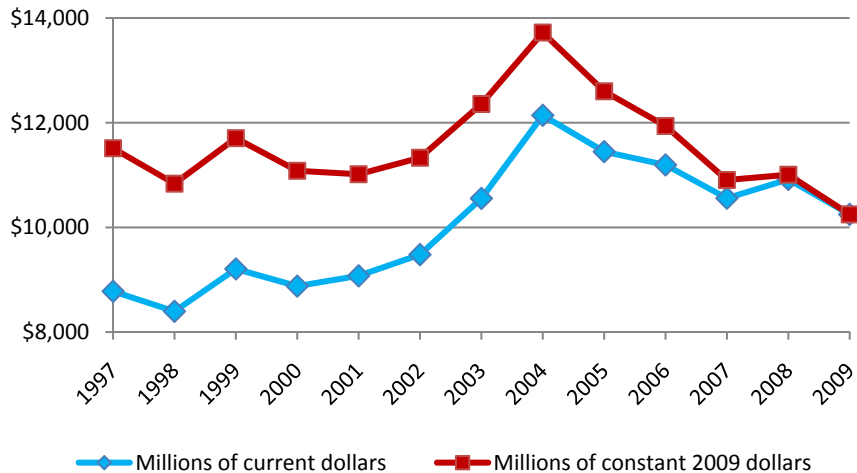


Source: USDC, BEA (2011b).

Note: Calculated from current dollars.

<sup>a</sup> The BEA includes Ala., Ark., Fla., Ga., Ky., La., Miss., N.C., S.C., Tenn., Va., and W.V. in the Southeast region.

Fig. 2. Arkansas' Agriculture and Food Sector GDP, 1997 to 2009.



Source: USDC, BEA (2011b).

## 1.4: Agriculture and Food and the Arkansas Economy

In 2009, Arkansas' total GDP was \$98.8B (constant 2009 dollars are used throughout this section, unless otherwise noted) (USDC BEA, 2011b) with the Agriculture and Food Sector contributing \$10.2B to the total. During the 1997 to 2009 period, the GDP of Agriculture and Food lost 11% of its value. However, the period was also marked by volatility. From 1998 to 2004, the GDP of Agriculture and Food steadily increased to its peak of \$13.7B in 2004. Except for a slight rebound in 2008, the value of the Agri-

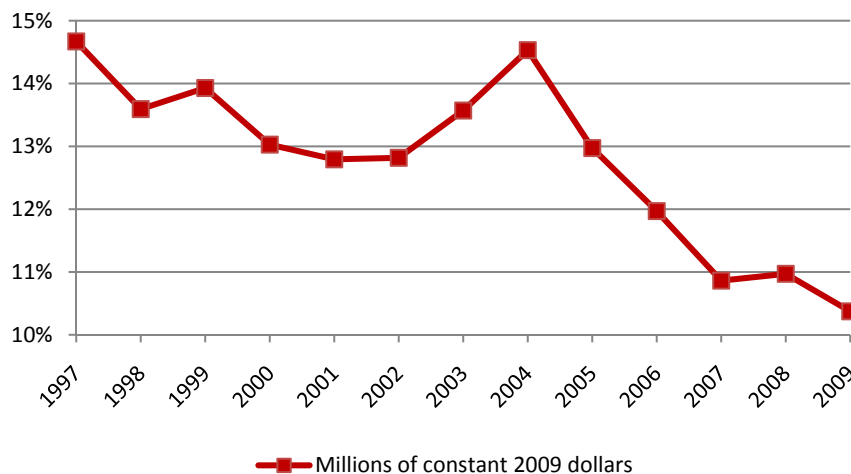
culture and Food Sector declined 25% from 2004 to 2009 due predominantly to decreases in production levels and prices for various commodities across these years. (More details are provided throughout Part 1 of this document). Additionally, the 2009 value of the GDP of the Agriculture and Food Sector was down 7% from 2008 (Fig. 2). High cash receipts for Arkansas in 2008 may explain the increase of the Agriculture and Food Sector's GDP in 2008. In real dollars, Arkansas 2009 agricultural cash receipts

for all commodities were valued at \$7.2 billion, down from \$7.4 billion in 2008 (USDA NASS, 2010, 2011a).

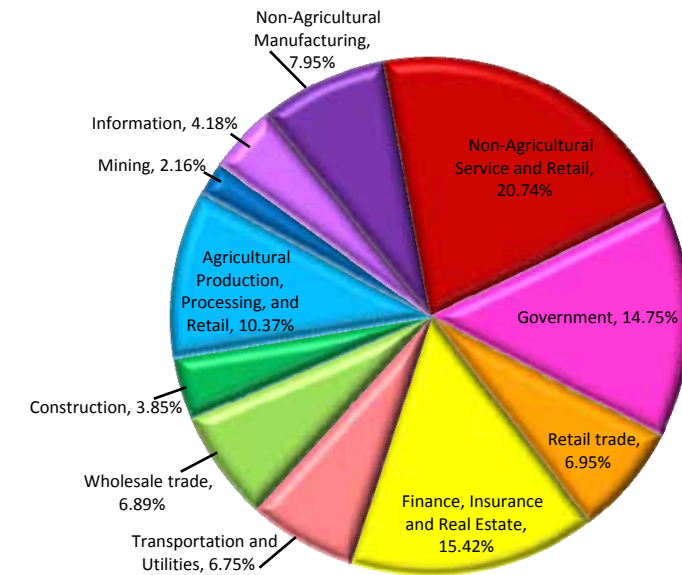
From 1997 to 2009, the percentage change in the share of Arkansas GDP attributable to the Agriculture and Food Sector decreased 29%. In 1997, the Agriculture and Food Sector's contribution to GDP was approaching 15%, the highest share from 1997 to 2009. The portion of the state GDP attributed to Agriculture and Food fell to under 13% in 2001. Much of this loss is explained by falling prices for agricultural products between 1997 and 2002. The percent contribution of the Agriculture and Food Sector rebounded in 2004 to near the 1997 level. Despite a small rally in 2008, the portion of Arkansas GDP attributed to the Agriculture and Food Sector has been steadily declining since 2004. Year 2009 marked Agriculture and Food's lowest contribution to Arkansas GDP since 1997 at 10.4% (\$10.2B), undercutting the previous low of 10.9% (\$10.9B) in 2007 (Fig. 3).

Arkansas' total GDP only experienced a 2% loss during the recession from 2007 to 2009. In fact, 2007 and 2008 were the first and second highest GDPs recorded in Arkansas since 1997. However, as is reflected by its declining share of

Fig. 3. The Agriculture and Food Sector's Share of Arkansas GDP, 1997 to 2009.



Source: USDC, BEA (2011b).

**Fig. 4. Sector Components of Arkansas' GDP, 2009.**

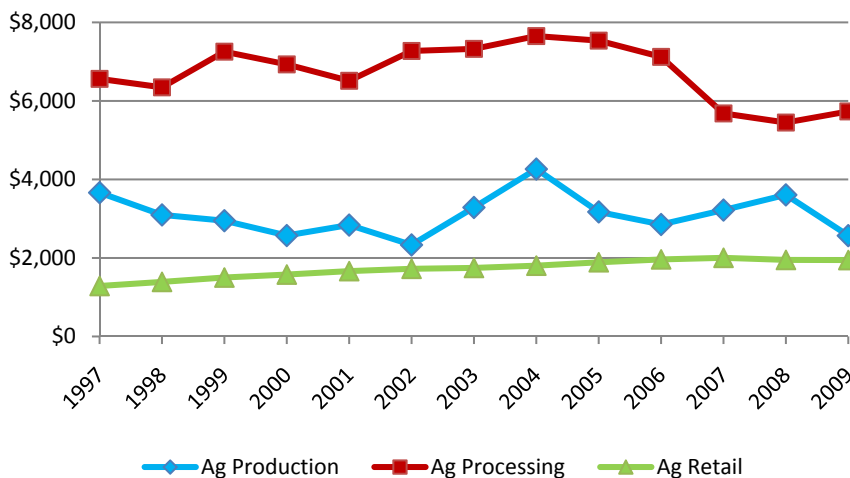
Source: USDC, BEA (2011b).

Note: Calculated from current dollars.

Arkansas GDP, Agriculture and Food lost 6% of its value from 2007 to 2009, pointing toward deeper recession effects for agriculture than the economy as a whole.

The diversity of Arkansas's GDP components may provide partial insulation from recession effects. As in previous years, the Agriculture and Food Sector ranks as the fourth largest sector in the state (Fig. 4). The only sectors larger are Non-Agricultural Service and Retail (21%), Finance, Insurance, and Real Estate (15%) and Government (15%).

The three major components of the Agriculture and Food Sector—agricultural production, agricultural processing and agricultural retail—totaled \$2.6B, \$5.7B, and \$1.9B GDP, respectively (Fig. 5). Both agricultural production and retail showed a decrease from 2008, but agricultural retail only lost a small fraction (0.2%) of its GDP value. On the other hand, agricultural production GDP lost 29% of its value from 2008 to 2009. Agricultural processing experienced a slight increase of 5% from 2008 to 2009.

**Fig. 5. GDP for Arkansas' Agricultural Production, Processing, and Retail, 1997 to 2009.**

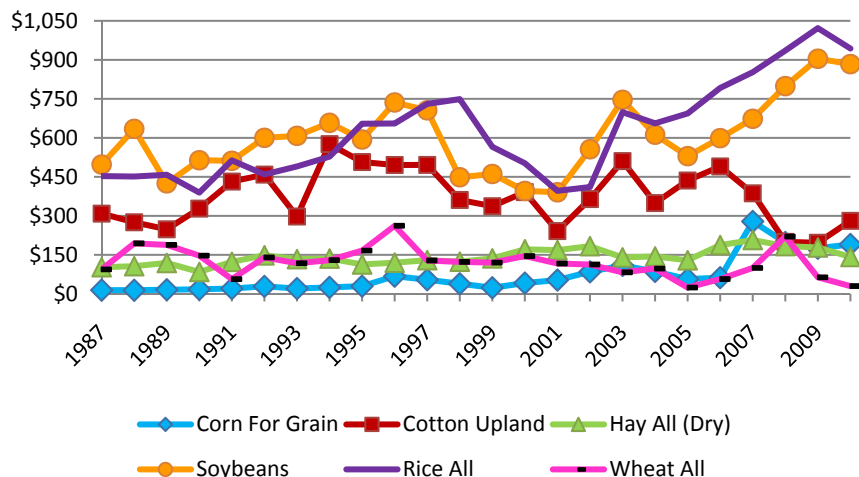
Source: USDC, BEA (2011b).

Note: Presented in millions of constant 2009 dollars.

## 1.4.1: Agricultural Production

Crop and animal production, forestry, aquaculture, and horticulture are the primary agricultural production industries found in Arkansas. Arkansas was ranked in the top 25 producing states for 24 commodities in 2010, including first in rice, second in broilers, and third in cotton, cottonseed, and catfish (Haydu, Hodges, and Hall, 2006; USDA 2007; USDA NASS, 2011b). Agricultural production declined by 30% between 1997 and 2009 (Fig. 5). However, this was not a constant downward trend. Instead, agricultural production rose and fell several times during this twelve year period. From 1997 to 2002, agricultural production declined except for a small rally in 2001 and fell to its lowest level (\$2.3B) in 2002, representing a loss of 36% in GDP since 1997. Growth stalled in these years due to low agricultural prices in the world market, especially in the Crops Sector. Barriers to poultry exports also contributed to the decline (USDA ERS, 2008b). However, the value of the GDP of agricultural production then rebounded in 2003 and 2004 to \$4.3B, which was the highest value for the 1997 to 2009 period, which represented an increase over 2002 of 83%. In 2003 and 2004, farmers experienced consecutive years of large harvests for major crops and unusually high prices for livestock and milk. These factors combined to yield record net farm income for the U.S. farm sector in 2004 (\$90.3B in constant 2005 dollars) (USDA ERS, 2011d). Although the value of animal agriculture production increased in 2005, these increases did not inhibit a decrease in agricultural production GDP in both 2005 and 2006, when it fell to \$2.9B. However, the value of the GDP of agricultural production increased in 2007 and 2008. The rally was short-lived, as in 2009, agricultural production had lost 40% of its 2004 value and declined to \$2.6B. Although both crops and livestock components of production declined, livestock accounted for the majority of the loss (USDA ERS, 2011a). The value of dairy production decreased most sharply nationally, but Arkansas was more affected by the loss in value of the poultry sector, since it is the largest production sector in the state.

Fig. 6. Arkansas' Crops Value of Production, 1987 to 2010.



Source: USDA, NASS (2011b).

Note: Presented in constant 1990-1992 dollars.

For selected crops: rice, soybeans, cotton, hay, wheat, and corn.

#### 1.4.1.1: Crops Production

The time-series graph of major crops in Arkansas shows trends in value of production from 1987-2010. Despite volatility and a substantial decline of the value of crop production from 1998 to 2001, the value of crops production has increased overall by 64% from 1987 to 2010 (Fig. 6). Over this period, rice and soybeans have consistently been the highest valued crops, with rice and soybeans representing an average of 31% and 30%, respectively, of total value of field and miscellaneous crops<sup>8</sup> over the years. Third is upland cotton, repre-

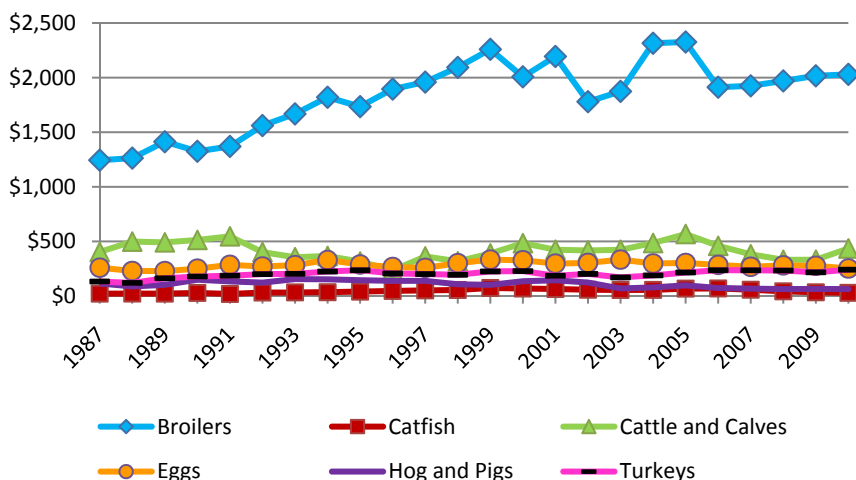
senting 19% of field and miscellaneous crops on average (USDA NASS, 2011b). In 2001, total crops value of production fell to the lowest level since 1987, down to \$1.5B. This decrease was due mostly to the downward trends of the values of the top three crops (rice, soybeans, and cotton) in Arkansas. From 1998 to 2001, rice lost 47% of its value, and from 1997 to 2001, soybeans and cotton lost 45% and 51%, respectively. However, from 2001 to 2003 crops prices and exports increased, and domestic and international demand for products was strong. As a result, the total value of crops production jumped

65% between 2001 and 2003. The gains were partly erased as the total market value (in constant 1990-1992 dollars) of crop production in Arkansas dropped in 2004 and again in 2005. During that time there was a general increase in output and prices for agricultural products in the U.S.; however, in Arkansas, cotton, rice, and soybean output increased, but prices did not. In 2008, Arkansas' crop value of production increased to the highest level over the period to \$2.6B. Much of the value can be attributed to record high global rice prices, attributable to exports barriers from other rice-producing countries, record high prices for fuel and fertilizer, and a weak U.S. dollar. Additionally, soybeans, the second largest crop in Arkansas, also experienced record prices (USDA ERS, 2008d). The total crops value of production has dropped off slightly since 2008, losing 4% of its value between 2008 and 2010.

#### 1.4.1.2: Animal Production

Animal production is also a major component of Arkansas' agricultural production. In terms of constant 1990-1992 dollars, animal production cash receipts (which measure income and sales from marketing) in Arkansas increased from \$2.3B in 1987 to \$3.1B in 2010, representing a 34% gain in value (USDA ERS, 2011b). From 2009 to 2010, animal production cash receipts increased 4%. Broilers have consistently been the largest portion of animal cash receipts in Arkansas, constituting an average of 60% of value over the 1987-2010 period (Fig. 7). The 2007-2009 recession and its resulting high unemployment negatively affected domestic animal protein demand. Cash receipts for Arkansas' cattle and calves declined 28%, hogs and pigs fell 12%, and turkeys fell 8% from 2006 to 2009. However, cash receipts for broilers actually increased 5% over the same period (USDA ERS, 2011a), due in part likely to a substitution to more affordable animal protein sources. Cash receipts for many livestock products in Arkansas were virtually unchanged from 2009-2010, but some experienced significant changes. Catfish and eggs had the largest losses from 2009-2010: 15% and 9%, respectively. Honey, cattle and calves, and turkeys gained the most value from 2009-

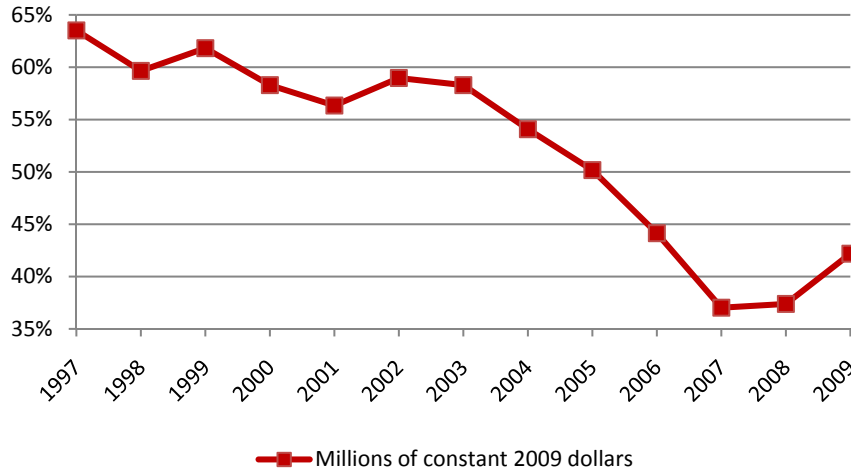
Fig. 7. Arkansas' Livestock and Livestock Products Value of Cash Receipts, 1987 to 2010.



