



**U.S. Food and Agriculture Industries  
Economic Impact Study, 2017**

Methodology and Documentation

Prepared for:

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## **Executive Summary:**

The 2017 Food and Agriculture Industries Economic Impact Study estimates the economic contributions made by the food industry to the U.S. economy in 2017. For the purpose of the study, the food industry included any businesses involved in food product agriculture, food manufacturing, food wholesaling, and food retailing (so-called “farm to fork”). John Dunham & Associates conducted this research, which was funded by The Goodstone Group.

The study measures the number of jobs in food and agriculture related industries; the wages paid to employees, the value added and total output. In addition, it measures the economic impact of the suppliers that support the food and agriculture industries, as well as those industries supported by the induced spending of direct and supplier industries.

Industries are linked to each other when one industry buys from another to produce its own products. Each industry in turn makes purchases from a different mix of other industries, and so on. Employees in all industries extend the economic impact when they spend their earnings. Thus, economic activity started in food and agriculture industries generates output (and jobs) in hundreds of other industries, often in states far removed from the original economic activity. The impact of supplier firms, and the “induced impact” of the re-spending by employees of industry and supplier firms, is calculated using an input/output model of the United States. The study calculates the impact on a national basis, by state, and by Congressional District.

The study also estimates taxes paid by the industries and their employees. Federal taxes include industry-specific excise and sales taxes, business and personal income taxes, FICA, and unemployment insurance. State and local tax systems vary widely. Direct retail taxes include state and local sales taxes, license fees, and applicable gross receipt taxes. In addition, businesses pay real estate and personal property taxes, business income taxes, and other business levies that vary in each state and municipality.

The food and agriculture industries are dynamic contributors to the U.S. economy, accounting for about \$6.79 trillion in output or about 20.4% of total national output. They employ approximately 43.31 million Americans who earned wages and benefits of about \$1.99 trillion.

Members of the industries and their employees paid \$894.13 billion in federal, state and local taxes. This does not include state and local sales taxes or excise taxes that may apply for specific retail services.

## **Summary Results**

The food and agriculture industries (as defined in this study) include businesses involved in food agriculture, food manufacturing, food wholesaling, and food retailing. The food and agriculture industries reach into all corners of the United States, employing 22.82 million and generating \$763.12 billion in wages. Retail grocery businesses directly generate \$2.82 trillion in economic activity nationally. The direct employment of the food and agriculture industries is equivalent to 14.9% of total U.S. employment.

**Table 1 – Economic Contribution of the Food and Agriculture Industries**

	Direct	Indirect	Induced	Total
Jobs	22,815,868	9,427,506	11,067,683	43,311,057
Wages	\$763,120,037,900	\$600,109,569,700	\$621,874,666,100	\$1,985,104,273,700
Economic Impact	\$2,824,780,372,700	\$2,005,521,579,500	\$1,957,954,044,800	\$6,788,255,997,000
State and Local Taxes				\$360,816,489,000
Federal Taxes				\$533,310,418,700

Other firms are related to the food and agriculture industries as suppliers. These firms produce and sell a broad range of items and including tools and equipment, trucks, and shelving. In addition, supplier firms provide a broad range of services, including personnel services, financial services, advertising services, consulting services or transportation services. Finally, a number of people are employed in government enterprises responsible for the regulation of the food and agriculture industries. All told, we estimate that the industry is responsible for 9.43 million supplier jobs. These firms generate about \$2.01 trillion in economic activity.<sup>1</sup>

An economic analysis of the industry will also take additional linkages into account. While it is inappropriate to claim that suppliers to the industry’s indirect firms are part of the industry being analyzed,<sup>2</sup> the spending by employees of the industry, and that of indirect firms whose jobs are directly dependent on the food and agriculture industries, should be included. This spending - on everything from housing, to food, to education and medical care - makes up what is traditionally called the “induced impact,” or multiplier effect, of the food and agriculture industries. For 2017, the induced impact of the industry generates 11.07 million jobs and \$1.96 trillion in economic impact, for a multiplier of 0.69.<sup>3</sup>

An important part of an impact analysis is the calculation of the contribution of the industry to the public finances of the country. In the case of the retail grocery industry, the direct taxes paid by firms and their employees provide \$533.31 billion to the Federal Government and \$360.82 billion to state and local governments. These figures do not include state and local sales and excise taxes that might be incurred by consumers.

Table 1 presents a summary of the total economic impact of the food and agriculture industries in the United States. Summary tables for the United States, individual states, congressional districts, and state legislative districts are included in the Output Model, which is discussed in the following section.

