

The Food and Fiber System and Production Agriculture's Contributions to the Texas Economy

Production Agriculture

Production agriculture in Texas ranked third in 2017 among all states in cash receipts and is one component of the larger food and fiber system that serves Texas' 28.3 million consumers as well as millions of consumers beyond the state. The production, processing, distribution, and consumption activities associated with meeting these consumer needs provide the impetus for significant economic activity contributing to the state's economy.

The food and fiber system in Texas is evolving and changing. The structure of production agriculture now is such that while the number of farms is increasing, fewer farm and ranch operations are generating the majority of gross cash sales. Production and marketing integration, along with computerized systems, are used to more efficiently manage the supply chain from producer to consumer. The system now gives greater emphasis to quality, safety, and consumer convenience.

As a result of these changes in Texas' food and fiber system, important policy questions are being raised about the role of the system in state and local economies. Of particular interest is the relationship between the food and fiber system and the economic health and viability of rural areas.

Defining the Food and Fiber System: From Farm to Consumer

The total food and fiber system includes all economic activities linked to agricultural production, such as machinery repair, fertilizer production, food processing and manufacturing, transportation, wholesale distribution of products, retail sales, and eating establishments. Also included are the economic activities that link the production of plant and animal fibers and hides to fabric, clothing, and footwear.

The impact of the food and fiber system on the Texas economy is multiplied by its links to a variety of industries. Machinery, fertilizer, chemicals, seed, feed, labor, financial services, and other inputs are required to produce crops and livestock. This production is then sold to the sectors that store, process, transport, manufacture, distribute, export, and merchandise the products. The food and fiber system is also among the largest users of real estate, rental services, transportation, and warehouse services.

Measuring Economic Impact: Value-Added Contribution

Although the value of production, or gross receipts, is often used as an indicator of economic impact, a more appropriate measure is the contribution to the state's gross domestic product (GDP). The state's GDP is the value added in production (gross receipts less the cost of inputs) through the use of the land, labor, capital, and management resources of the state. A state's GDP is derived as the sum of the gross domestic product originating in all industries in that state. In concept, an industry's contribution to the state's GDP is equivalent to its value of production (sales or receipts and other operating income, and inventory change) minus its intermediate inputs (consumption of goods and services purchased from other U.S. industries or imported). The state's GDP is the state counterpart to the nation's GDP, the federal government's measure of U.S. economic output.

Contributions to the Texas Economy

In 2016, Texas' GDP was \$1.60 trillion. The food and fiber system's total estimated contribution was \$145.7 billion, or approximately 9.1% of the state's total GDP (see table 1). As illustrated in figure 1, from 2007 to 2016, the contribution of the food and fiber system to the state's GDP has remained stable, ranging from 8.3% to 9.1% of GDP, even though the absolute dollar value of the contribution has increased by 47%. Production agriculture (agriculture, forestry, fishing, and hunting) alone contributed 0.7% of the state's GDP.

The food and fiber system's percentage contribution to the state's GDP in 2016 (9.1%) increased slightly, relative to 2015 (8.9%). Other sectors of the economy that experienced the strongest growth were finance, real estate, rental and leasing, construction, wholesale trade, and services.

Figure 2 compares the contribution of the food and fiber system to that of the other industries making up the state's economy. The largest single industry classification is services followed by finance, insurance, and real estate; manufacturing; government; and the food and fiber system. The sectors illustrated in figure 2 are adjusted by the portion of each sector's share of the food and fiber system.

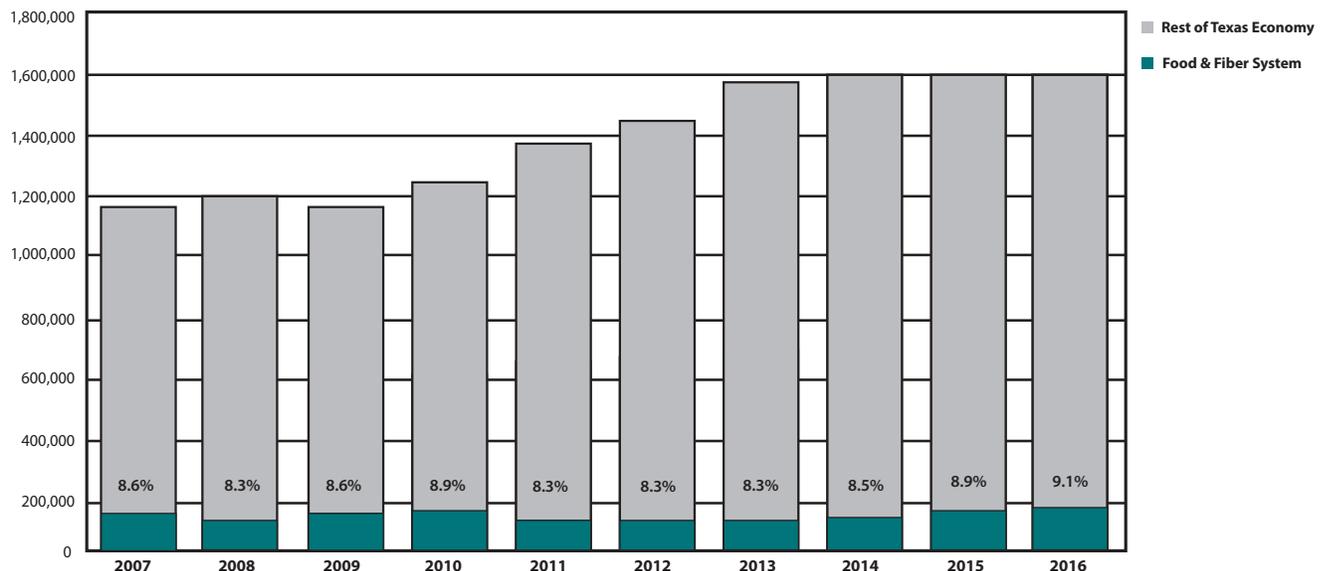
Table 1. Estimated Contribution of the Food and Fiber System to the Texas Economy, 2016