Source: USDA, ERS (2011b).

Note: Presented in constant 1990-1992 dollars.

For selected products: broilers, cattle and calves, eggs, turkeys, hogs and pigs, and catfish.

**Fig. 8. Agricultural Processing's Share of Arkansas' Manufacturing GDP, 1997 to 2009.**

Source: USDC, BEA (2011b).

2010. Honey doubled in value (from \$1M to \$2M), cattle and calves increased 31%, and turkeys gained 11%. The substantial gains for cattle and calves and turkeys returned cash receipts for 2010 (\$436M and \$241M, respectively) to near pre-recession values (\$460M and \$236M in 2006, respectively).

#### 1.4.1.3: Forestry Production

Arkansas' land base is composed of approximately 18.7M acres of forest (56% of total land base) (USDA Forest Service, 2011). The state is fourth in the production of saw-logs in the South<sup>9</sup> (Johnson, Bentley, and Howell, 2009). There were 20.0M tons of timber (soft- and hardwood) removed from forests in Arkansas in 2010, valued at \$413M. Numbers for 2010 show an increase in both production and value of the timber over 2009. From 2005 to 2009, forestry production and value of production decreased steadily, but rebounded in 2010. The five-year (2006 to 2010) low in both production and value was in 2009 (16.5M tons removed valued at \$300M), but from 2009 to 2010, value increased 38% and production increased 21% (Arkansas Forestry Commission, 2011). Forestry production is essential to Arkansas' economy. Foresters supply wood product manufacturers with raw materials. Arkansas' timber is fundamental to such industries as paper, lumber and wood, and furniture and fixtures. As will be discussed later, processed goods derived from forestry production are the third

largest component of processed agricultural goods, in terms of employment, labor income, and value added.

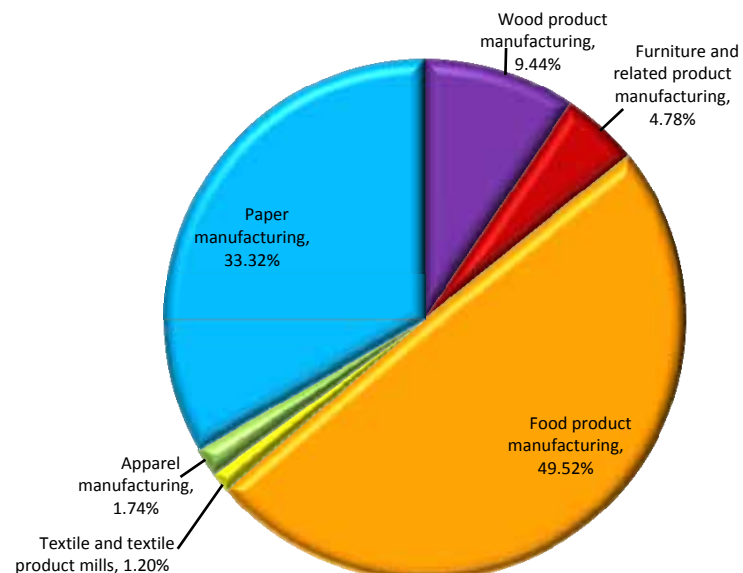
#### 1.4.1.4: Agriculture-Related and Support Industries

Agriculture-related industries include commercial fishing, hunting and trapping from the natural environment (not farm-raised), and agriculture and forestry support activities (e.g., cotton ginning and crop dusting). In pre-2007 reports, on-farm construction was also included; however, the data are no longer available and have been dropped from the analysis. The largest of these indus-

tries is agriculture and forestry support activities. These activities may be performed by an independent firm as an input required for the production process for a given crop, animal, or forestry industry. Typical activities include, but are not limited to, cotton ginning; soil preparation, planting, and cultivating; breeding services and livestock sprayers. A smaller portion of the sector is made up of commercial fishing, hunting, and trapping activities. In 2009, 2,677 commercial licenses were issued: 348 hunting and trapping and 2,329 fishing. Additionally, 17 wildlife management business licenses and 491 resident hunting guide licenses were issued in 2009 (AGFC, 2011).

## 1.4.2: Agricultural Processing

Processed crop, livestock, and forestry products are an integral part of agriculture in Arkansas. Arkansas' manufacturing sector depends upon raw materials from the crops, animal agriculture, and forestry sectors for use in many of its largest industries. Poultry production and processing, for example, may lead to such processed goods as frozen chicken, eggs, animal feed, and animal oils; cotton production may lead to ginning and processing of materials to be used in the textile industry. Figure 5 details the time

**Fig. 9. Components of Arkansas' Agricultural Processing Sector GDP, 2009.**

Source: USDC, BEA (2011b).

Note: Presented in current dollars.



series trend of agricultural processing in Arkansas from 1997 to 2009. Over the twelve year period, the value of agricultural processing has declined by 13%. From 2001 to 2004, agricultural processing was on an upward trend, peaking at its period high of almost \$7.7B in 2004. Since 2004, agricultural processing has decreased 29% from 2004 to \$5.4B in 2008, but showed a slight increase in 2009 to \$5.7B.

Agricultural processing's share of manufacturing has been generally declining since 1997, except for the increase experienced in 2009. Over the twelve year period, the percentage change in the share of manufacturing has decreased 34% (Fig. 8). Since 1997, agricultural process-

ing's share of manufacturing GDP has ranged from a low of 37% in 2007 to a high of 64% in 1997.

Food Product Manufacturing, Paper Manufacturing, and Wood Product Manufacturing accounted for 92% of Arkansas' processed agricultural goods in 2009. The contribution of individual agricultural processing industries to agricultural processing in 2009 is shown in Fig. 9. In 2009, agricultural processing's share of the overall manufacturing sector was 42% in 2009, posting a percentage change increase of almost 13%. While most agricultural processing sectors declined from 2008 to 2009 (Wood Product Manufacturing experienced the greatest percentage change loss at 22%),

the increase in the value of Food Product Manufacturing more than offset other agricultural processing declines. A discussion of each industry's percentage of GDP over time follows.

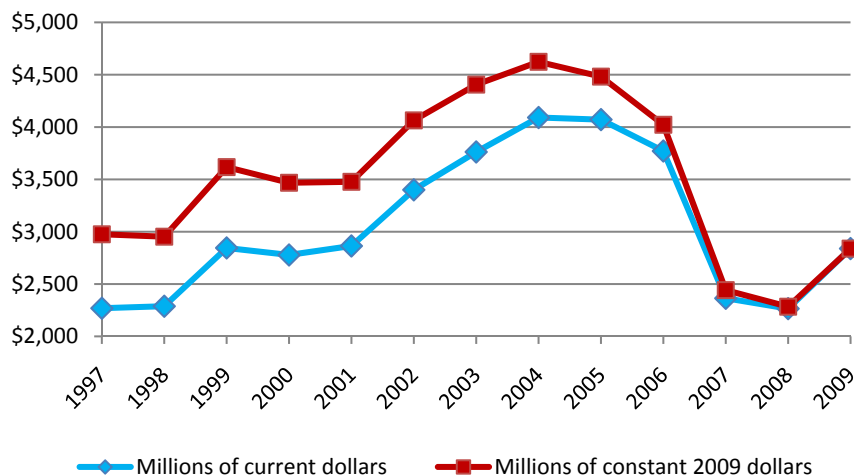
#### 1.4.2.1: Food Product Manufacturing

The Food Product Manufacturing Sector is consistently the largest agricultural processing sector in Arkansas, accounting for almost 50% of agricultural processing's GDP in 2009. This sector declined 5% over the 1997 to 2009 period. The Food Product Manufacturing Sector's GDP grew 33% from 2001 to 2004 to \$4.6B, the period high, but then began declining from 2004 to 2008 and dropped 51% from 2004 to 2008 (Fig. 10). Much of the growth in the industry from 2001 until 2004 can be explained by the build-up in production and processing capacity due to global demand expectations in the 1990s, when global trade was expected to rapidly expand into the 2000s and beyond. This anticipated demand growth was due to an evolving, bold interconnected global marketplace, which many analysts at the time believed would bring increased demand for U.S. and Arkansas raw and processed agricultural products. The decelerating global economic growth from 1997 to 2003, attributable to the Asian Financial Crisis, significantly impacted the industry in the 2001-2004 period due to a combination of lower commodity prices and record high levels of production for a number of commodities. Food Product Manufacturing's decline from 2004 to 2008 was likely a result of the industry's rebalancing production and processing output to conform to the post global financial crisis world where input costs (e.g., energy) and commodity price volatility were at modern historic levels (pers. comm., Robert E. Coats, 2011; unreferenced). In 2009, the sector showed a rebound from \$2.3B in 2008 to \$2.8B in 2009, a 24% increase.

#### 1.4.2.2: Paper Manufacturing

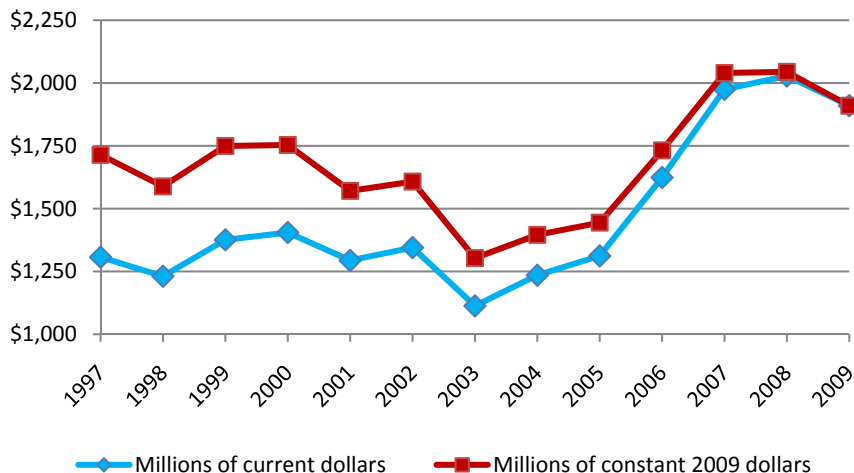
The Paper Manufacturing Sector has been the second-largest processing industry in Arkansas since 1997. This sector increased 11% from 1997 to 2009. However, while pulp and paper manufacturers in North America were affected by the Asian financial crisis during the mid-

Fig. 10. The GDP of Arkansas Food Product Manufacturing, 1997 to 2009.

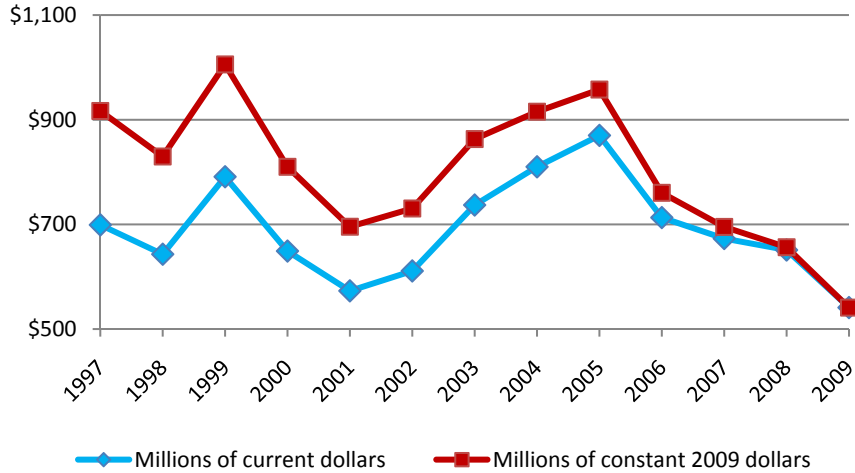


Source: USDC, BEA (2011b).

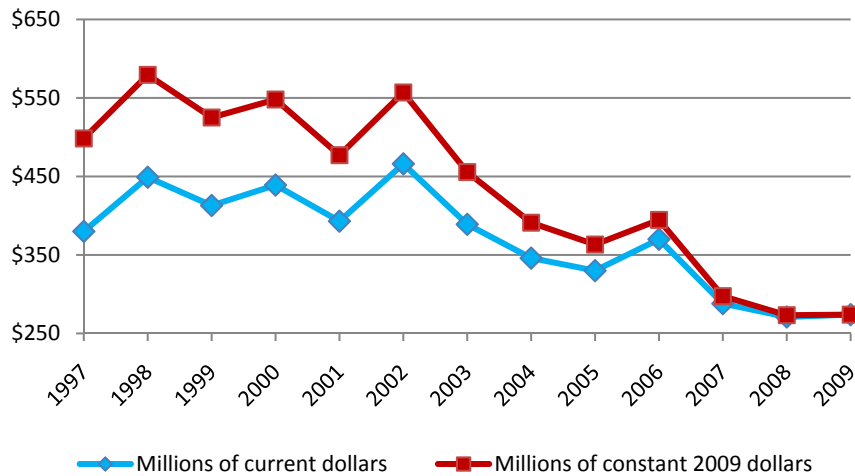
Fig. 11. The GDP of Arkansas Paper Manufacturing, 1997 to 2009.



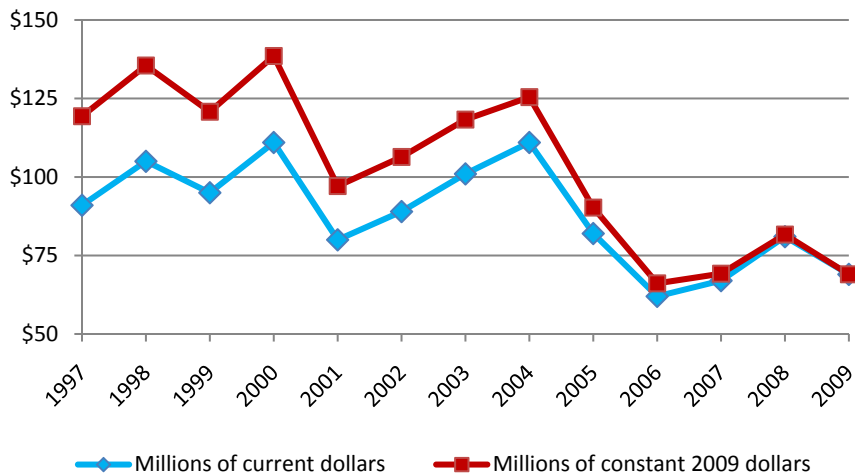
Source: USDC, BEA (2011b).

**Fig. 12. The GDP of Arkansas Wood Manufacturing, 1997 to 2009.**

Source: USDC, BEA (2011b).

**Fig. 13. The GDP of Arkansas Furniture and Related Products Manufacturing, 1997 to 2009.**

Source: USDC, BEA (2011b).

**Fig. 14. The GDP of Arkansas Textile and Textile Product Mills, 1997 to 2009.**

Source: USDC, BEA (2011b).

to-late 1990s (Simard, 1999), which continued to impact manufacturers through 2001, impact to Arkansas manufacturing was minimal. Figure 11 shows a 7% decline in the industry's value from 1997 to 1998, but with a rebound of 10% the following year. This sector's lowest GDP in the period occurred in 2003, but until 2008 the sector experienced strong growth, as by 2008 the GDP of the Paper Manufacturing Sector had improved by 57%. In 2008, its GDP was at its period high of \$2.0B (Fig. 11). However, the GDP declined 7% in 2009 down to \$1.9B.

#### 1.4.2.3: Wood Product Manufacturing

Arkansas' third largest agricultural processing sector lost 41% of its value from 1997 to 2009. After a brief increase from 1998 to 1999, the GDP of Wood Product Manufacturing plummeted 31% from 1999 to 2001 (Fig. 12). As explained in detail in Popp, Vickery, and Miller (2005), most of the decline in this industry was attributed to a slow-down in the international market for U.S. wood chips and a drop in soft wood prices that followed an influx of Canadian wood on the market. This sector experienced steady growth from 2001 to 2005, and the GDP for wood product manufacturing increased by 38% to \$958M. Economic activity in the U.S. was strong in 2005 and during the first half of 2006; however, new housing construction weakened during the second half of 2006 (USDA Forest Service, 2009). New construction accounts for more than one-third of the U.S. annual consumption of sawn wood and structural panels, as well as other soft- and hardwood products. New privately owned housing units construction starts were at the highest level since 1972 in 2005 in the South,<sup>10</sup> at 996,100 starts. From 2005 to 2009, new starts declined sharply to 278,200 starts, representing a 72% slowdown. New starts in 2009 marked the fewest annual housing starts in the South since at least 1959; the next fewest starts in the South were in 1991, at 414,100 starts (USCB, 2011b). As a result of the crash in new construction, the sector's value has been steadily declining since 2005, losing 44% of its value from 2005 to 2009. The sector was at its lowest GDP of the period in 2009 at \$541M.