<sup>1</sup> In 2017, we have relied on zip code based employment data supplied by Infogroup, the leading provider of business and consumer data for the top search engines and leading in-car navigation systems in North America. Infogroup gathers data from a variety of sources, by sourcing, refining, matching, appending, filtering, and delivering the best quality data. Infogroup verifies its data at the rate of almost 100,000 phone calls per day to ensure absolute accuracy.

<sup>2</sup> These firms would more appropriately be considered as part of the indirect firm’s industries.

<sup>3</sup> Often economic impact studies present results with very large multipliers – as high as 4 or 5. These studies invariably include the firms supplying the induced industries as part of the induced impact. John Dunham & Associates believes that this is not an appropriate definition of the induced impact and as such limits this calculation only to the effect of spending by direct and indirect employees.

## Model Description and Data

The Economic Impact Study begins with the IMPLAN model of the United States economy. Food-related IMPLAN industries are identified, and a matrix of state-by-state employment in the food industries is constructed. Since our most recent IMPLAN model is based off of 2014 employment and output data, we identified the growth rate in these industries through the end of 2016. The growth trends are based on annual jobs data by NAICS sector, as recorded by the Bureau of Labor Statistics' Quarterly Census of Employment and Wages. Combining the original industry job with the growth in employment in the industry, we estimate jobs for the end of 2016. A percentage break is applied to any IMPLAN industry which has significant business outside the scope of the food industry in order to isolate that portion of business related to food. Product breaks are based off the 2012 Economic Census of Retail Trade and the 2012 Economic Census of Wholesale Trade (the most recent data available). The intuition being, if ten percent of a wholesaler's business is moving and storing food-related products then ten percent of the wholesale jobs in that state should be considered food industry jobs. The job estimates are then run through the IMPLAN Input-Output model to estimate wages, output, and business taxes, as well as the supplier and induced impacts.

Table 2 at the end of the document summarizes the industries included in the study. The first two columns are the IMPLAN code and industry for those identified as food-related. The third column identifies which category corresponds with the particular industry. These are the categories presented on the data tables. The final column identifies which industries have a percentage applied to reflect only the food-related share of business. For those marked 'no', all jobs are assumed to be food-related; For those marked 'yes', the industry does business outside of the scope of the food industry and a percentage break is applied.

## IMPLAN Methodology<sup>4</sup>

Francoise Quesnay one of the fathers of modern economics, first developed the analytical concept of inter-industry relationships in 1758. The concept was actualized into input-output analysis by Wassily Leontief during the Second World War, an accomplishment for which he received the 1973 Nobel Prize in Economics.

Input-Output analysis is an econometric technique used to examine the relationships within an economy. It captures all monetary market transactions for consumption in a given period and for a specific geography. The IMPLAN model uses data from many different sources – as published government data series, unpublished data, sets of relationships, ratios, or as estimates. The IMPLAN Group, LLC gathers this data, converts it into a consistent format, and estimates the missing components.

There are three different levels of data generally available in the United States: Federal, state and county. Most of the detailed data are available at the county level, but there are many issues with disclosure – especially in the case of smaller industries. IMPLAN overcomes these disclosure problems by combining a large number of datasets and by estimating those variables that are not found from any of them. The data is then converted into national input-output matrices (Use, Make, By-products,

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<sup>4</sup> This section is paraphrased from IMPLAN Professional: Users Guide, Analysis Guide, Data Guide, Version 2.0, MIG, Inc., June 2000.

Absorption and Market Shares) as well as national tables for deflators, regional purchase coefficients and margins.

The IMPLAN Make matrix represents the production of commodities by industry. The Bureau of Economic Analysis (BEA) Benchmark I/O Study of the US Make Table forms the bases of the IMPLAN model. The Benchmark Make Table is updated to current year prices, and rearranged into the IMPLAN sector format. The IMPLAN Use matrix is based on estimates of final demand, value-added by sector and total industry and commodity output data as provided by government statistics or estimated by IMPLAN. The BEA Benchmark Use Table is then bridged to the IMPLAN sectors. Once the re-sectoring is complete, the Use Tables can be updated based on the other data and model calculations of interstate and international trade.

In the IMPLAN model, as with any input-output framework, all expenditures are in terms of producer prices. This allocates all expenditures to the industries that produce goods and services. As a result, all data not received in producer prices is converted using margins which are derived from the BEA Input-Output model. Margins represent the difference between producer and consumer prices. As such, the margins for any good add to one.

Deflators, which account for relative price changes during different time periods, are derived from the Bureau of Labor Statistics (BLS) Growth Model. The 224 sector BLS model is mapped to the 536 sectors of the IMPLAN model. Where data are missing, deflators from BEA's Survey of Current Businesses are used.