INDUSTRY	FFS Contribution (\$ million)	Contribution as % of Total FFS
Agriculture, forestry, fishing & hunting	10,826	7.4%
Mining	147	0.1%
Manufacturing		
Wood products	1,759	1.2%
Nonmetallic mineral products	514	0.4%
Machinery	172	0.1%
Furniture & related products	712	0.5%
Food, beverage, & tobacco products	15,210	10.4%
Textiles & textile product mills	515	0.4%
Apparel, leather, & allied products	226	0.2%
Paper products	2,141	1.5%
Petroleum & coal products	2,993	2.1%
Chemical products	1,719	1.2%
Wholesale trade	24,202	16.6%
Retail trade	18,424	12.6%
Transportation & warehousing	4,523	3.1%
Finance, insurance, & real estate (F.I.R.E.)		
Federal Reserve banks & related services	3,386	2.3%
Insurance carriers & related activities	4,256	2.9%
Real estate	13,358	9.2%
Rental & leasing services & lessors of intangible assets	2,097	1.4%
Services		
Food services & drinking places	37,324	25.6%
Government		
Federal, state, & local	1,256	0.9%
Contribution of Food & Fiber System	145,760	100.0%
Texas' Gross Domestic Product	1,601,517	
% of Texas GDP Contributed by FFS	9.1%	

Due to rounding, the sum of both the dollars and the percentages may not exactly equal the total. Source: Texas GDP is from the Bureau of Economic Analysis, U.S. Department of Commerce, in current dollars, for 2016 (bea.gov/regional). The portion contributed by the food and fiber system was estimated by Texas A&M AgriLife Research, the Texas A&M AgriLife Extension Service, and the Department of Agricultural Economics in the College of Agriculture and Life Sciences at Texas A&M University. This document was reviewed by the Texas Comptroller's Office.

GDP (\$ million)

Figure 1. Contribution of Food and Fiber System to Texas' Gross Domestic Product, 2007–2016

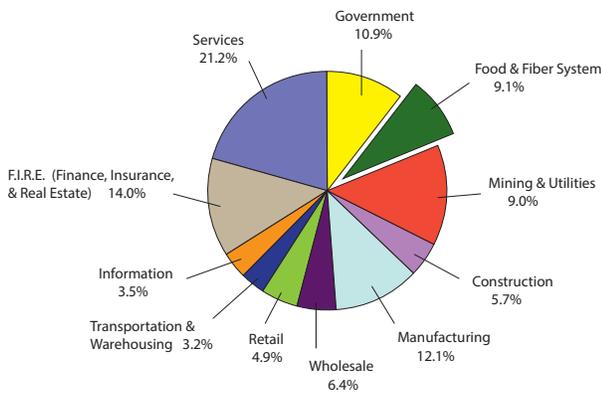


Food & Fiber system	99,102	99,533	98,282	108,496	112,621	120,808	129,620	135,512	143,137	145,760
Rest of Texas economy	1,049,429	1,102,571	1,048,365	1,114,408	1,244,677	1,342,213	1,427,573	1,466,465	1,465,266	1,455,757
Total*	1,148,531	1,202,104	1,146,647	1,222,904	1,357,298	1,463,021	1,557,193	1,601,977	1,608,403	1,601,517
Food & Fiber %	8.6%	8.3%	8.6%	8.9%	8.3%	8.3%	8.3%	8.5%	8.9%	9.1%

*Since the BEA sometimes makes minor revisions to the GDP data, the Texas GDP data for 2007–2015 may vary slightly from what is currently available from the BEA.

Source: Texas GDP is from the Bureau of Economic Analysis, U.S. Department of Commerce, in current dollars, for 2007–2016 (bea.gov/regional). The portion contributed by the food and fiber system was estimated by Texas A&M AgriLife Research, the Texas A&M AgriLife Extension Service, and the Department of Agricultural Economics in the College of Agriculture and Life Sciences at Texas A&M University. This document was reviewed by the Texas Comptroller's Office.