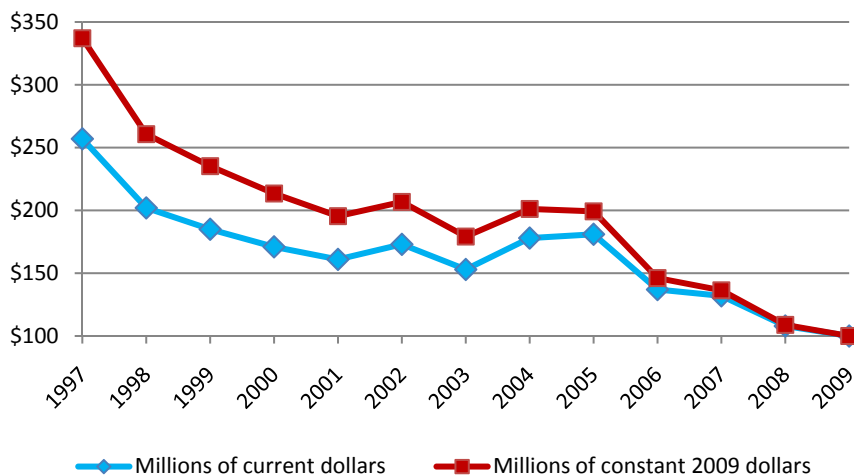
#### 1.4.2.4: Furniture and Related Products Manufacturing

Over the 1997 to 2009 period, Furniture and Related Products Manufacturing lost 45% of its value. Its GDP was volatile from 1997 to 2002 and reached the period high level of \$579M in 1998. This sector benefited from a strong resale housing market throughout the 1990s.

The resale housing market is a leading indicator of demand for the furniture industry (Schuler, Taylor, and Araman, 2001). The housing and real estate markets gained momentum in 2002, represented by the sharp increase in this sector for that year; however, imports of furniture and other wood producers were also on the rise, flooding the market with less

expensive substitutes for U.S. manufactured products. A flooded market partially led to the 35% drop from 2002 to 2005 to \$363M. Since 2002, except for limited recovery in 2006, the sector has been on a marked path of decline from \$557M in 2002 to \$274M in 2009, representing a 51% decrease (Fig. 13). In 2009, the sector growth was almost flat. Much of the decline since 2006 may be attributed to recession effects since Furniture and Related Products Manufacturing is so closely tied to the housing construction and real estate markets. These markets have been anemic, as the 2007-2009 recession resulted in declining new construction existing home sales.

**Fig. 15. The GDP of Arkansas Apparel, Leather, and Allied Products Manufacturing, 1997 to 2009.**



Source: USDC, BEA (2011b).

**Fig. 16. The GDPs of Arkansas' Agricultural Processing Sectors, 1997 to 2009.**



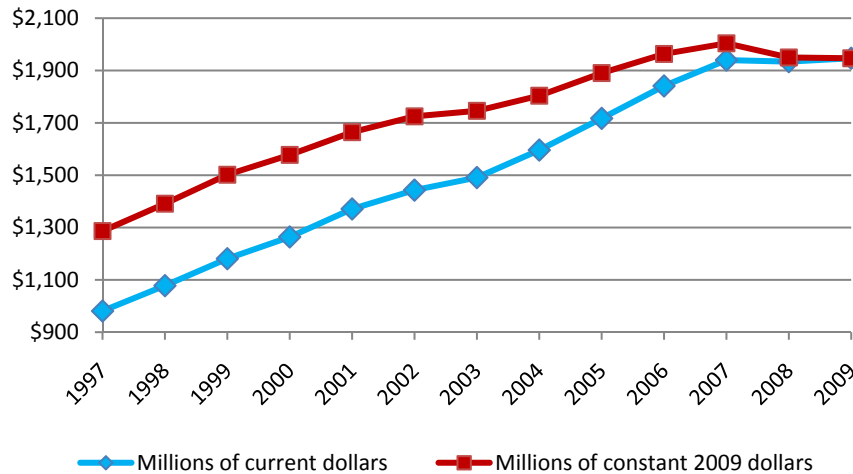
Source: USDC, BEA (2011b).

Note: Presented in millions of constant 2009 dollars.

#### 1.4.2.5: Textile and Textile Product Mills

The Textile and Textile Product Mills Sector has been in decline for three decades, and from 1997 to 2009, its value declined 42%. Technological improvements and import competition have reduced the industry's activity in the U.S. The decline in textile and apparel industries accelerated following the implementation of the North American Free Trade Agreement (NAFTA) with Canada and Mexico in 1994. Although the overall effect of NAFTA on the U.S. economy is controversial, some studies have concluded that NAFTA has actually increased demand for U.S. textiles in Mexico and Canada, which may explain some of the growth in 2002 and 2003 (USCC, 2002; USDA FAS, 2001; Wall, 2000). Furthermore, in March 2001, the economy slipped into recession, which ended in November 2001 (NBER, 2011). The end of the 2001 recession may have also attributed to the growth in the following years. In Arkansas, the sector has been the smallest component of agricultural processing during the period from 1997 to 2009 but has been volatile. Much of the steep decline in 2001 occurred because a major textile manufacturer closed its last plant in Arkansas in 2000. From 2004 to 2006, Textile and Textile Product Mills declined in value by almost half (47%) to the period low of \$66M (Fig. 14); The sector recovered briefly from 2006 to 2008, but the value of its GDP decreased 16% from \$82M in 2008 to \$69M in 2009.

Fig. 17. The GDP of Arkansas Food Services and Drinking Places, 1997 to 2009.



Source: USDC, BEA (2011b).

#### 1.4.2.6: Apparel, Leather, and Allied Products Manufacturing

As seen in Fig. 15, the GDP for Apparel, Leather, and Allied Products Manufacturing has experienced alternating periods of growth and decline, but has experienced a general overall decline in GDP from 1997 to 2009. During this period, the sector has declined from a high of \$337M in 1997 to a low of \$100M in 2009, representing a 70% drop over the period. Much like the textile industry, apparel manufacturing has been in decline in the U.S. for over thirty years. The decline has also been partly attributed to NAFTA, which possibly accelerated the drop in apparel manufacturing in the late 1990s and the shifting of apparel manufacturing out of the state to countries with lower wage rates.

#### 1.4.2.7: Agricultural Processing Summary

Figure 16 shows all components of agricultural processing to better compare the sectors and their contributions over time to agricultural processing. Food Product Manufacturing has consistently contributed the largest share of agricultural processing, but has shown substantial volatility over the period, including a substantial decline in value from 2004 to 2008. The second largest component, Paper Manufacturing, has shown signs of volatility, but its pattern is almost perfectly anticyclical to Food Product Manufacturing, partially insulating agricultural processing. The remaining sectors contribute the least to the GDP of agricultural processing, and have either been relatively stable over the period or in steady decline.

### 1.4.3: Agricultural Retail

#### 1.4.3.1: Food Services and Drinking Places

The GDP in agricultural retail in 2009 was \$1.9B (Fig. 17). From 1997 to 2007, agricultural retail increased 56%. Until 2007, there was an increase in the GDP of agricultural retail each year since 1997. Food service operations, including restaurants, have steadily increased their share of total food expenditures over time contributing to the steady increases in the sector.<sup>11</sup> Food service operations, including restaurants and fast food outlets, have increased their share of total food spending over the years. Long-term trends show that as household incomes have increased, and more women have entered the workforce, the share of household spending for prepared foods and meals has risen. By 2006, food away from home spending by households and businesses account for almost half of all food spending, up from 39% in 1980, further evidence of the market forces behind the increases in agricultural retail GDP (USDA ERS, 2008c). From 2007 to 2009, the sector lost 3% of its value of GDP, its first decline since 1997. This decline was possibly due to increases in dining at home and decreasing expenditures per capita on food away from home during the most recent recession, officially from December 2007 to June 2009 (PRNewswire, 2011; NBER, 2010).

## 1.5: Summary of the Trends in Gross Domestic Product by State for Agriculture and Food

The GDP by State data from BEA indicate that Arkansas' Agriculture and Food Sector has contributed a larger share of GDP by State to the overall Arkansas state economy than does the Agriculture and Food Sector in other states of the southeastern U.S. since 1969. Arkansas' agricultural production declined in 2009, after two consecutive years of gain. The decline is likely due to a combination of increasing expenses and declines in

many commodities' cash receipts in 2009. These trends are exemplified in data for Arkansas net farm income, which declined 39%, from \$2.5B in 2008 to \$1.5B in 2009 (in constant 2009 dollars) (USDA ERS, 2011c; USDA NASS, 2011a). Most agricultural manufacturing sectors declined in 2009, except Furniture and Related Product Manufacturing and Food Product Manufacturing. The increase in Food Product Manufacturing was by far

the larger gain, at 24% from 2008 versus 0.3% for Furniture and Related Product Manufacturing. Finally, agricultural retail has experienced two years of slight decline for the first time in the 1997-2009 period, most likely due to changes in consumer spending habits during the deepest contraction since BEA estimates began in 1947 (PRNewswire, 2011; USDC BEA, 2011a).

# 2: Direct, Indirect, and Induced Contributions of the Aggregate Agriculture Sector

## 2.1: Introduction

The total economic contribution of Arkansas' Aggregate Agriculture Sector is much more than the direct contribution of agricultural production and processing. To measure agriculture's total economic contribution, the indirect and induced contributions of agriculture must also be taken into consideration. Indirect contributions occur when the Aggregate Agriculture Sector purchases goods and services from local businesses. The production of fertilizers and certain farm machinery and equipment, for example, are indirect contributions of agricultural production. Agriculture's induced contributions are measured by increases in economic activity to satisfy the personal consumption by employees of the Aggregate Agriculture Sector and by employees of firms that provide inputs to the Aggregate Agriculture Sector. The sum of direct, indirect, and induced agricultural effects provides a measure for the total economic contribution of agriculture. Part 2 of the report discusses the overall economic contribution of agriculture to Arkansas' economy, considering the direct, indirect, and induced effects of the Aggregate Agriculture Sector in 2009.

## 2.2: Methods

As in our previous reports, the economic contribution of Arkansas' Aggregate Agriculture Sector was computed using data and input-output (I-O) modeling software from Minnesota IMPLAN Group, Inc. (MIG; Stillwater, Minn.). Contributions are reported in terms of employment, labor income, and value added (introduced previously and described in depth in section 2.3). The only sectors included as part of the agriculture sector in the analysis are those directly producing agricultural products, processing raw agricultural products, or providing agricultural services to producers. This is our basic rule for inclusion/exclusion of industries as part of the Aggregate Agriculture Sector. Any sector less than 100% tied to agriculture is not included as part of the Aggregate Agriculture Sector (such as restaurants, grocery stores, fertilizer manufacturers and distributors). The Aggregate Agriculture Sector is made up of three types of industries: agricultural production industries, agricultural processing industries, and agriculture-related industries. Definitions for these industries for this analysis are provided below and in Appendix A. Additionally, the indirect and induced contributions of the non-agricultural sectors are included in the total contribution of agriculture. Note that what is called "contribution" in part 1 of this document is calculated differently than in part 2. The "contribution" as used in part 1 only includes the direct agriculture production and processing activities plus the food services and drinking industry. The "contribution" in part 2 includes the direct, indirect and induced effects of agricultural production and processing activities, and excludes the direct effect of the food services and drinking industry. "Contribution analysis" typically describes that portion of a region's economy that can be attributed to an existing industry, event or policy by identifying all the direct and backward linkages in the study area (MIG).

### 2.2.1: General Procedures

For the economic contribution analysis of the agriculture sector, Part 2, the entire measure of economic activity in the industries that make up the Aggregate Agriculture Sector (crop, livestock, and forestry production and processing industries, and ag-related activities) are considered to be 100% agriculture. This is the basic rule for inclusion/exclusion of industries as part of the agriculture sector. The Aggregate Agriculture Sector is made up of three kinds of industries:

agriculture production industries, agriculture processing industries, and agriculture-related industries. The version 3.0 IMPLAN model was used to estimate the contribution of agriculture to the state economy. There are several key considerations in the construction of the IMPLAN I-O models used to measure the economic contribution of the Aggregate Agriculture Sector. For each step of the analysis, careful consideration was taken to ensure that the analysis reflects accurately the Arkansas Aggregate Agriculture Sector. The main steps for constructing

the models were: data reconciliation, selection of multipliers, estimating trade flows, the transaction basis, and local purchase coefficients.

The Aggregate Agriculture Sector is made up of three broad categories of agricultural industries: agricultural production industries, agricultural processing industries, and agricultural related industries. The output data for the agricultural production industries (IMPLAN sectors 1 – 14)<sup>12</sup> were checked for accuracy against the latest available estimates for the value of production from NASS

and ERS. The agricultural production data in IMPLAN are sometimes unreliable for three reasons. First, output data for all industries outside of agriculture are estimated from a large number of sources, but data for agricultural production are derived entirely from NASS value of production data and the most recent U.S. Census of Agriculture. Due to NASS publication lags, IMPLAN data are often released using preliminary estimates for a given year. To check the accuracy of the IMPLAN data, the agricultural production industries are compared against finalized NASS/ERS data for the relevant year. Second, there are also non-disclosure problems, particularly at the county level (which is why analysis is done at the state level); this makes data reconciliation between IMPLAN and NASS data difficult at the county level. Third, employment and income data for the agriculture sectors are difficult to estimate since there are no employment and earnings data collected on a commodity basis. The only farm employment and income data are derived from BEA's Regional Economic Information System (REIS) program but these are only single farm employment and income numbers for all agriculture sectors combined. MIG collects estimates of output and creates vectors of employment and income to allocate the single REIS value to the separate IMPLAN agricultural production sectors (Lindall, 1998). MIG encourages analysts with better agriculture data to use it when building models (Olson and Lindall, 2009).

The default IMPLAN data for IMPLAN agricultural production sectors 1-14 were updated with the most recent NASS/ERS output estimates for the state of Arkansas (USDA ERS, 2011b; USDA NASS, 2011b). The default output data was changed to reflect the NASS/ERS output estimate. For Hogs and Pigs and for Cattle and Calves, gross income is used instead of value of production or cash receipts because it is defined as cash receipts plus on-farm or home consumption of slaughtered animals, which is most similar to other commodities' measurements. For any sector where a change was made to the value of output, a change corresponding to the percent change in output was also made to all four components of value added. This holds the relationship between Total Industry Output and Total Value Added (a fundamental re-

lationship in I-O analysis) constant, and the model production functions are left unchanged. Additionally, for the poultry production sector, output per worker estimates are changed to reflect the 2007 census of agriculture employment numbers (USDA 2007). These numbers are newer and more accurate than those used by MIG to estimate poultry employment; this method allows for the number of jobs in sector 13 to be changed to reflect the census output per worker. Output per worker is calculated by dividing the census baseline output by the census total number of poultry jobs. Then, output per worker for the data year is calculated using the census number of poultry jobs and the data year output from NASS. Lastly, the data year output per worker is adjusted with IMPLAN's output deflator for sector 13, and number of poultry jobs for the data year is calculated by dividing the data year output value by the adjusted output per worker for the data year. Once the default IMPLAN data have been updated to reflect the most recent NASS/ERS estimates, the type of multiplier used to construct the model is selected.

Multipliers describe the response of the economy to a change in economic activity and estimate changes in output, employment, income and value added. When analyzing the economic contributions of the Aggregate Agriculture Sector, type SAM (Social Accounting Matrix) multipliers are used to incorporate household expenditures into the models and to calculate the indirect and induced contributions. Type SAM multipliers are the direct, indirect and induced effects where the induced effect is based on both study area data and additional information in the social account matrix. The SAM framework tracks both market and non-market flows. Non-market flows are transactions between non-industrial institutions such as households-to-government, government-to-households, and so on. These flows are called "inter-institutional transfers" (Alward and Lindall, 1996). The SAM multiplier approach enables the model to account for commuting, social security tax payments, household income tax payments, and savings; it accounts for income that is not normally re-spent immediately within the region, such as commuting workers who live outside the region and retirement benefits. I-O models built with Type

SAM multipliers usually have results that are lower than an I-O model built with Type II multipliers (also available in IMPLAN). The Type SAM is the most appropriate choice for analyzing the contributions of the agriculture sector.

Estimating trade flows across regional boundaries is possibly the largest source of error in non-survey I-O models (Stevens and Trainor, 1980) and the selection and use of the RPC (regional purchase coefficient) is one way to eliminate some of the errors. The RPC represents the proportion of intermediate demands and local demands for a specific commodity that will be satisfied by local production (Olson and Lindall, 2009). For example, a RPC value of 0.80 means that 80% of the final demand for the industry is provided by local producers. The remainder (20%) is the portion imported from outside the region. To avoid over-estimation of the Aggregate Agriculture Sector, the model RPCs must be set to zero for these industries (see Appendix A), instructing the model not to purchase products and services from the Aggregate Agriculture Sector. This removes the agriculture sectors from the production function and eliminates multiple counting of economic activity in these sectors.

When conducting contribution analysis, IMPLAN allows the user to determine the transaction basis (industry or commodity) for the change in final demand. The industry basis assumes that the sector is solely responsible for the entire value of the product or service being sold (such as the *Oilseed Farming* industry is solely responsible for the entire value of soybeans produced). The commodity basis will allocate spending to all industry sectors that produce the goods and services purchased according to their market shares (such as retail purchases of groceries). Each industry included in the Aggregate Agriculture Sector is solely responsible for the entire value of the product or service in their respective industry; thus the industry basis is selected when running the analysis.

The final important procedure is to estimate the portion of activity that accrues to the local (in this case the state) economy. This was previously termed in IMPLAN as the Local Purchase Coefficient (LPC) but is now known as %Local. Only the portion of an industry's value that is produced locally should accrue to the local

economy. For instance, output in the *Oilseed Farming* industry (IMPLAN sector 1) involves the %Local being set at 100%, which means the entire output value of the industry accrued to the region because the goods in the sector are produced within the study region. Alternatively, spending by tourists on gasoline and oil involves setting the %Local to the actual percent of expenditures made in the study area. Estimating the economic contribution of the Aggregate Agriculture Sector involves applying 100% of each industry considered part of the Aggregate Agriculture Sector to the local economy.