Finally, the Regional Purchase Coefficients (RPCs) – essential to the IMPLAN model – must be derived. IMPLAN is derived from a national model, which represents the “average” condition for a particular industry. Since national production functions do not necessarily represent particular regional differences, adjustments need to be made. Regional trade flows are estimated based on the Multi-Regional Input-Output Accounts, a cross-sectional database with consistent cross interstate trade flows developed in 1977. These data are updated and bridged to the 536 sector IMPLAN model.

Once the databases and matrices are created, they go through an extensive validation process. IMPLAN builds separate state and county models and evaluates them, checking to ensure that no ratios are outside of recognized bounds. The final datasets and matrices are not released before extensive testing takes place.

**Table 2. IMPLAN Industries, Report Grouping, and Additional Data for 2017 Economic Impact Study**

<b>IMPLAN Code</b>	<b>IMPLAN Industry</b>	<b>Grouping</b>	<b>Break Applied</b>
	1 Oilseed farming	Agriculture	no
	2 Grain farming	Agriculture	no
	3 Vegetable and melon farming	Agriculture	no
	4 Fruit farming	Agriculture	no
	5 Tree nut farming	Agriculture	no
	9 Sugarcane and sugar beet farming	Agriculture	no
	10 All other crop farming	Agriculture	no
	11 Beef cattle ranching and farming	Agriculture	no
	12 Dairy cattle and milk production	Agriculture	no
	13 Poultry and egg production	Agriculture	no
	14 Animal production, exc cattle and poultry and eggs	Agriculture	no
	17 Commercial fishing	Agriculture	no
	18 Commercial hunting and trapping	Agriculture	no
	67 Flour milling	Manufacturing	no
	68 Rice milling	Manufacturing	no
	69 Malt manufacturing	Manufacturing	no
	70 Wet corn milling	Manufacturing	no
	71 Soybean and other oilseed processing	Manufacturing	no
	72 Fats and oils refining and blending	Manufacturing	no
	73 Breakfast cereal manufacturing	Manufacturing	no
	74 Beet sugar manufacturing	Manufacturing	no
	75 Sugar cane mills and refining	Manufacturing	no
	76 Nonchocolate confectionery manufacturing	Manufacturing	no
	77 Chocolate and confectionery manufacturing	Manufacturing	no
	78 Confectionery manufacturing fr purchased chocolate	Manufacturing	no
	79 Frozen fruits, juices and vegetables manufacturing	Manufacturing	no
	80 Frozen specialties manufacturing	Manufacturing	no
	81 Canned fruits and vegetables manufacturing	Manufacturing	no
	82 Canned specialties	Manufacturing	no
	83 Dehydrated food products manufacturing	Manufacturing	no
	84 Fluid milk manufacturing	Manufacturing	no
	85 Creamery butter manufacturing	Manufacturing	no
	86 Cheese manufacturing	Manufacturing	no
	87 Dry, condensed, and evaporated dairy product mfg	Manufacturing	no
	88 Ice cream and frozen dessert manufacturing	Manufacturing	no
	89 Animal, except poultry, slaughtering	Manufacturing	no
	90 Meat processed from carcasses	Manufacturing	no
	91 Rendering and meat byproduct processing	Manufacturing	no
	92 Poultry processing	Manufacturing	no
	93 Seafood product preparation and packaging	Manufacturing	no
	94 Bread and bakery product, except frozen, mfg	Manufacturing	no
	95 Frozen cakes and other pastries manufacturing	Manufacturing	no
	96 Cookie and cracker manufacturing	Manufacturing	no
	97 Dry pasta, mixes, and dough manufacturing	Manufacturing	no
	98 Tortilla manufacturing	Manufacturing	no
	99 Roasted nuts and peanut butter manufacturing	Manufacturing	no
	100 Other snack food manufacturing	Manufacturing	no
	101 Coffee and tea manufacturing	Manufacturing	no
	102 Flavoring syrup and concentrate manufacturing	Manufacturing	no
	103 Mayonnaise, dressing, and sauce manufacturing	Manufacturing	no
	104 Spice and extract manufacturing	Manufacturing	no
	105 All other food manufacturing	Manufacturing	no
	106 Bottled and canned soft drinks & water	Manufacturing	no
	107 Manufactured ice	Manufacturing	no
	108 Breweries	Manufacturing	no
	109 Wineries	Manufacturing	no
	110 Distilleries	Manufacturing	no
	395 Wholesale trade	Wholesaling	yes
	400 Retail - Food and beverage stores	Retailing - Off Premise	no
	401 Retail - Health and personal care stores	Retailing - Off Premise	yes
	405 Retail - General merchandise stores	Retailing - Off Premise	yes
	501 Full-service restaurants	Retailing - On Premise	no
	502 Limited-service restaurants	Retailing - On Premise	no
	503 All other food and drinking places	Retailing - On Premise	no