Figure 2. Contribution of the Food and Fiber System to Texas' Gross Domestic Product, 2016



INDUSTRY	Texas GDP (\$ million)
Food & fiber system	145,760
Mining & utilities	143,621
Construction	91,243
Manufacturing	193,351
Wholesale	103,176
Retail	78,546
Transportation & Warehousing	52,016
Information	55,636
F.I.R.E. (Finance, insurance, & real estate)	224,821
Services	339,240
Government	174,108
TOTAL	1,601,517

Measuring the Impacts of Individual Commodities

The economic contribution of the production activities for a specific commodity is often estimated using either the market value of production or total cash receipts. The costs of inputs purchased from other industries are not subtracted from either of these measures. Because the value of the inputs is also included as a part of each supplying industry's value of production, using this statistic may be misleading. A more appropriate measure is the contribution to the state's GDP because it eliminates the possibility of double counting.

The economic impact of specific commodities beyond the farm gate is difficult to separate from that of other commodities because of data aggregation problems. It is possible, however, to estimate economic impacts from the farm gate back through the supply chain using the IMPLAN input-output system's Type SAM multipliers.*

When evaluating the impacts of individual agricultural commodities on the state's economy, input-output analysis provides an appropriate economic procedure to trace the direct and indirect links of these production activities. Input-output analysis is based on the idea that a change in one sector of the economy has effects on other sectors of the economy. Input-output analysis captures the relationships between industries and estimates the change

in each sector's sales due to an initial change in final demand for a given industry's output. The sum of these changes is the industry's multiplier. Multipliers estimate a change in a state's gross domestic product as a result of sales to final demand in a specific sector of the economy.

Estimates of the economic contribution of a commodity's production activities are based on the value added through production only. Each commodity has unique requirements for purchased inputs and land, labor, capital, and management resources. Therefore, the contribution to the state's GDP through the farm gate for individual commodities, relative to the gross value of production, will vary across commodities. One standard multiplier cannot be applied across all agricultural commodities.

Table 2 contains the farm-level cash receipts, the direct contributions to Texas' GDP, and the total contribution to Texas' GDP from the production of some leading agricultural commodities in Texas. Commodities are listed in descending order based on the total contribution to Texas' GDP. Beef cattle and calves generate the largest total contribution to GDP of the agricultural commodities listed, followed by cotton, dairy, greenhouse and nursery, and broilers.

* For more information see IMPLAN Group, LLC, 2016, *IMPLAN System* [data and software], 16740 Birkdale Commons Parkway, Suite 206, Huntersville, NC 28078 (implan.com).

Calculating Economic Impacts

Value of Production	The value of an individual economic sector's output. This is commonly referred to as value of production because it reflects price multiplied by quantity sold (avg. 2013–2016).
Government Payments	The value of farm program payments made by the government to producers.
Total Cash Receipts	The value of all production plus government payments.
Direct Contribution to Texas' GDP	The portion of output that contributes to Texas' GDP. This value is equivalent to gross revenue less costs of goods sold; that is, returns to land (rent), labor (wages), capital (interest), and management (profit). The value is direct in terms of its origin; it is "directly" from the producer because contributions from input suppliers are explicitly not included.
Total Contribution to Texas' GDP	The total contribution to the state's GDP includes the direct contribution plus contributions made to GDP indirectly. Indirect contributions arise from inter-industry activities and related household spending. These economic activities are stimulated by output. As output changes, inputs (to the producer of the output) must change as well; as a result, the suppliers' contributions to GDP are affected.

Table 2. Leading Agricultural Commodities Based on Contribution to Texas' Gross Domestic Product*

	Total Cash Receipts** (\$ million)	Direct Contribution to GDP (\$ million)	Total Contribution to GDP (\$ million)
Beef cattle & calves	10,241.4	3,798.4	9,271.0
Cotton (including cottonseed)	2,137.6	1,258.2	2,415.4
Dairy (milk & cows)	2,330.9	1,013.0	2,112.3
Greenhouse & nursery	1,455.4	973.2	1,651.0
Broilers	2,078.2	620.4	1,526.7
Corn	1,224.3	142.0	972.4
Grain Sorghum	530.8	61.6	420.0
Eggs	521.8	150.4	381.5
Vegetables	321.2	239.9	371.6
Timber ***	284.5	134.5	342.0
Wheat	432.3	47.4	338.3
Fruits, nuts, and berries	243.4	184.0	295.3
Peanuts	206.6	114.2	231.7
Rice	215.7	24.1	172.7
Sheep, goats, wool, & mohair	126.4	104.3	143.4

* The above figures capture only the impact of the production of these commodities based on the economic impact through the point of first sale. Economic impacts through further value-added processes are not captured in this analysis.

**Average annual cash receipts (from the USDA Economic Research Service) and estimated government payments, 2013–2016.

***Based on stumpage value reported by the Texas A&M Forest Service and the USDA National Agricultural Statistics Service, Texas Field Office.

Direct contribution to GDP (or value added) reflects each commodity's profitability and employee compensation. A commodity's direct contribution will be higher in years when the crop or livestock enterprise is more profitable. For example, when wheat yields and prices are higher, the direct contribution to GDP from Texas' wheat producers increases. The total contribution to GDP includes the direct and indirect contributions resulting from input purchases. Indirect contributions to GDP may also increase, but input purchases are typically more stable over time than are commodity prices.

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