### 2.2.2: Notes

The results of the economic contributions of agriculture are presented for four main sectors: Crops Sector, Animal Agriculture Sector, Forestry Sector, and Aggregate Agriculture Sector. For the first three sectors, agriculture is defined as those production and processing sectors in IMPLAN directly related to that sector (crops, animal, or forestry). The IMPLAN industries used to create those sectors are presented in Appendix A, Tables 1-3. Aggregate Agriculture is defined as the sum of the three sectors: Crops, Animal Agriculture, and Forestry Sectors plus the Agriculture-Related Sector (presented in Appendix A, Table 4). Aggregate Agriculture includes all of the IMPLAN industries listed in Appendix A, Tables 1-4. In some cases, results are presented as production and processing contributions instead of by Sector. The Aggregate Agriculture Sector's IMPLAN industries are presented grouped by production and processing in Appendix A, Tables 5-6. State level IMPLAN data for Arkansas for 2009 (the most recent data available) were used to calculate all contributions. The relevant employment, labor income, and value added contributions of agriculture are detailed in Appendix B and are summarized below. All labor income and value added figures in Part 2 are reported in current 2009 dollars, unless otherwise noted.

### 2.2.3: Measures of Economic Contribution

Total economic contributions are made up of three separate components: 1) direct contributions – generated by

farm production and processing of crops, poultry, livestock and forest products; 2) indirect contributions – generated when agricultural firms purchase materials and services from other Arkansas businesses; and 3) induced contributions – result when employees of agricultural firms and their suppliers spend a portion of their income within Arkansas. Each of these contributions makes up an important part of the total economic contribution of the Arkansas agriculture sector. The overall definition of the Aggregate Agriculture Sector in this study is limited to only those sectors considered to be 100% tied to agriculture, as defined in the “Methods” section. However, the indirect and induced contributions measure the contributions of those industries that are linked to agriculture but may not be entirely defined as agriculture. These industries represent important economic bases of many communities across the state and contribute to the jobs, income and value added in these communities due to their relationships with agriculture. Since sectors are interlinked throughout the state, expansion in activities in one sector can cause activities in other sectors to expand. Therefore, the contributions accruing in other sectors as a result of agricultural production and processing are included in the total economic contribution.

Economic contributions are often measured in terms of: 1) total industry output, 2) wages and labor income (wages, salaries, and proprietor income), 3) total value added, and 4) employment. I-O analysis can be used to assess the economic contribution of an existing sector. These measures are thought of as a sector's gross contribution to the regional economy. This is accomplished by “removing” the sector of choice from the I-O model and examining how this removal affects the economic activity in the region. This provides an estimate of the contribution of the sector by looking at the losses experienced (or activity generated) by the sector of interest.

Employment includes all wage and salary employees, as well as self-employed jobs, in a given sector. All jobs are not equal; they pay different wages, require different skills and different work hours, etc., which makes aggregate estimates or comparisons across regions and industries problematic. However, jobs as a mea-

sure of economic contribution are easily understood and an important component of economic activity. Labor income consists of two parts: first is proprietary income, which includes all income received by self-employed individuals including private business owners, owner-operators, etc; second is wages, which includes all worker salaries, payments, and fringe benefits paid by employers. Value added represents all payments to workers (labor income) plus indirect taxes and other property-type income, such as payments for rents, royalties, and dividends. Value added is comparable to GDP by State but is measured using different data sources and methods, so the data may not be precisely equal. Value added is the income and indirect business taxes generated by the activity and offers a more complete examination of the total economic contribution of an activity on a region; therefore, economists generally prefer value added to output as the measure for assessing the contribution of a given industry or activity to a region's economy (Olson and Lindall, 2009). Income and value added are also relatively clear measures of economic contribution that can be directly compared across industries and regions that contain a range of different economic activities.

Measuring the economic importance of an industry using output can be misleading. Output represents the dollar value of an industry's total production, but can also be thought of as the sum of the goods and services used to provide a product. Economic contribution analyses estimate the contribution of production (output) by including purchases from other industries to produce the inputs required to create this output; therefore, output includes the production of intermediate goods which are included in another industry's output. Summing the output of all industries would include multiple counting of some goods and services. Gross sales receipts overestimate the economic size of an industry because the values of inputs are recounted at each succeeding stage of production. As a result, output should not be used as a measure of economic contribution and is not reported here.

## 2.3: The Aggregate Agriculture Sector

In 2009, agriculture made large contributions to the Arkansas economy in terms of employment, labor income, wages, and value added (see Box 1). The Aggregate Agriculture Sector provided 275,435 jobs, or 18%, of state employment (Table 2). That is, more than one in six Arkansas jobs can be attributed to agriculture. In that same year, agriculture paid \$10.7B, or 17% of state labor income.

### Box 1. Total Contribution of Arkansas Agriculture, 2009<sup>a</sup>

<b>Employment</b>
275,435 jobs (1 out of 6 Arkansas jobs)
<b>Wages</b>
\$8,316M (15% of Arkansas wages)
<b>Labor Income</b>
\$10,743M (17% of Arkansas labor income)
<b>Value-Added</b>
\$17,018M (\$1 out of \$6 Arkansas value added)

<sup>a</sup>Current dollars.

Wages accounted for \$8.3B, or 77% of total labor income generated by agriculture. Additionally, the Aggregate Agriculture Sector added \$17.0B of value to the state economy, or 17% of state value added. That is, more than \$1 out of every \$6 in value added can be attributed to agriculture. Details of these contributions are presented in Appendix B, Table 1 and are summarized in Tables 2 - 4 below.

Agriculture generates employment in all 20 of the 2-digit NAICS sectors. Almost three-quarters of all agriculture-generated jobs are in five sectors (Box 2). The poultry industry (comprised of *Poultry Processing* and *Poultry and Egg Production*) alone provides 38,213 jobs, or one in four jobs generated by agriculture in Arkansas (Box 8). *Poultry Processing* employed 29,556 of these workers. The remaining 8,657 workers were employed in *Poultry and Egg Production*.

The far-reaching contributions of agriculture are seen in the distribution of agriculture-generated value added throughout the economy. Box 3 shows the five sectors that benefit most from value added generated by agriculture. Note that

### Box 2. Employment Generated by Agriculture, 2009 Top Five NAICS Industries<sup>a</sup>

<b>Manufacturing</b>
78,573 jobs (95% of the jobs are in agricultural processing)
<b>Agriculture, Forestry, Fishing and Hunting</b>
75,654 jobs (89% of the jobs are in agricultural production)
<b>Retail Trade</b>
15,264 jobs
<b>Health and Social Services</b>
14,829 jobs
<b>Transportation and Warehousing</b>
14,280 jobs
<b>Top Five Total</b>
197,599 jobs (72% of all jobs generated by Agriculture)

<sup>a</sup>Based on 2-Digit NAICS aggregation (USCB, 2006).

**Table 2. The Aggregate Agriculture Sector's Contribution to Arkansas' Economy, 2009.**

	Employment <sup>a</sup>			Labor Income <sup>b</sup>			Value Added <sup>c</sup>		
	Number of Jobs	% Total	% Total Arkansas Jobs	Million \$	% Total	% Total Arkansas Labor Income	Million \$	% Total	% Total Arkansas Value Added
Production <sup>d</sup>	66,330	24.1	4.3	2,104	19.6	3.3	2,483	14.6	2.5
Processing <sup>e</sup>	74,662	27.1	4.9	3,301	30.7	5.2	5,296	31.1	5.4
Ag-Related <sup>f</sup>	8,324	3.0	0.5	268	2.5	0.4	240	1.4	0.2
<b>Direct Contribution</b>	<b>149,315</b>	<b>54.2</b>	<b>9.7</b>	<b>5,673</b>	<b>52.8</b>	<b>8.9</b>	<b>8,019</b>	<b>47.1</b>	<b>8.2</b>
Indirect Effects	61,951	22.5	4.0	2,990	27.8	4.7	5,145	30.2	5.2
<b>Direct + Indirect Contribution</b>	<b>211,266</b>	<b>76.7</b>	<b>13.7</b>	<b>8,663</b>	<b>80.6</b>	<b>13.6</b>	<b>13,164</b>	<b>77.4</b>	<b>13.4</b>
Induced Effects	64,169	23.3	4.2	2,081	19.4	3.3	3,854	22.6	3.9
<b>Total Contribution</b>	<b>275,435</b>	<b>100.0</b>	<b>17.9</b>	<b>10,743</b>	<b>100.0</b>	<b>16.9</b>	<b>17,018</b>	<b>100.0</b>	<b>17.3</b>

Source: Computed using the 2009 Arkansas database from MIG (2010).

Note: Presented in current dollars.

<sup>a</sup> Equivalent to full- and part-time jobs (MIG, 2000).

<sup>b</sup> Labor income represents all forms of employment income; it is the sum of employee compensation and proprietor income (MIG, 2000).

<sup>c</sup> Value added is the sum of employee compensation, proprietary income, other property type income, and indirect business taxes.

<sup>d</sup> Appendix A, Table 3 lists sectors of direct agricultural production in terms of IMPLAN sectors.

<sup>e</sup> Appendix A, Table 3 lists sectors of direct agricultural processing in terms of IMPLAN sectors.

<sup>f</sup> Ag-related sectors include agricultural sectors not categorized as agricultural production or processing. These sectors are Fishing, Hunting, and Trapping; Agriculture and Forestry Support Activities; and New Farm Housing Units and Additions and Alterations.



<b>Box 3. Value Added Generated by Agriculture, 2009<sup>a</sup> Top Five NAICS Industries<sup>b</sup></b>	
<b>Manufacturing</b>	\$5,712M
(93% of the value added is in agricultural processing)	
<b>Agriculture, Forestry, Fishing and Hunting</b>	\$2,723M
(91% of the value added is in agricultural production)	
<b>Wholesale Trade</b>	\$1,460M
<b>Real Estate and Rental</b>	\$1,420M
<b>Transportation and Warehousing</b>	\$959M
<b>Top Five Total</b>	\$12,274M
(72% of all value added generated by Agriculture)	

<sup>a</sup>Current dollars.

<sup>b</sup>Based on 2-Digit NAICS aggregation (USCB, 2006).

<b>Box 4. Labor Income Generated by Agriculture, 2009<sup>a</sup> Top Five NAICS Sectors<sup>b</sup></b>	
<b>Manufacturing</b>	\$3,515M
(94% of labor income is in agricultural processing)	
<b>Agriculture, Forestry, Fishing and Hunting</b>	\$2,372M
(89% of labor income is in agricultural production)	
<b>Wholesale Trade</b>	\$848M
<b>Transportation and Warehousing</b>	\$708M
<b>Health and Social Services</b>	\$653M
<b>Top Five Total</b>	\$8,097M
(75% of all labor income generated by Agriculture)	

<sup>a</sup>Current dollars.

<sup>b</sup>Based on 2-Digit NAICS aggregation (USCB, 2006).

As with value added, much of the income attributable to agricultural activity is generated outside of agricultural sectors. Box 4 shows the five sectors that generate the most income as the result of agricultural activity in Arkansas. In 2009, \$5.1B, or 47% of all labor income, went to workers in non-agricultural sectors. Within the agricultural sectors, the top three crops production sectors, the poultry industry, and the top five forestry sectors received \$3.5B, or 32% of all labor income generated

three of those sectors (*Wholesale Trade*, *Real Estate and Rental*, and *Transportation and Warehousing*) lie outside of the agriculture sector as defined here. Although almost half of all agriculture-generated value added accrues outside agricultural sectors, these sectors are closely tied to agriculture. For instance, *Wholesale Trade* contains businesses such as grain and livestock wholesalers as well as farm supply wholesalers.

Within *Crops Sector* production industries, *Grain Farming*, *Oilseed Farming*, and *Cotton Farming* add the largest

amount of value, while in the *Animal Agriculture Sector*, the poultry industry (*Poultry and Egg Production* and *Poultry Processing*) contributes the largest value. In the *Forestry Sector*, the top five contributors to value in the economy are *Paper Mills*, *Sanitary Paper Product Manufacturing*, *Paperboard Mills*, *Sawmills and Wood Preservation*, and *Paperboard Container Manufacturing*. About 37% (\$3.0B) of direct value added by agriculture accrues in *Crops*, 28% (\$2.2B) in *Animal Agriculture*, and 33% (\$2.6B) in *Forestry* (Tables 5, 6, 7). The remaining 2% accrues in the *Agriculture-Related Sector*.

by agriculture.

Agriculture's direct contribution to the state economy is measured by the sum of the contributions of farm production, processing of farm products, and agriculture related sectors. There were 149,315 workers employed by the agricultural production, processing and agriculture related sectors (Table 2). Of the production jobs, the crops industries employed over two-thirds (68%), while the animal agriculture industries employed 25% and the forestry industries 8% (Table 3). Of the processing jobs, animal agriculture employed almost half the workers (47%), while crops and

**Table 3. The Contribution of Major Agricultural Sectors to Agricultural Production and Processing, 2009.**

	<b>Employment<sup>a</sup></b>		<b>Labor Income<sup>b</sup></b>		<b>Value Added<sup>c</sup></b>	
	Number of Jobs	% Total	Million \$	% Total	Million \$	% Total
<b>Production</b>						
<i>Crops</i>	44,746	31.7	1,259	23.3	1,501	19.3
<i>Animal Agriculture</i>	16,423	11.6	649	12.0	698	9.0
<i>Forestry</i>	5,161	3.7	195	3.6	284	3.7
<b>Production Total</b>	<b>66,330</b>	<b>47.0</b>	<b>2,104</b>	<b>38.9</b>	<b>2,483</b>	<b>31.9</b>
<b>Processing</b>						
<i>Crops</i>	16,676	11.8	789	14.6	1,464	18.8
<i>Animal Agriculture</i>	35,260	25.0	1,230	22.8	1,505	19.3
<i>Forestry</i>	22,725	16.1	1,282	23.7	2,327	29.9
<b>Processing Total</b>	<b>74,662</b>	<b>53.0</b>	<b>3,301</b>	<b>61.1</b>	<b>5,296</b>	<b>68.1</b>
<b>Prod. + Proc. Total</b>	<b>140,991</b>	<b>100.0</b>	<b>5,405</b>	<b>100.0</b>	<b>7,779</b>	<b>100.0</b>

Source: Computed using the 2009 Arkansas database from MIG (2010).

Note: Presented in current dollars.

<sup>a</sup> Equivalent to full- and part-time jobs (MIG, 2000).

<sup>b</sup> Labor income represents all forms of employment income; it is the sum of employee compensation and proprietor income (MIG, 2000).

<sup>c</sup> Value added is the sum of employee compensation, proprietary income, other property type income, and indirect business taxes.

forestry employed 22% and 30%, respectively (Table 3). The owners, operators, and workers of these farms and businesses received nearly \$5.7B in labor income (Table 2); 58% of direct labor income went to workers and business owners in processing industries. Agricultural production, processing, and agriculture-related industries directly added value of \$8.0B to the Arkansas economy, of which 66% was from processing industries.

Indirect contributions result when agricultural firms purchase raw materials and services from other Arkansas businesses to produce their products. In 2009, there were 61,951 workers employed by industries supplying goods and services to the farm production and processing industries. These workers and the owners of those establishments received \$3.0B in labor income and these industries added value of over \$5.1B to the state economy (Table 2).

Induced contributions result when employees of agricultural firms and employees of the raw material and service firms spend a portion of their income on local purchases. There were 64,169 workers employed by businesses providing goods and services to the employees in agriculture and its supplying industries. These employees and the proprietors of these businesses received roughly \$2.1B in labor income and added value of almost \$3.9B to the Arkansas economy.

### Box 5. Direct Contribution of the Crops Sector, 2009<sup>a</sup>

<b>Employment</b>	61,422 jobs
<b>Wages</b>	\$868M
<b>Labor Income</b>	\$2,048M
<b>Value-Added</b>	\$2,965M

<sup>a</sup>Current dollars.

### 2.3.1: The Crops Sector

The Crops Sector includes all enterprises engaged in the production and processing of cotton, food and feed grains, oil bearing crops, fruits, nuts and vegetables, and hay and pasture (Appendix A, Table 1). The Crops Sector's direct contribution on the state economy is measured by the sum of the contributions of crop production and processing of crops products.

In 2009, the Crops Sector provided 61,422 jobs within the Aggregate Agriculture Sector, or 4% of state employment (Box 5 and Table 4). The workers and business owners received \$2.0B in labor income (\$868M of that in wages), or 3% of state labor income. The Crops Sector added \$3.0B, or 3%, to state value-added. *Grain Farming, Oilseed Farming* and *Cotton Farming* together represented 70% of jobs, 52% of labor income, and 46% of value added in the overall Crops Sector (Box 6). A summary is presented in Table 4 and details are provided in Appendix B, Table 2.

### Box 6. Direct Contribution of the Top Three Crops Production Industries: Grain Farming, Oilseed Farming, and Cotton Farming<sup>a</sup>

<b>Employment</b>	42,827 jobs (70% of Crops jobs)
<b>Wages</b>	\$71M (8% of Crops wages)
<b>Labor Income</b>	\$1,075M (52% of Crops labor income)
<b>Value-Added</b>	\$1,371M (46% of Crops value added)

<sup>a</sup>Current dollars.

### 2.3.2: The Animal Agriculture Sector

The Animal Agriculture Sector includes all enterprises engaged in the production and processing of animals, including poultry and egg, cattle, dairy farm, hogs and pigs, other animal agriculture, processed meat, and dairy processing industries (Appendix A, Table 2). The Animal Agriculture Sector's direct contribution on the state economy is measured by the sum of the contributions of animal production and processing of animal products. This sector accounted for 51,684 jobs in 2009, or over 3% of state employment, and these workers and business owners received \$1.9B in labor income, or 3% of state labor income. Of this labor income, 77% (\$1.4B) was at-

**Table 4. The Crops Sector's Direct Contribution to Arkansas' Economy, 2009.**

	Employment <sup>a</sup>			Labor Income <sup>b</sup>			Value Added <sup>c</sup>		
	Number of Jobs	% Direct Impact	% Total Arkansas Jobs	Million \$	% Direct Impact	% Total Arkansas Labor Income	Million \$	% Direct Impact	% Total Arkansas Value Added
Production <sup>d</sup>	44,746	30.0	2.9	1,259	22.2	2.0	1,501	18.7	1.5
Processing <sup>e</sup>	16,676	11.2	1.1	789	13.9	1.2	1,464	18.3	1.5
<b>Direct Impact</b>	<b>61,422</b>	<b>41.1</b>	<b>4.0</b>	<b>2,048</b>	<b>36.1</b>	<b>3.2</b>	<b>2,965</b>	<b>37.0</b>	<b>3.0</b>

Source: Computed using the 2009 Arkansas database from MIG (2010).

Note: Presented in current dollars.

<sup>a</sup> Equivalent to full- and part-time jobs (MIG, 2000).

<sup>b</sup> Labor income represents all forms of employment income; it is the sum of employee compensation and proprietor income (MIG, 2000).

<sup>c</sup> Value added is the sum of employee compensation, proprietary income, other property type income, and indirect business taxes.

<sup>d</sup> Appendix A, Table 5 lists sectors of direct agricultural production in terms of IMPLAN sectors.

<sup>e</sup> Appendix A, Table 6 lists sectors of direct agricultural processing in terms of IMPLAN sectors.

tributable to wages. In 2009, the Animal Agriculture Sector added \$2.2B of value to the state economy, or over 2% of state value added (Table 5 and Box 7). Table 5 provides a summary of the Animal Agriculture Sector's total contribution on Ar-

kansas' economy; details can be found in Appendix B, Table 3. Poultry and Egg Production and Poultry Processing<sup>13</sup> provided 74% of jobs, 83% of income and 74% of value added in the Animal Agriculture Sector in 2009 (Box 8).

### 2.3.3: The Forestry Sector

The Forestry Sector is primarily comprised of commercial logging, forest products, furniture and wood and paper processing enterprises (Appendix A, Table 3). The Forestry Sector's direct contribution to the state economy is measured by the sum of the contributions of forestry production and processing. There were 27,886 jobs (almost 2% of state employment) in the Forestry Sector in 2009, and these workers and business owners received almost \$1.5B in labor income, or just over 2% of state labor income. The Forestry Sector added \$2.6B of value to the state economy, or almost 3% of total state value-added (Table 6 and Box 9). Within this sector, Paper Mills, Sanitary Paper Product Manufacturing, Paperboard Mills, Sawmills and Wood Preservation, and Paperboard Container Manufacturing comprised 47% of forestry jobs, and 57% and 64% of forestry income and value added, respectively (Box 10). Details can be found in Appendix B, Table 4. These contributions are summarized in Table 6.

<b>Box 7. Direct Contribution of the Animal Agriculture Sector, 2009<sup>a</sup></b>	
<b>Employment</b>	51,684 jobs
<b>Wages</b>	\$1,440M
<b>Labor Income</b>	\$1,880M
<b>Value-Added</b>	\$2,203M

<sup>a</sup>Current dollars.

<b>Box 9. Direct Contribution of the Forestry Sector, 2009<sup>a</sup></b>	
<b>Employment</b>	27,886 jobs
<b>Wages</b>	\$1,361M
<b>Labor Income</b>	\$1,477M
<b>Value-Added</b>	\$2,612M

<sup>a</sup>Current dollars.

<b>Box 8. Direct Contribution of the Poultry Industry (Poultry and Egg Production and Poultry Processing)<sup>a</sup></b>	
<b>Employment</b>	38,213 jobs (74% of Animal Agriculture jobs) (1 out of 4 agricultural jobs)
<b>Wages</b>	\$1,150M (80% of Animal Agriculture wages) (30% of agricultural wages)
<b>Labor Income</b>	\$1,567M (83% of Animal Agriculture labor income) (28% of agricultural labor income)
<b>Value-Added</b>	\$1,624M (74% of Animal Agriculture value added) (\$1 out of \$5 agricultural value added)

<sup>a</sup>Current dollars.

<b>Box 10. Direct Contribution of the Top Five Forestry Industries: Paper Mills, Sanitary Paper Product Manufacturing, Paperboard Mills, Sawmills and Wood Preservation, and Paperboard Container Manufacturing<sup>a</sup></b>	
<b>Employment</b>	12,979 jobs (47% of Forestry jobs)
<b>Wages</b>	\$840M (62% of Forestry wages)
<b>Labor Income</b>	\$849M (57% of Forestry labor income)
<b>Value-Added</b>	\$1,670M (64% of Forestry value added)

<sup>a</sup>Current dollars.

**Table 5. The Animal Agriculture Sector's Direct Contribution to Arkansas' Economy, 2009.**

	<b>Employment<sup>a</sup></b>			<b>Labor Income<sup>b</sup></b>			<b>Value Added<sup>c</sup></b>		
	Number of Jobs	% Direct Impact	% Total Arkansas Jobs	Million \$	% Direct Impact	% Total Arkansas Labor Income	Million \$	% Direct Impact	% Total Arkansas Value Added
Production <sup>d</sup>	16,423	11.0	1.1	649	11.4	1.0	698	8.7	0.7
Processing <sup>e</sup>	35,260	23.6	2.3	1,230	21.7	1.9	1,505	18.8	1.5
<b>Direct Impact</b>	<b>51,684</b>	<b>34.6</b>	<b>3.4</b>	<b>1,880</b>	<b>33.1</b>	<b>3.0</b>	<b>2,203</b>	<b>27.5</b>	<b>2.2</b>

Source: Computed using the 2009 Arkansas database from MIG (2010).

Note: Presented in current dollars.

<sup>a</sup> Equivalent to full- and part-time jobs (MIG, 2000).

<sup>b</sup> Labor income represents all forms of employment income; it is the sum of employee compensation and proprietor income (MIG, 2000).

<sup>c</sup> Value added is the sum of employee compensation, proprietary income, other property type income, and indirect business taxes.

<sup>d</sup> Appendix A, Table 5 lists sectors of direct agricultural production in terms of IMPLAN sectors.

<sup>e</sup> Appendix A, Table 6 lists sectors of direct agricultural processing in terms of IMPLAN sectors.

**Table 6. The Forestry Sector's Direct Contribution to Arkansas' Economy, 2009.**

	Employment <sup>a</sup>			Labor Income <sup>b</sup>			Value Added <sup>c</sup>		
	Number of Jobs	% Direct Impact	% Total Arkansas Jobs	Million \$	% Direct Impact	% Total Arkansas Labor Income	Million \$	% Direct Impact	% Total Arkansas Value Added
Production <sup>d</sup>	5,161	3.5	0.3	195	3.4	0.3	284	3.5	0.3
Processing <sup>e</sup>	22,725	15.2	1.5	1,282	22.6	2.0	2,327	29.0	2.4
<b>Direct Impact</b>	<b>27,886</b>	<b>18.7</b>	<b>1.8</b>	<b>1,477</b>	<b>26.0</b>	<b>2.3</b>	<b>2,612</b>	<b>32.6</b>	<b>2.7</b>

Source: Computed using the 2009 Arkansas database from MIG (2010).

Note: Presented in current dollars.

<sup>a</sup> Equivalent to full- and part-time jobs (MIG, 2000).

<sup>b</sup> Labor income represents all forms of employment income; it is the sum of employee compensation and proprietor income (MIG, 2000).

<sup>c</sup> Value added is the sum of employee compensation, proprietary income, other property type income, and indirect business taxes.

<sup>d</sup> Appendix A, Table 5 lists sectors of direct agricultural production in terms of IMPLAN sectors.

<sup>e</sup> Appendix A, Table 6 lists sectors of direct agricultural processing in terms of IMPLAN sectors.

## 2.4: Summary of the Contribution of Agriculture in 2009

In 2009, the Aggregate Agriculture Sector contributed 149,315 direct jobs, or almost 10% of state employment. In addition, the Agriculture Sector contributed 126,120 indirect and induced jobs, for a total direct, indirect and induced contribution of 18% of state employment. Indirect and induced jobs were created in all 20 of the 2-digit NAICS aggregated

industries. The largest production sector was the Crops Sector, accounting for about two-thirds of employment, labor income, and value added in agricultural production. The most processing jobs were attributable to the Animal Agriculture Sector, which accounted for almost half of processing jobs. The Forestry Sector was the leader in agricultural process-

ing labor income and value added, accounting for about \$2 in every \$5 of each. However, for agricultural production, the Crops Sector led in employment, labor income, and value added. When production and processing are combined, the Crops Sector contributed most to value added.

## 3: Report Summary

The GDP by State data from BEA indicates that Arkansas' Agriculture and Food Sector continues to contribute a larger share of GDP by State to the overall Arkansas state economy than does Agriculture and Food in other states of the southeastern U.S. According to 2009 IMPLAN data and subsequent analyses, over \$0.17 of every \$1 of the total state value added and 1 in 6 jobs can be attributed

to agriculture. One in six dollars of labor income can be attributed to agriculture as well.

IMPLAN data and the analysis indicate that the Arkansas Aggregate Agriculture Sector plays a significant role in generating jobs, income, and value added throughout the state's economy. World and domestic price stability and associated agricultural and food policies will

continue to have a significant impact on Arkansas agriculture and its contribution to the Arkansas economy. Continued strength of agriculture is of paramount importance if the social and economic fabric of rural Arkansas communities is to be retained and if the essential infrastructure and services that translate into an acceptable quality of life for its residents are to be maintained.

## End Notes

- 1 This report presents two economic analyses of the agricultural sector in Arkansas. The analyses have separate and distinct scopes, definitions, and methodologies and the results of each analysis should not be compared as they are different measures of economic contribution. Please see the Definitions and Styles section for more.
- 2 GDP by State data are for years 1997-2009. IMPLAN data for Arkansas are for 2009. The value of production data from USDA, ERS, and NASS used in Figs. 6 and 7 are for 1987-2010.
- 3 Throughout this report, all numerical references to agricultural trends are calculated using constant dollars, unless noted otherwise. The use of constant dollars factors in the effects of inflation, other economic fluctuations on price, and changes in the costs of inputs and allows for a value comparison over time. Constant dollars are derived from BEA's 2005 chained-dollar series, adjusted to a base year of 2009. BEA uses industry-specific deflators to adjust current dollars to constant dollars.
- 4 GDP by State is a measurement of economic activity in the state economy. GDP by State is a similar measure to value added as defined by MIG, or the sum of employee compensation, proprietary income (e.g., rent payments), other property-type income, and indirect business taxes (e.g., sales taxes paid by individuals to firms). GDP by State is also equivalent to gross output minus the cost of intermediate output. However, GDP by State and value added are based on different data and estimated using different methodologies. Thus, while they are essentially the same measure, the estimated values are different.
- 5 SIC definitions, use to categorize GDP by State and IMPLAN data in some previous reports, were based upon what was produced. It paid particular attention to manufacturing industries, as was appropriate for the economy of the 1930s when these definitions were created. The service sector of the economy has since developed in inconceivable ways. NAICS is designed to focus on how products and services are created resulting in major differences in industry groupings. NAICS categorizes data into one of two domains: goods producing or service providing. These domains are further divided into 12 super sectors and then broken into 20 industry sectors designated by two digits, compared with the eleven alphabetically designated divisions of SIC. Because of its increased number of sectors, NAICS allows for greater precision in data assignment and analyses. Only six of the twenty NAICS sectors had changes during the 2007 revision of NAICS. The sectors with changes in 2007 had no impact on the analyses presented here and the only sector of interest with any revision was: Sector 11 Agriculture, Forestry, Fishing and Hunting, in which sweet potato and yam farming was moved to sub-sector Potato Farming and algae, seaweed, and other plant aquaculture were moved to sub-sector Other Aquaculture. These were simply re-allocations within sectors and had no impact on overall totals.
- 6 The BEA defines agricultural production as Agriculture, Forestry, and Fishing and Hunting. They define agricultural processing as: Wood Product Manufacturing; Furniture and Related Products Manufacturing; Food Manufacturing; Textile and Textile Product Mills; Apparel, Leather, and Allied Products Manufacturing; and Paper Manufacturing. Agricultural retail is Food Services and Drinking Places.
- 7 The BEA includes Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia in the Southeast region.

- It is not equivalent to either Johnson, Bentley, and Howell's (2009) definition of the South or the South census region.
- 8 For purposes of this report, field and miscellaneous crops is the total value of crop production. Specifically, field and miscellaneous crops includes grains and hay, oilseeds, cotton, tobacco, sugar, dry beans, peas, lentils, potatoes, and other miscellaneous crops, but explicitly does not include fruits, nuts, or vegetables.
  - 9 For forestry reporting, the South includes 13 states: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Oklahoma, North Carolina, South Carolina, Tennessee, Texas, and Virginia. It is not equivalent to either BEA's Southeast region or the South census region.
  - 10 The census region South includes the states Alabama, Arkansas, Delaware, Florida, Georgia, Louisiana, Kentucky, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia, and the District of Columbia. It is not equivalent to either BEA's Southeast region or Johnson, Bentley, and Howell's (2009) definition of the South.
  - 11 GDP by State is reported for agricultural retail but the output from this sector is not included in the economic contribution analysis and is not used to calculate direct contributions of the agriculture sector. However, this sector does represent an important contribution through the purchases made from direct agricultural sectors and these contributions are captured in the indirect contributions analysis.
  - 12 Although sectors 15 and 16 are also production sectors (forestry), no newer or more accurate data is available to update these sectors.
  - 13 One important change in recent years occurred in the poultry production sector where large productivity gains have been experienced. The amount of labor required to produce the same output on poultry farms has decreased and the majority of poultry output is increasingly produced on fewer acres. This is reflected in the employment number associated with poultry production in this report which has decreased since the 2001 report. The reason for such a drop reflects productivity gains occurring over the past 10 or more years that were only recently adjusted for in the IMPLAN data set.

## Literature Cited

- AGFC (Arkansas Game and Fish Commission). 2011. Data for commercial hunting and trapping, fishing, wildlife management business, and resident hunting guide (GLH) licenses for 2010. Data available by request only. 2 Natural Resources Drive, Little Rock, AR 72205. [www.afgc.com](http://www.afgc.com). Accessed 18 July 2011.
- Alward, G. and Lindall, S. 1996. "Deriving SAM multiplier models using IMPLAN." Paper presented at 1996 IMPLAN user conference.
- Arkansas Forestry Commission. 2011. Production and value data for 2010. Data available by request only. 3821 West Roosevelt Road, Little Rock, AR 72204. <http://www.forestry.state.ar.us/>. Accessed 7 June 2011.
- Goodwin, H.L., J. Popp, W. Miller, G. Vickery and Z. Clayton-Neiderman. 2002. Impact of the agricultural sector on the Arkansas economy. Research Report 969. Arkansas Agricultural Experiment Station Division of Agriculture, Fayetteville.
- Haydu, J. J., A. W. Hodges, and C. R. Hall. 2006. Economic impact of the turfgrass and lawncare industry in the United States. EDIS document FE632. Food and Resource Economics Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. April. <http://edis.ifas.ufl.edu/pdf/FE/FE63200.pdf>. Accessed 5 August 2011.
- Johnson, T.G., J.W. Bentley and M. Howell. 2009. The South's timber industry – An assessment of timber product output and use, 2007. USDA Forest Service. Resource Bulletin SRS-164. Southern Research Station. [http://www.srs.fs.usda.gov/pubs/rb/rb\\_srs164.pdf](http://www.srs.fs.usda.gov/pubs/rb/rb_srs164.pdf). Accessed 7 June 2011.
- Kemper, N., J. Popp and W. Miller. 2009. Economic contribution of the agriculture sector to the Arkansas economy in 2007 and revised estimates for 2006. Research Report 987. Arkansas Agricultural Experiment Station Division of Agriculture, Fayetteville.
- Lindall, S. 1998. "How does MIG estimate that pesky agricultural data anyway?" An MIG Knowledge Base Article. Minnesota IMPLAN Group, Inc., Stillwater, Minn.
- McGraw, K., J. Popp, and W. Miller. 2011a. Economic contribution of Arkansas agriculture. Pocket guide. UA Division of Agriculture, Little Rock.
- McGraw, K., J. Popp, and W. Miller. 2011b. "Economic contribution of agriculture to the Arkansas economy in 2009." Fact sheet. UA Division of Agriculture, Little Rock.
- MIG (Minnesota IMPLAN Group, Inc.). 2000. IMPLAN Professional Version 2.0 Social Accounting and Impact Analysis Software User Guide, Analysis Guide, and Data Guide. 2nd edition, Stillwater, Minn.
- Mississippi Forestry Association. 2010. "Mississippi Forest Facts." [www.msforestry.net](http://www.msforestry.net). Accessed 27 June 2011.
- NBER (National Bureau for Economic Research). 2010. "September 20, 2010 announcement." <http://www.nber.org/cycles/sept2010.html>. Accessed 13 July 2011.
- NBER (National Bureau for Economic Research). 2011. "U.S. business cycle expansions and contractions." <http://www.nber.org/cycles.html>. Accessed 5 Aug. 2011.

- Olson, D., and S. Lindall. 2009. IMPLAN Professional Version 2.0 Software, Analysis, and Data Guide. Minnesota IMPLAN Group, Inc. Stillwater, Minn.
- Oswalt, C.M., S.N. Oswalt, T.G. Johnson, J.L. Chamberlain, K.C. Randolph and J.W. Coulston. 2009. Tennessee's forests, 2004. USDA Forest Service. Resource Bulletin SRS-144. Southern Research Station. <http://www.treesearch.fs.fed.us/pubs/32506>. Accessed 7 June 2011.
- Popp, J., N. Kemper and W. Miller. 2007. Impact of the agricultural sector on the Arkansas economy in 2003. Research Report 981. University of Arkansas System Agricultural Experiment Station, Fayetteville, Ark.
- Popp, J., N. Kemper, W. Miller, K. McGraw and K. Karr. 2010. The economic contribution of the agricultural sector to the Arkansas economy in 2008. Research Report 989. University of Arkansas System Agricultural Experiment Station, Fayetteville, Ark.
- Popp, J., G. Vickery and W. Miller. 2005. Impact of the agricultural sector on the Arkansas economy in 2001. Research Report 975. University of Arkansas Agricultural Experiment Station, Fayetteville, Ark.
- PRNewswire. 2011. "Trends and Behaviors in Eating Out." Press Release. <http://www.prnewswire.com/news-releases/trends-and-behaviors-in-eating-out-124765548.html>. 30 June. New York: United Business Media. Accessed 9 Aug. 2011.
- Schuler, A., R. Taylor, and P. Araman. 2001. "Competitiveness of U.S. wood furniture manufacturers: Lessons learned from the softwood molding industry." *Forest Prod.*, 55:14-20.
- Simard, G. 1999. "Logging Industry: Manufacturing, Construction and Energy Division." <http://www.statcan.gc.ca/pub/25f0002m/25f0002m1999001-eng.htm>. Accessed 5 Aug. 2011.
- Stevens, B. and G. Trainor. 1980. "Error generation on regional input-output analysis and its implications for non-survey models," in *Economic impact analysis: Methodology and applications*, ed. S. Pleeter, 68-79. Amsterdam: Marinus Nijhoff.
- USCB (U.S. Census Bureau). 2006. North American Classification System (NAICS). <http://www.census.gov/eos/www/naics/>. Accessed 7 June 2011.
- USCB (U.S. Census Bureau). 2011a. "Frequently asked questions (FAQs)." <http://www.census.gov/eos/www/naics/faqs/faqs.html>. Accessed 4 Aug. 2011.
- USCB (U.S. Census Bureau). 2011b. "New privately owned housing units started: Annual data, 1959 to 2010." Manufacturing, Mining, and Construction Statistics: New Residential Construction. <http://www.census.gov/const/www/newresconstindex.html>. Accessed 13 July 2011.
- USCC (U.S. Chamber of Commerce). 2002. "Trade promotion authority and Arkansas." <http://www.uschamber.org/>. Accessed 7 June 2011.
- USDA (U.S. Department of Agriculture). 2007. Census of Agriculture. [http://www.agcensus.usda.gov/Publications/2007/Full\\_Report/index.asp](http://www.agcensus.usda.gov/Publications/2007/Full_Report/index.asp). Accessed 7 June 2011.
- USDA ERS (U.S. Department of Agriculture Economic Research Service). 2008a. "Measuring agriculture's contribution to gross domestic product." <http://www.ers.usda.gov/AmberWaves/About/AgGDP.htm>. Accessed 5 Aug. 2011.
- USDA ERS (U.S. Department of Agriculture Economic Research Service). 2008b. "Global agricultural supply and demand: Factors contributing to the recent increase in food commodity prices/ WRS-0801." <http://www.ers.usda.gov/Publications/WRS0801/WRS0801.pdf>. Accessed 5 Aug. 2011.
- USDA ERS (U.S. Department of Agriculture Economic Research Service). 2008c. "Food marketing system in the U.S." <http://www.ers.usda.gov/Briefing/FoodMarketingSystem/>. Accessed 5 Aug. 2011.
- USDA ERS (U.S. Department of Agriculture Economic Research Service). 2008d. "What's behind the surge in global rice prices?" *Amber Waves*, Sept. 2008. <http://www.ers.usda.gov/AmberWaves/September08/Findings/Rice-Prices.htm>. Accessed 5 Aug. 2011.
- USDA ERS (U.S. Department of Agriculture Economic Research Service). 2011a. "Farm income and costs: 2009 farm sector income estimates." USDA Briefing Room – Farm Income and Costs. <http://www.ers.usda.gov/Briefing/FarmIncomeandCosts/>. Accessed 12 July 2011.
- USDA ERS (U.S. Department of Agriculture Economic Research Service). 2011b. Farm income: Data files. "Arkansas cash receipts 2000 to 2010." <http://www.ers.usda.gov/data/farmincome/FinfidmuXls.htm>. Accessed 30 Aug. 2011.
- USDA ERS (U.S. Department of Agriculture Economic Research Service). 2011c. Farm income: Data files. "Arkansas state net value added (with net farm income) 2000 to 2010." <http://www.ers.usda.gov/data/farmincome/FinfidmuXls.htm>. Accessed 8 Sept. 2011.
- USDA ERS (U.S. Department of Agriculture Economic Research Service). 2011d. Farm income: Data files. "Farm income and balance sheet statistics in constant (2005=100) dollars, 1929-2011." <http://www.ers.usda.gov/data/farmincome/finfidmu.htm>. Accessed 12 July 2011.
- USDA (U.S. Department of Agriculture) Forest Service. 2009. "U.S. forest products, annual market review and prospects, 2004 - 2008." [http://www.fpl.fs.fed.us/documnts/fplrn/fpl\\_rn305.pdf](http://www.fpl.fs.fed.us/documnts/fplrn/fpl_rn305.pdf). Accessed 5 Aug. 2011.
- USDA (U.S. Department of Agriculture) Forest Service. 2011. Forest Inventory and Analysis National Program FIDO (Forest Inventory Data Online) database. "Arkansas: Area, in acres, by county and forest-type group." Data for 2010. <http://apps.fs.fed.us/fido/>. Accessed 7 June 2011.
- USDA NASS (U.S. Department of Agriculture National Agricultural Statistics Service). 2010. "Arkansas agricultural cash receipts report." <http://www.nass.usda.gov/Statistics/byState/Arkansas/Publications/EconomicandDemographicReleases/index.asp>. Accessed 19 July 2011.
- USDA NASS (U.S. Department of Agriculture National Agricultural Statistics Service). 2011a. Annual average index numbers of prices received 1987-2010. <http://www.nass.usda.gov/QuickStats/CreateFederalAll.jsp>. Accessed 19 July 2011.
- USDA NASS (U.S. Department of Agriculture National Agricultural Statistics

- Service). 2011b. Commodity production and values data for 2006-2010. <http://usda.mannlib.cornell.edu/MannUsda/homepage.do;jsessionid=118B9D6A6FF48DA1BEC379A03362B1D0>. Accessed 11 July 2011.
- USDC BEA (U.S. Department of Commerce Bureau of Economic Analysis). 2011a. "FAQ: How did the recent GDP revisions change the picture of the 2007 – 2009 recession and the recovery?" [http://www.bea.gov/faq/index.cfm?faq\\_id=1004&searchQuery=&start=0&cat\\_id=0](http://www.bea.gov/faq/index.cfm?faq_id=1004&searchQuery=&start=0&cat_id=0). Accessed 9 Aug. 2011.
- USDC BEA (U.S. Department of Commerce Bureau of Economic Analysis). 2011b. Gross domestic product by state database. <http://www.bea.gov/regional/gsp/>. Accessed 7 June 2011.
- Wall, H. J. 2000. "Now and forever NAFTA." <http://research.stlouisfed.org/publications/regional/00/04/NAFTA.pdf>. Accessed 5 Aug. 2011.
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## Appendix A

### *Description of IMPLAN Sectors and Aggregation Schemes*

**Table 1. Major Components of the Crops Sector as Defined by IMPLAN Sectors, 2009.**

Aggregate Sector	Sector ID	IMPLAN Sector
CROPS PRODUCTION	1	Oilseed farming
	2	Grain farming
	3	Vegetable and melon farming
	4	Fruit farming
	5	Tree nut farming
	6	Greenhouse, nursery, and floriculture production
	7	Tobacco farming
	8	Cotton farming
	9	Sugarcane and sugar beet farming
	10	All other crop farming
CROPS PROCESSING	43	Flour milling and malt manufacturing
	44	Wet corn milling
	45	Soybean and other oilseed processing
	46	Fats and oils refining and blending
	47	Breakfast cereal manufacturing
	48	Sugar cane mills and refining
	49	Beet sugar manufacturing
	50	Chocolate and confectionery manufacturing from cacao beans
	51	Confectionery manufacturing from purchased chocolate
	52	Nonchocolate confectionery manufacturing
	53	Frozen food manufacturing
	54	Fruit and vegetable canning, pickling, and drying
	62	Bread and bakery product manufacturing
	63	Cookie, cracker, and pasta manufacturing
	64	Tortilla manufacturing
	65	Snack food manufacturing
	66	Coffee and tea manufacturing
	67	Flavoring syrup and concentrate manufacturing
	68	Seasoning and dressing manufacturing
	69	All other food manufacturing
	70	Soft drink and ice manufacturing
	71	Breweries
	72	Wineries
	73	Distilleries
	74	Tobacco product manufacturing
	75	Fiber, yarn, and thread mills
	76	Broadwoven fabric mills
	77	Narrow fabric mills and schiffli machine embroidery
	78	Nonwoven fabric mills
	79	Knit fabric mills
	80	Textile and fabric finishing mills
	81	Fabric coating mills
82	Carpet and rug mills	
83	Curtain and linen mills	
84	Textile bag and canvas mills	
85	All other textile product mills	
86	Apparel knitting mills	
87	Cut and sew apparel contractors	
88	Men's and boys' cut and sew apparel manufacturing	
89	Women's and girls' cut and sew apparel manufacturing	
90	Other cut and sew apparel manufacturing	
91	Apparel accessories and other apparel manufacturing	

**Table 2. Major Components of the Animal Agriculture Sector, Defined by IMPLAN Sectors, 2009.**

<b>Aggregated Sector</b>	<b>Sector ID</b>	<b>IMPLAN Sector</b>
ANIMAL PRODUCTION	11	Cattle ranching and farming
	12	Dairy cattle and milk production
	13	Poultry and egg production
	14	Animal production, except cattle and poultry
ANIMAL PROCESSING	41	Dog and cat food manufacturing
	42	Other animal food manufacturing
	55	Fluid milk and butter manufacturing
	56	Cheese manufacturing
	57	Dry, condensed, and evaporated dairy product manf.
	58	Ice cream and frozen dessert manufacturing
	59	Animal (except poultry) slaughtering and rendering
	60	Poultry processing
	61	Seafood product preparation and packaging
	92	Leather and hide tanning and finishing
	93	Footwear manufacturing
	94	Other leather and allied product manufacturing

**Table 3. Major Components of the Forestry Sector as Defined by IMPLAN Sectors, 2009.**

<b>Aggregated Sector</b>	<b>Sector ID</b>	<b>IMPLAN Sector</b>
FORESTRY PRODUCTION	15	Forestry, forest products, and timber tract production
	16	Commercial logging
FORESTRY PROCESSING	95	Sawmills and wood preservation
	96	Veneer and plywood manufacturing
	97	Engineered wood member and truss manufacturing
	98	Reconstituted wood product manufacturing
	99	Wood windows and doors and millwork manufacturing
	100	Wood container and pallet manufacturing
	101	Manufactured home (mobile home) manufacturing
	102	Prefabricated wood building manufacturing
	103	All other miscellaneous wood product manufacturing
	104	Pulp mills
	105	Paper mills
	106	Paperboard mills
	107	Paperboard container manufacturing
	108	Coated and laminated paper, packaging paper and plastics film manf.
	109	All other paper bag and coated and treated paper manufacturing
	110	Stationery product manufacturing
	111	Sanitary paper product manufacturing
	112	All other converted paper product manufacturing
	295	Wood kitchen cabinet and countertop manufacturing
	296	Upholstered household furniture manufacturing
297	Nonupholstered wood household furniture manufacturing	
300	Office furniture manufacturing	
301	Custom architectural wood manufacturing	

**Table 4. Major Components of the Agriculture-Related Sector as Defined by IMPLAN Sectors, 2009.**

<b>Aggregated Sector</b>	<b>Sector ID</b>	<b>IMPLAN Sector</b>
	17	Commercial fishing
AGRICULTURE RELATED	18	Commercial hunting and trapping
	19	Support activities for agriculture and forestry

**Table 5. Major Components of Agricultural Production and Agriculture-Related as Defined by IMPLAN Sectors.**

<b>Aggregated Sector</b>	<b>IMPLAN Sector</b>
CROPS PRODUCTION	Oilseed farming; Grain farming; Vegetable and melon farming; Tree nut farming; Fruit farming; Greenhouse and nursery production; Tobacco farming; Cotton farming; Sugarcane and sugar beet farming; All other crop farming
ANIMAL PRODUCTION	Cattle ranching and farming; Poultry and egg production; Animal production, except cattle and poultry
FORESTRY PRODUCTION	Forestry, forest products, and timber tract production; Commercial logging
AGRICULTURE RELATED	Commercial fishing; Commercial hunting and trapping; Support activities for agriculture and forestry

**Table 6. Major Components of Agricultural Processing as Defined by IMPLAN Sectors.**

<b>Aggregated Sector</b>	<b>IMPLAN Sector</b>
CROPS PROCESSING	Flour milling and malt manufacturing; Wet corn milling; Soybean and other oilseed processing; Fats and oils refining and blending; Breakfast cereal manufacturing; Sugar cane mills and refining; Beet sugar manufacturing; Chocolate and confectionery manufacturing from cacao beans; Confectionery manufacturing from purchased chocolate; Nonchocolate confectionery manufacturing; Frozen food manufacturing; Fruit and vegetable canning, pickling, and drying; Bread and bakery product manufacturing; Cookie, cracker, and pasta manufacturing; Tortilla manufacturing; Snack food manufacturing; Coffee and tea manufacturing; Flavoring syrup and concentrate manufacturing; Seasoning and dressing manufacturing; All other food manufacturing; Soft drink and ice manufacturing; Breweries; Wineries; Distilleries; Tobacco product manufacturing; Fiber, yarn, and thread mills; Broadwoven fabric mills; Narrow fabric mills and schiffli machine embroidery; Nonwoven fabric mills; Knit fabric mills; Textile and fabric mills; Fabric coating mills; Carpet and rug mills; Curtain and linen mills; Textile bag and canvas mills; All other textile product mills; Cut and sew apparel contractors; Men's and boys' cut and sew apparel manufacturing; Women's and girls' cut and sew apparel manufacturing; Other cut and sew apparel manufacturing; Apparel accessories and other apparel manufacturing
ANIMAL PROCESSING	Dog and cat food manufacturing; Other animal food manufacturing; Fluid milk and butter manufacturing; Cheese manufacturing; Dry- condensed- and evaporated dairy products; Ice cream and frozen dessert manufacturing; Animal (except poultry) slaughtering and rendering; Poultry processing; Seafood product preparation and packaging; Leather and hide tanning and finishing; Footwear manufacturing; Other leather and allied product manufacturing
FORESTRY PROCESSING	Sawmills and wood preservation; Veneer and plywood manufacturing; Engineered wood member and truss manufacturing; Reconstituted wood product manufacturing; Wood windows and doors and millwork manufacturing; Wood container and pallet manufacturing; Manufactured home (mobile home) manufacturing; Prefabricated wood building manufacturing; All other miscellaneous wood product manufacturing; Pulp mills; Paper mills; Paperboard mills; Paperboard container manufacturing; Coated and laminated paper, packaging paper and plastics film manufacturing; All other paper bag and coated and treated paper; Stationery product manufacturing; Sanitary paper product manufacturing; All other converted paper product manufacturing; Wood kitchen cabinet and countertop manufacturing; Upholstered household furniture manufacturing; Non-upholstered wood household furniture manufacturing; Office furniture manufacturing; Custom architectural wood manufacturing

## Appendix B

### Agriculture-Generated Activity by Sector

**Table 1. Agriculture-Generated Activity by Sector, 2009.**

Sector ID	Aggregate Agriculture Contribution to	Employment (Jobs)	Income (Million \$)	Value Added (Million \$)
60	Poultry processing	29,556	974.977	1,077.567
2	Grain farming	27,889	534.183	731.498
1	Oilseed farming	13,556	446.247	521.123
319	Wholesale trade businesses	13,348	848.361	1,459.773
413	Food services and drinking places	10,182	173.665	248.995
335	Transport by truck	9,156	416.255	534.215
360	Real estate establishments	8,682	78.350	584.354
13	Poultry and egg production	8,657	591.816	546.029
19	Support activities for agriculture and forestry	8,210	264.307	228.235
95	Sawmills and wood preservation	4,582	198.973	254.981
16	Commercial logging	4,580	162.605	180.822
53	Frozen food manufacturing	4,555	202.404	270.277
14	Animal production, except cattle and poultry	4,386	33.753	81.104
394	Offices of physicians, dentists, and other health practitioners	4,159	285.458	304.456
381	Management of companies and enterprises	3,281	324.618	395.524
11	Cattle ranching and farming	3,238	22.656	65.854
397	Private hospitals	3,206	163.809	174.857
398	Nursing and residential care facilities	2,707	77.166	83.312
329	Retail Stores - General merchandise	2,618	67.112	109.255
107	Paperboard container manufacturing	2,601	151.773	185.754
105	Paper mills	2,542	242.011	550.736
382	Employment services	2,277	44.225	52.783
324	Retail Stores - Food and beverage	2,208	56.895	92.350
388	Services to buildings and dwellings	2,188	41.604	57.149
414	Automotive repair and maintenance, except car washes	2,178	67.518	81.703
62	Bread and bakery product manufacturing	2,166	94.397	113.268
426	Private household operations	2,013	15.800	15.800
354	Monetary authorities and depository credit intermediation activities	2,002	97.084	201.677
39	Maintenance and repair construction of nonresidential structures	1,990	68.545	80.769
340	Warehousing and storage	1,889	76.121	97.253
59	Animal (except poultry) slaughtering, rendering, and processing	1,837	84.735	96.100
400	Individual and family services	1,786	38.048	38.157
99	Wood windows and doors and millwork manufacturing	1,763	68.416	89.416
96	Veneer and plywood manufacturing	1,721	95.976	121.152
320	Retail Stores - Motor vehicle and parts	1,718	75.561	91.332
111	Sanitary paper product manufacturing	1,672	113.031	378.623
330	Retail Stores - Miscellaneous	1,630	26.129	39.310
109	All other paper bag and coated and treated paper manufacturing	1,629	87.719	114.862
43	Flour milling and malt manufacturing	1,619	85.781	169.151
106	Paperboard mills	1,583	143.297	300.344
425	Civic, social, professional, and similar organizations	1,545	43.665	44.054
368	Accounting, tax preparation, bookkeeping, and payroll services	1,533	57.241	73.592
93	Footwear manufacturing	1,477	47.640	70.133
31	Electric power generation, transmission, and distribution	1,458	156.181	536.379
8	Cotton farming	1,383	94.489	118.329
333	Transport by rail	1,381	126.386	205.278
432	Other state and local government enterprises	1,316	73.522	83.427
331	Retail Nonstores - Direct and electronic sales	1,314	13.969	41.272
356	Securities, commodity contracts, investments, and related activities	1,300	42.280	47.229

Table 1. (Continued).

Sector ID	Aggregate Agriculture Contribution to	Employment (Jobs)	Income (Million \$)	Value Added (Million \$)
367	Legal services	1,294	63.726	113.679
10	All other crop farming	1,248	91.067	68.418
54	Fruit and vegetable canning, pickling, and drying	1,197	64.674	114.997
65	Snack food manufacturing	1,173	65.617	188.146
323	Retail Stores - Building material and garden supply	1,151	38.145	60.147
327	Retail Stores - Clothing and clothing accessories	1,139	19.939	39.479
399	Child day care services	1,119	21.206	23.934
42	Other animal food manufacturing	1,055	58.854	123.376
20	Extraction of oil and natural gas	1,041	49.439	114.779
325	Retail Stores - Health and personal care	1,007	36.708	57.540
411	Hotels and motels, including casino hotels	986	20.809	37.099
369	Architectural, engineering, and related services	944	50.996	53.875
295	Wood kitchen cabinet and countertop manufacturing	921	32.801	30.330
357	Insurance carriers	895	52.586	140.890
326	Retail Stores - Gasoline stations	851	23.625	38.594
386	Business support services	846	19.562	20.788
296	Upholstered household furniture manufacturing	845	31.461	46.529
100	Wood container and pallet manufacturing	823	25.066	43.189
70	Soft drink and ice manufacturing	816	50.187	64.613
339	Couriers and messengers	811	25.483	47.055
63	Cookie, cracker, and pasta manufacturing	720	36.523	66.423
374	Management, scientific, and technical consulting services	712	37.648	42.308
328	Retail Stores - Sporting goods, hobby, book and music	681	12.122	19.821
85	All other textile product mills	676	34.937	49.296
396	Medical and diagnostic labs and outpatient and other ambulatory care services	675	31.330	40.279
391	Private elementary and secondary schools	654	13.179	13.135
86	Apparel knitting mills	636	16.002	23.668
401	Community food, housing, and other relief services, including rehabilitation services	603	15.284	15.062
393	Other private educational services	602	16.504	22.004
419	Personal care services	598	19.174	20.870
338	Scenic and sightseeing transportation and support activities for transportation	592	36.296	38.280
149	Other plastics product manufacturing	583	24.357	38.545
15	Forestry, forest products, and timber tract production	581	32.811	103.227
395	Home health care services	573	21.052	22.341
142	Plastics packaging materials and unlaminated film and sheet manufacturing	559	31.811	67.848
427	US Postal Service	558	44.544	41.315
40	Maintenance and repair construction of residential structures	555	18.852	23.382
417	Commercial and industrial machinery and equipment repair and maintenance	531	23.622	29.574
98	Reconstituted wood product manufacturing	508	31.166	110.226
424	Grantmaking, giving, and social advocacy organizations	504	16.544	16.321
392	Private junior colleges, colleges, universities, and professional schools	501	13.527	13.970
403	Spectator sports companies	482	5.527	6.087
387	Investigation and security services	479	11.729	12.893
322	Retail Stores - Electronics and appliances	475	17.750	22.002
321	Retail Stores - Furniture and home furnishings	473	14.730	26.479

Table 1. (Continued).

Sector ID	Aggregate Agriculture Contribution to	Employment (Jobs)	Income (Million \$)	Value Added (Million \$)
97	Engineered wood member and truss manufacturing	470	18.250	28.735
41	Dog and cat food manufacturing	464	20.839	70.580
377	Advertising and related services	456	17.360	25.757
409	Amusement parks, arcades, and gambling industries	439	7.927	10.106
410	Other amusement and recreation industries	433	8.478	12.983
380	All other miscellaneous professional, scientific, and technical services	426	10.850	28.473
372	Computer systems design services	421	28.840	19.685
355	Nondepository credit intermediation and related activities	410	27.572	65.861
6	Greenhouse, nursery, and floriculture production	410	50.548	39.653
55	Fluid milk and butter manufacturing	406	23.468	38.541
421	Dry-cleaning and laundry services	400	14.135	15.100
351	Telecommunications	400	47.129	148.444
407	Fitness and recreational sports centers	395	5.834	6.521
88	Men's and boys' cut and sew apparel manufacturing	363	9.517	14.641
91	Apparel accessories and other apparel manufacturing	363	11.329	11.825
45	Soybean and other oilseed processing	344	18.963	45.215
341	Newspaper publishers	308	9.814	13.087
362	Automotive equipment rental and leasing	300	9.994	34.038
297	Nonupholstered wood household furniture manufacturing	289	10.119	18.280
29	Support activities for oil and gas operations	282	16.861	17.906
32	Natural gas distribution	278	26.117	110.569
73	Distilleries	275	21.339	165.917
359	Funds, trusts, and other financial vehicles	266	6.309	11.287
379	Veterinary services	263	6.620	7.091
68	Seasoning and dressing manufacturing	263	8.898	11.239
404	Promoters of performing arts and sports and agents for public figures	261	3.974	5.170
358	Insurance agencies, brokerages, and related activities	259	12.082	17.269
384	Office administrative services	243	12.250	12.534
389	Other support services	241	7.356	13.756
390	Waste management and remediation services	240	9.900	17.191
348	Radio and television broadcasting	236	42.964	33.765
402	Performing arts companies	233	2.406	2.335
418	Personal and household goods repair and maintenance	232	10.626	14.295
46	Fats and oils refining and blending	223	10.675	34.767
113	Printing	220	9.405	11.995
415	Car washes	209	2.976	3.578
336	Transit and ground passenger transportation	208	4.560	5.701
103	All other miscellaneous wood product manufacturing	207	6.290	11.009
365	Commercial and industrial machinery and equipment rental and leasing	206	16.544	33.482
420	Death care services	203	8.002	9.198
376	Scientific research and development services	182	10.627	10.569
3	Vegetable and melon farming	181	32.457	16.847
64	Tortilla manufacturing	180	6.299	9.049
58	Ice cream and frozen dessert manufacturing	176	9.018	13.974
423	Religious organizations	175	4.301	4.351
78	Nonwoven fabric mills	169	11.777	20.095
431	State and local government electric utilities	167	12.250	21.058
69	All other food manufacturing	158	5.581	8.549
141	All other chemical product and preparation manufacturing	157	11.846	16.083
422	Other personal services	156	8.099	9.376

Table 1. (Continued).

Sector ID	Aggregate Agriculture Contribution to	Employment (Jobs)	Income (Million \$)	Value Added (Million \$)
300	Office furniture manufacturing	151	5.787	15.310
416	Electronic and precision equipment repair and maintenance	145	6.989	9.151
203	Farm machinery and equipment manufacturing	142	6.463	14.637
12	Dairy cattle and milk production	142	1.020	4.733
110	Stationery product manufacturing	139	5.200	6.960
412	Other accommodations	137	3.195	4.743
47	Breakfast cereal manufacturing	130	8.082	28.681
363	General and consumer goods rental except video tapes and discs	129	9.177	9.339
84	Textile bag and canvas mills	123	5.176	6.758
61	Seafood product preparation and packaging	121	3.322	3.610
346	Motion picture and video industries	121	2.421	4.970
337	Transport by pipeline	115	14.875	18.134
195	Machine shops	115	5.043	6.381
207	Other industrial machinery manufacturing	113	6.072	7.543
373	Other computer related services, including facilities management	112	8.468	16.374
115	Petroleum refineries	111	10.730	59.498
33	Water, sewage and other treatment and delivery systems	107	4.973	9.416
246	Printed circuit assembly (electronic assembly) manufacturing	105	4.791	6.118
370	Specialized design services	102	3.960	6.464
375	Environmental and other technical consulting services	98	5.292	5.520
18	Commercial hunting and trapping	96	2.430	10.438
283	Motor vehicle parts manufacturing	95	4.533	6.392
108	Coated and laminated paper, packaging paper and plastics film manufacturing	95	6.731	11.101
158	Glass container manufacturing	94	4.264	7.850
87	Cut and sew apparel contractors	93	1.877	2.003
112	All other converted paper product manufacturing	93	4.406	6.047
56	Cheese manufacturing	91	4.326	6.321
364	Video tape and disc rental	89	1.765	3.189
332	Transport by air	87	5.400	8.335
125	All other basic inorganic chemical manufacturing	83	7.369	11.328
148	Plastics bottle manufacturing	81	4.672	10.927
80	Textile and fabric finishing mills	79	2.813	3.487
94	Other leather and allied product manufacturing	71	2.808	4.177
247	Other electronic component manufacturing	68	3.362	3.675
302	Showcase, partition, shelving, and locker manufacturing	68	3.435	4.815
429	Other Federal Government enterprises	64	1.578	2.329
301	Custom architectural wood manufacturing	60	2.198	2.691
143	Unlaminated plastics profile shape manufacturing	60	3.088	5.860
344	Directory, mailing list, and other publishers	59	3.013	6.309
352	Data processing, hosting, ISP, web search portals and related services	58	3.133	7.009
190	Metal can, box, and other metal container (light gauge) manufacturing	57	3.311	7.906
147	Urethane and other foam product (except polystyrene) manufacturing	57	3.645	6.889
405	Independent artists, writers, and performers	54	3.485	4.464
371	Custom computer programming services	53	2.976	2.963
126	Other basic organic chemical manufacturing	53	5.394	8.625
4	Fruit farming	52	8.083	3.932
130	Fertilizer manufacturing	50	4.408	8.243
44	Wet corn milling	49	3.472	7.217
72	Wineries	47	2.352	3.673

Table 1. (Continued).

Sector ID	Aggregate Agriculture Contribution to	Employment (Jobs)	Income (Million \$)	Value Added (Million \$)
140	Printing ink manufacturing	44	2.841	2.663
309	Dental laboratories manufacturing	42	1.860	1.925
334	Transport by water	41	2.671	5.157
308	Ophthalmic goods manufacturing	40	1.621	3.504
197	Coating, engraving, heat treating and allied activities	40	1.599	2.701
146	Polystyrene foam product manufacturing	39	1.716	4.084
228	Material handling equipment manufacturing	38	1.752	2.524
342	Periodical publishers	36	1.510	2.134
89	Women's and girls' cut and sew apparel manufacturing	35	0.890	1.723
71	Breweries	34	3.595	14.604
139	Toilet preparation manufacturing	34	2.797	7.886
378	Photographic services	32	0.571	1.039
383	Travel arrangement and reservation services	32	0.952	1.446
305	Surgical and medical instrument, laboratory and medical instrument manufacturing	32	1.775	3.018
185	Handtool manufacturing	32	1.505	2.609
90	Other cut and sew apparel manufacturing	31	0.614	0.852
51	Confectionery manufacturing from purchased chocolate	31	0.367	0.711
220	Cutting tool and machine tool accessory manufacturing	30	1.517	1.967
145	Laminated plastics plate, sheet (except packaging), and shape manufacturing	30	1.362	2.409
243	Semiconductor and related device manufacturing	30	1.572	3.008
406	Museums, historical sites, zoos, and parks	29	1.015	1.865
5	Tree nut farming	29	2.167	1.287
52	Nonchocolate confectionery manufacturing	29	0.841	1.323
122	Synthetic dye and pigment manufacturing	28	1.625	2.145
118	Petroleum lubricating oil and grease manufacturing	28	1.597	4.326
131	Pesticide and other agricultural chemical manufacturing	27	2.041	7.534
350	Internet publishing and broadcasting	26	1.073	0.999
267	Motor and generator manufacturing	25	1.256	2.462
366	Lessors of nonfinancial intangible assets	24	0.995	26.269
83	Curtain and linen mills	24	0.674	1.099
144	Plastics pipe and pipe fitting manufacturing	22	1.298	2.868
102	Prefabricated wood building manufacturing	22	0.709	0.820
270	Storage battery manufacturing	22	1.453	2.185
385	Facilities support services	20	0.688	1.013
314	Sign manufacturing	20	0.816	0.746
76	Broadwoven fabric mills	19	0.858	1.268
21	Mining coal	19	1.385	2.692
198	Valve and fittings other than plumbing manufacturing	18	1.008	2.107
17	Commercial Fishing	18	1.081	1.598
240	Audio and video equipment manufacturing	17	0.776	1.129
353	Other information services	15	0.641	0.589
204	Lawn and garden equipment manufacturing	15	0.408	0.825
66	Coffee and tea manufacturing	14	0.618	1.123
137	Adhesive manufacturing	13	1.483	1.814
75	Fiber, yarn, and thread mills	13	0.424	0.574
430	State and local government passenger transit	13	0.447	0.504
303	Mattress manufacturing	12	0.379	0.867
50	Chocolate and confectionery manufacturing from cacao beans	11	0.407	0.567



Table 1. (Continued).

Sector ID	Aggregate Agriculture Contribution to	Employment (Jobs)	Income (Million \$)	Value Added (Million \$)
101	Manufactured home (mobile home) manufacturing	11	0.328	0.398
26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals	11	0.532	0.782
306	Surgical appliance and supplies manufacturing	10	0.692	1.398
27	Mining and quarrying other nonmetallic minerals	10	0.435	1.162
345	Software publishers	9	0.677	1.430
343	Book publishers	9	0.466	0.965
317	All other miscellaneous manufacturing	9	0.285	0.458
298	Metal and other household furniture (except wood) manufacturing	9	0.443	0.771
286	Other aircraft parts and auxiliary equipment manufacturing	9	0.503	0.652
196	Turned product and screw, nut, and bolt manufacturing	9	0.365	0.609
242	Bare printed circuit board manufacturing	8	0.379	0.405
135	Biological product (except diagnostic) manufacturing	8	0.478	0.814
408	Bowling centers	8	0.115	0.211
194	Spring and wire product manufacturing	8	0.300	0.571
25	Mining and quarrying stone	8	0.381	0.888
225	Other engine equipment manufacturing	8	0.401	0.758
219	Special tool, die, jig, and fixture manufacturing	7	0.349	0.395
307	Dental equipment and supplies manufacturing	7	0.318	0.587
67	Flavoring syrup and concentrate manufacturing	7	0.698	6.267
299	Institutional furniture manufacturing	7	0.341	0.599
174	Aluminum product manufacturing from purchased aluminum	7	0.442	0.801
266	Power, distribution, and specialty transformer manufacturing	7	0.341	0.646
224	Mechanical power transmission equipment manufacturing	7	0.276	0.439
208	Plastics and rubber industry machinery manufacturing	7	0.315	0.402
282	Travel trailer and camper manufacturing	7	0.218	0.226
284	Aircraft manufacturing	7	0.479	0.686
127	Plastics material and resin manufacturing	7	0.566	0.904
272	Communication and energy wire and cable manufacturing	7	0.454	0.851
117	Asphalt shingle and coating materials manufacturing	6	0.853	2.845
133	Pharmaceutical preparation manufacturing	6	0.474	1.120
114	Support activities for printing	6	0.253	0.300
193	Hardware manufacturing	6	0.271	0.537
159	Glass product manufacturing made of purchased glass	6	0.301	0.409
57	Dry, condensed, and evaporated dairy product manufacturing	6	0.374	0.758
138	Soap and cleaning compound manufacturing	6	0.376	1.092
213	Other commercial and service industry machinery manufacturing	6	0.334	0.500
151	Rubber and plastics hoses and belting manufacturing	6	0.296	0.498
199	Plumbing fixture fitting and trim manufacturing	5	0.248	0.757
81	Fabric coating mills	5	0.281	0.345
120	Petrochemical manufacturing	5	0.367	1.939
349	Cable and other subscription programming	5	0.938	0.755
231	Packaging machinery manufacturing	5	0.267	0.320
82	Carpet and rug mills	5	0.124	0.226
347	Sound recording industries	4	0.174	0.723
229	Power-driven handtool manufacturing	4	0.218	0.461
187	Ornamental and architectural metal products manufacturing	4	0.228	0.326
273	Wiring device manufacturing	4	0.198	0.379
278	Heavy duty truck manufacturing	4	0.238	0.319
279	Motor vehicle body manufacturing	4	0.240	0.357

Table 1. (Continued).

Sector ID	Aggregate Agriculture Contribution to	Employment (Jobs)	Income (Million \$)	Value Added (Million \$)
170	Iron and steel mills and ferroalloy manufacturing	4	0.437	1.080
252	Totalizing fluid meters and counting devices manufacturing	4	0.241	0.310
263	Household refrigerator and home freezer manufacturing	4	0.224	0.375
157	Other pressed and blown glass and glassware manufacturing	4	0.143	0.205
201	Fabricated pipe and pipe fitting manufacturing	4	0.202	0.427
171	Steel product manufacturing from purchased steel	4	0.222	0.376
311	Sporting and athletic goods manufacturing	4	0.144	0.249
260	Lighting fixture manufacturing	4	0.192	0.310
121	Industrial gas manufacturing	4	0.362	0.845
275	All other miscellaneous electrical equipment and component manufacturing	4	0.198	0.254
237	Telephone apparatus manufacturing	4	0.273	0.384
152	Other rubber product manufacturing	3	0.177	0.299
256	Watch, clock, and other measuring and controlling device manufacturing	3	0.188	0.236
274	Carbon and graphite product manufacturing	3	0.166	0.324
183	Crown and closure manufacturing and metal stamping	3	0.163	0.247
268	Switchgear and switchboard apparatus manufacturing	3	0.168	0.313
280	Truck trailer manufacturing	3	0.128	0.147
202	Other fabricated metal manufacturing	3	0.153	0.275
186	Plate work and fabricated structural product manufacturing	3	0.157	0.272
134	In-vitro diagnostic substance manufacturing	3	0.121	0.139
116	Asphalt paving mixture and block manufacturing	2	0.120	0.392
269	Relay and industrial control manufacturing	2	0.138	0.214
184	Cutlery, utensil, pot, and pan manufacturing	2	0.079	0.161
132	Medicinal and botanical manufacturing	2	0.146	0.188
245	Electronic connector manufacturing	2	0.088	0.106
285	Aircraft engine and engine parts manufacturing	2	0.123	0.200
291	Boat building	2	0.060	0.072
244	Electronic capacitor, resistor, coil, transformer, and other inductor manufacturing	2	0.070	0.086
238	Broadcast and wireless communications equipment manufacturing	2	0.115	0.134
24	Mining gold, silver, and other metal ore	2	0.164	0.816
313	Office supplies (except paper) manufacturing	1	0.086	0.171
251	Industrial process variable instruments manufacturing	1	0.097	0.112
257	Software, audio, and video media for reproduction	1	0.007	0.009
289	Railroad rolling stock manufacturing	1	0.070	0.139
264	Household laundry equipment manufacturing	1	0.084	0.208
205	Construction machinery manufacturing	1	0.057	0.121
172	Alumina refining and primary aluminum production	1	0.113	0.237
315	Gasket, packing, and sealing device manufacturing	1	0.060	0.079
214	Air purification and ventilation equipment manufacturing	1	0.054	0.077
211	Optical instrument and lens manufacturing	1	0.051	0.068
249	Search, detection, and navigation instruments manufacturing	1	0.060	0.078
162	Concrete pipe, brick, and block manufacturing	1	0.044	0.073
150	Tire manufacturing	1	0.066	0.110
222	Turbine and turbine generator set units manufacturing	1	0.054	0.135
119	All other petroleum and coal products manufacturing	1	0.045	0.161
191	Ammunition manufacturing	1	0.052	0.125
178	Nonferrous metal (except copper and aluminum) rolling, drawing, extruding and alloying	1	0.038	0.090

Table 1. (Continued).

Sector ID	Aggregate Agriculture Contribution to	Employment (Jobs)	Income (Million \$)	Value Added (Million \$)
165	Abrasive product manufacturing	1	0.056	0.116
164	Lime and gypsum product manufacturing	1	0.046	0.090
200	Ball and roller bearing manufacturing	1	0.044	0.108
230	Other general purpose machinery manufacturing	1	0.035	0.049
216	Air conditioning, refrigeration, and warm air heating equipment manufacturing	1	0.032	0.060
166	Cut stone and stone product manufacturing	1	0.021	0.024
92	Leather and hide tanning and finishing	1	0.031	0.036
206	Mining and oil and gas field machinery manufacturing	1	0.036	0.060
318	Broom, brush, and mop manufacturing	1	0.029	0.053
210	Vending, commercial, industrial, and office machinery manufacturing	1	0.021	0.025
236	Computer terminals and other computer peripheral equipment manufacturing	1	0.022	0.027
218	Metal cutting and forming machine tool manufacturing	1	0.027	0.038
180	Nonferrous metal foundries	1	0.028	0.034
209	Semiconductor machinery manufacturing	1	0.072	0.092
153	Pottery, ceramics, and plumbing fixture manufacturing	1	0.026	0.033
294	All other transportation equipment manufacturing	1	0.032	0.062
177	Copper rolling, drawing, extruding and alloying	1	0.024	0.057
221	Rolling mill and other metalworking machinery manufacturing	1	0.032	0.043
217	Industrial mold manufacturing	0	0.020	0.022
290	Ship building and repairing	0	0.016	0.019
250	Automatic environmental control manufacturing	0	0.022	0.031
226	Pump and pumping equipment manufacturing	0	0.019	0.033
227	Air and gas compressor manufacturing	0	0.016	0.026
254	Analytical laboratory instrument manufacturing	0	0.025	0.030
161	Ready-mix concrete manufacturing	0	0.012	0.019
261	Small electrical appliance manufacturing	0	0.011	0.023
233	Fluid power process machinery manufacturing	0	0.016	0.023
176	Primary smelting and refining of nonferrous metal (except copper and aluminum)	0	0.015	0.032
312	Doll, toy, and game manufacturing	0	0.009	0.016
248	Electromedical and electrotherapeutic apparatus manufacturing	0	0.020	0.029
192	Arms, ordnance, and accessories manufacturing	0	0.015	0.042
163	Other concrete product manufacturing	0	0.011	0.015
181	All other forging, stamping, and sintering	0	0.009	0.011
310	Jewelry and silverware manufacturing	0	0.010	0.015
253	Electricity and signal testing instruments manufacturing	0	0.007	0.008
188	Power boiler and heat exchanger manufacturing	0	0.009	0.016
316	Musical instrument manufacturing	0	0.006	0.007
287	Guided missile and space vehicle manufacturing	0	0.011	0.012
136	Paint and coating manufacturing	0	0.009	0.013
189	Metal tank (heavy gauge) manufacturing	0	0.006	0.008
169	Miscellaneous nonmetallic mineral product manufacturing	0	0.005	0.008
168	Mineral wool manufacturing	0	0.002	0.003
154	Brick, tile, and other structural clay product manufacturing	0	0.003	0.004
179	Ferrous metal foundries	0	0.002	0.003
128	Synthetic rubber manufacturing	0	0.003	0.005
182	Custom roll forming	0	0.002	0.003
292	Motorcycle, bicycle, and parts manufacturing	0	0.001	0.002

Table 1. (Continued).

Sector ID	Aggregate Agriculture Contribution to	Employment (Jobs)	Income (Million \$)	Value Added (Million \$)
129	Artificial and synthetic fibers and filaments manufacturing	0	0.002	0.002
30	Support activities for other mining	0	0.001	0.002
160	Cement manufacturing	0	0.001	0.002
173	Secondary smelting and alloying of aluminum	0	0.001	0.001
167	Ground or treated mineral and earth manufacturing	0	0.001	0.002
259	Electric lamp bulb and part manufacturing	0	0.000	0.000
262	Household cooking appliance manufacturing	0	0.000	0.000
7	Tobacco farming	0	0.000	0.000
9	Sugarcane and sugar beet farming	0	0.000	0.000
22	Mining iron ore	0	0.000	0.000
23	Mining copper, nickel, lead, and zinc	0	0.000	0.000
28	Drilling oil and gas wells	0	0.000	0.000
34	Construction of new nonresidential commercial and health care structures	0	0.000	0.000
35	Construction of new nonresidential manufacturing structures	0	0.000	0.000
36	Construction of other new nonresidential structures	0	0.000	0.000
37	Construction of new residential permanent site single- and multi-family structures	0	0.000	0.000
38	Construction of other new residential structures	0	0.000	0.000
48	Sugar cane mills and refining	0	0.000	0.000
49	Beet sugar manufacturing	0	0.000	0.000
74	Tobacco product manufacturing	0	0.000	0.000
77	Narrow fabric mills and schiffli machine embroidery	0	0.000	0.000
79	Knit fabric mills	0	0.000	0.000
104	Pulp mills	0	0.000	0.000
123	Alkalies and chlorine manufacturing	0	0.000	0.000
124	Carbon black manufacturing	0	0.000	0.000
155	Clay and nonclay refractory manufacturing	0	0.000	0.000
156	Flat glass manufacturing	0	0.000	0.000
175	Primary smelting and refining of copper	0	0.000	0.000
212	Photographic and photocopying equipment manufacturing	0	0.000	0.000
215	Heating equipment (except warm air furnaces) manufacturing	0	0.000	0.000
223	Speed changer, industrial high-speed drive, and gear manufacturing	0	0.000	0.000
232	Industrial process furnace and oven manufacturing	0	0.000	0.000
234	Electronic computer manufacturing	0	0.000	0.000
235	Computer storage device manufacturing	0	0.000	0.000
239	Other communications equipment manufacturing	0	0.000	0.000
241	Electron tube manufacturing	0	0.000	0.000
255	Irradiation apparatus manufacturing	0	0.000	0.000
258	Magnetic and optical recording media manufacturing	0	0.000	0.000
265	Other major household appliance manufacturing	0	0.000	0.000
271	Primary battery manufacturing	0	0.000	0.000
276	Automobile manufacturing	0	0.000	0.000
277	Light truck and utility vehicle manufacturing	0	0.000	0.000
281	Motor home manufacturing	0	0.000	0.000
288	Propulsion units and parts for space vehicles and guided missiles manufacturing	0	0.000	0.000
293	Military armored vehicle, tank, and tank component manufacturing	0	0.000	0.000
304	Blind and shade manufacturing	0	0.000	0.000
361	Imputed rental activity for owner-occupied dwellings	0	0.000	729.461
428	Federal electric utilities	0	0.000	0.000

Table 1. (Continued).

Sector ID	Aggregate Agriculture Contribution to	Employment (Jobs)	Income (Million \$)	Value Added (Million \$)
433	* Not an industry (Used and secondhand goods)	0	0.000	0.000
434	* Not an industry (Scrap)	0	0.000	0.000
435	* Not an industry (Rest of the world adjustment)	0	0.000	0.000
436	* Not an industry (Noncomparable foreign imports)	0	0.000	0.000
437	* Employment and payroll only (state & local govt, non-education)	0	0.000	0.000
438	* Employment and payroll only (state & local govt, education)	0	0.000	0.000
439	* Employment and payroll only (federal govt, non-military)	0	0.000	0.000
440	* Employment and payroll only (federal govt, military)	0	0.000	0.000
<b>Total</b>		<b>275,435</b>	<b>10,743.478</b>	<b>17,017.807</b>

Note: Sorted by total number of jobs descending.

**Table 2. Crop Contributions by Sector, 2009.**

<b>Sector ID</b>	<b>Crops Sector Contribution to</b>	<b>Employment (Jobs)</b>	<b>Income (Million \$)</b>	<b>Value Added (Million \$)</b>
2	Grain farming	27,889	534.183	731.498
1	Oilseed farming	13,556	446.247	521.123
53	Frozen food manufacturing	4,555	202.404	270.277
62	Bread and bakery product manufacturing	2,166	94.397	113.268
43	Flour milling and malt manufacturing	1,619	85.781	169.151
8	Cotton farming	1,383	94.489	118.329
10	All other crop farming	1,248	91.067	68.418
54	Fruit and vegetable canning, pickling, and drying	1,197	64.674	114.997
65	Snack food manufacturing	1,173	65.617	188.146
70	Soft drink and ice manufacturing	816	50.187	64.613
63	Cookie, cracker, and pasta manufacturing	720	36.523	66.423
85	All other textile product mills	676	34.937	49.296
86	Apparel knitting mills	636	16.002	23.668
6	Greenhouse, nursery, and floriculture production	410	50.548	39.653
88	Men's and boys' cut and sew apparel manufacturing	363	9.517	14.641
91	Apparel accessories and other apparel manufacturing	363	11.329	11.825
45	Soybean and other oilseed processing	344	18.963	45.215
73	Distilleries	275	21.339	165.917
68	Seasoning and dressing manufacturing	263	8.898	11.239
46	Fats and oils refining and blending	223	10.675	34.767
3	Vegetable and melon farming	181	32.457	16.847
64	Tortilla manufacturing	180	6.299	9.049
78	Nonwoven fabric mills	169	11.777	20.095
69	All other food manufacturing	158	5.581	8.549
47	Breakfast cereal manufacturing	130	8.082	28.681
84	Textile bag and canvas mills	123	5.176	6.758
87	Cut and sew apparel contractors	93	1.877	2.003
80	Textile and fabric finishing mills	79	2.813	3.487
4	Fruit farming	52	8.083	3.932
44	Wet corn milling	49	3.472	7.217
72	Wineries	47	2.352	3.673
89	Women's and girls' cut and sew apparel manufacturing	35	0.890	1.723
71	Breweries	34	3.595	14.604
90	Other cut and sew apparel manufacturing	31	0.614	0.852
51	Confectionery manufacturing from purchased chocolate	31	0.367	0.711
5	Tree nut farming	29	2.167	1.287
52	Nonchocolate confectionery manufacturing	29	0.841	1.323
83	Curtain and linen mills	24	0.674	1.099
76	Broadwoven fabric mills	19	0.858	1.268
66	Coffee and tea manufacturing	14	0.618	1.123
75	Fiber, yarn, and thread mills	13	0.424	0.574
50	Chocolate and confectionery manufacturing from cacao beans	11	0.407	0.567
67	Flavoring syrup and concentrate manufacturing	7	0.698	6.267
81	Fabric coating mills	5	0.281	0.345
82	Carpet and rug mills	5	0.124	0.226
7	Tobacco farming	0	0.000	0.000
9	Sugarcane and sugar beet farming	0	0.000	0.000
48	Sugar cane mills and refining	0	0.000	0.000
49	Beet sugar manufacturing	0	0.000	0.000
74	Tobacco product manufacturing	0	0.000	0.000
77	Narrow fabric mills and schiffli machine embroidery	0	0.000	0.000
79	Knit fabric mills	0	0.000	0.000
<b>Total</b>		<b>61,422</b>	<b>2,048.304</b>	<b>2,964.725</b>

Note: Sorted by total number of jobs descending.

**Table 3. Animal Agriculture Contributions by Sector, 2009.**

<b>Sector ID</b>	<b>Animal Agriculture Sector Contribution to:</b>	<b>Employment (Jobs)</b>	<b>Income (Million \$)</b>	<b>Value Added (Million \$)</b>
60	Poultry processing	29,556	974.977	1,077.567
13	Poultry and egg production	8,657	591.816	546.029
14	Animal production, except cattle and poultry	4,386	33.753	81.104
11	Cattle ranching and farming	3,238	22.656	65.854
59	Animal (except poultry) slaughtering, rendering, and processing	1,837	84.735	96.100
93	Footwear manufacturing	1,477	47.640	70.133
42	Other animal food manufacturing	1,055	58.854	123.376
41	Dog and cat food manufacturing	464	20.839	70.580
55	Fluid milk and butter manufacturing	406	23.468	38.541
58	Ice cream and frozen dessert manufacturing	176	9.018	13.974
12	Dairy cattle and milk production	142	1.020	4.733
61	Seafood product preparation and packaging	121	3.322	3.610
56	Cheese manufacturing	91	4.326	6.321
94	Other leather and allied product manufacturing	71	2.808	4.177
57	Dry, condensed, and evaporated dairy product manufacturing	6	0.374	0.758
92	Leather and hide tanning and finishing	1	0.031	0.036
<b>Total</b>		<b>51,684</b>	<b>1,879.635</b>	<b>2,202.892</b>

Note: Sorted by total number of jobs descending.

**Table 4. Forestry Contributions by Sector, 2009.**

<b>Sector ID</b>	<b>Forestry Sector Contribution to:</b>	<b>Employment (Jobs)</b>	<b>Income (Million \$)</b>	<b>Value Added (Million \$)</b>
95	Sawmills and wood preservation	4,582	198.973	254.981
16	Commercial logging	4,580	162.605	180.822
107	Paperboard container manufacturing	2,601	151.773	185.754
105	Paper mills	2,542	242.011	550.736
99	Wood windows and doors and millwork manufacturing	1,763	68.416	89.416
96	Veneer and plywood manufacturing	1,721	95.976	121.152
111	Sanitary paper product manufacturing	1,672	113.031	378.623
109	All other paper bag and coated and treated paper manufacturing	1,629	87.719	114.862
106	Paperboard mills	1,583	143.297	300.344
295	Wood kitchen cabinet and countertop manufacturing	921	32.801	30.330
296	Upholstered household furniture manufacturing	845	31.461	46.529
100	Wood container and pallet manufacturing	823	25.066	43.189
15	Forestry, forest products, and timber tract production	581	32.811	103.227
98	Reconstituted wood product manufacturing	508	31.166	110.226
97	Engineered wood member and truss manufacturing	470	18.250	28.735
297	Nonupholstered wood household furniture manufacturing	289	10.119	18.280
103	All other miscellaneous wood product manufacturing	207	6.290	11.009
300	Office furniture manufacturing	151	5.787	15.310
110	Stationery product manufacturing	139	5.200	6.960
108	Coated and laminated paper, packaging paper and plastics film manufacturing	95	6.731	11.101
112	All other converted paper product manufacturing	93	4.406	6.047
301	Custom architectural wood manufacturing	60	2.198	2.691
102	Prefabricated wood building manufacturing	22	0.709	0.820
101	Manufactured home (mobile home) manufacturing	11	0.328	0.398
104	Pulp mills	0	0.000	0.000
<b>Total</b>		<b>27,886</b>	<b>1,477.125</b>	<b>2,611.541</b>

Note: Sorted by total number of jobs descending.





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