

The Economic Contribution of the Fertilizer Industry to the U.S. Economy

Prepared for The Fertilizer Institute

October 2024



Methodology



This study was commissioned by **The Fertilizer Institute** in order to gain a better understanding of the broader reach that the fertilizer supply chain has in the overall U.S. economy.

ComplEat Analytics conducted a formal economic contribution analysis utilizing IMPLAN economic input-output software to quantify these broader impacts. We chose to do a contribution analysis, as opposed to an impact analysis, to avoid double-counting of the directly impacted industries.

The direct industries covered in the analysis included fertilizer manufacturers, input mines, terminals/wholesalers, blenders, retailers, and other support activities.

We conducted the analysis for:

- All 50 states
- All 435 congressional districts
- The U.S. national total

Input Data

In order to quantify the broader effects in the economic impact analysis, our model needs specific economic data for input. This analysis is based on a combination of employment and sales data provided by The Fertilizer Institute (TFI), CropLife, IMPLAN, The Bureau of Labor Statistics (BLS), The Bureau of Economic Analysis (BEA), and the United States Department of Agriculture (USDA).

Critical data for the analysis was provided by The Fertilizer Institute in the form of direct employment data on mining facilities, manufacturing facilities, blending facilities, wholesale facilities, terminals, and retail facilities. This data was mapped to locations and to newly redrawn congressional districts. This data was supplemented by IMPLAN, BLS, and BEA data to fully capture the industry impacts. This was a collaborative process with TFI to ensure the geographic distribution of activity matched the actual industry structure. The fertilizer manufacturing sector's economic activity was compared to industry capacity data.

Data in manufacturing, mining, and mixing facilities were modeled as full jobs in the industry. The retail and wholesale industries require an additional series of steps to account for the percentage of business attributable to fertilizer, as well as retail and wholesale industry margins within the IMPLAN software.

To allocate retail economic activity across regions, USDA data on the number of acres treated with fertilizer was used as a supporting data series. This served as an additional proxy of sales and for supporting and verifying the geography of retail fertilizer sales.



Industry Classification



North American Industry Classification System (NAICS) codes form the basis for our industry categorizations in this analysis. The figure below shows how the NAICS codes are “bridged” to the IMPLAN system industry codes, and how they were categorized in the results reporting for this analysis. **It should be noted that a facility that manufactures fertilizer employs a wide variety of jobs ranging from more labor intensive “factory-style” jobs, to office support functions such as accounting, human resources, and management.** All of these jobs will be classified under a single NAICS code and captured in this analysis. Additionally, if the jobs associated with a location are for a manufacturer, then all of those jobs are classified under that category, regardless of the types of jobs (i.e. headquarters-based office jobs will be reflected under manufacturer in this analysis).

2022 NAICS CODES	NAICS Industry and Description	IMPLAN Industry Code / Classification	Results Category the Industry is Classified In
212390	Other Nonmetallic Mineral Mining and Quarrying: This industry is engaged in developing the mine site, mining, and/or milling or otherwise beneficiating nonmetallic minerals.	31: Potash, soda, and borate mineral mining	Fertilizer Manufacturing
		32: Phosphate rock mining	
		33: Other chemical and fertilizer mineral mining	
325311	Nitrogenous fertilizer manufacturing: mix ingredients made elsewhere into nitrogenous fertilizers.	167: Nitrogenous fertilizer manufacturing	
325312	Phosphatic fertilizer manufacturing: which includes businesses that manufacture phosphatic fertilizer materials or mix them into fertilizers.	168: Phosphatic fertilizer manufacturing	
325314	Fertilizer (mixing only) manufacturing: mix ingredients made elsewhere into fertilizers.	169: Fertilizer Mixing	
424910	Nursery, Garden Center, and Farm Supply Retailers: retailing farm supplies such as fertilizers and agricultural chemicals.	400: Wholesale – Other nondurable goods merchant wholesalers	
444240	Farm Supplies Merchant Wholesalers: wholesale distribution of farm supplies, such as fertilizers and agricultural chemicals.	405: Retail – Building material and garden equipment and supplies stores	Retail



Employment Data

Employment Data in IMPLAN is an industry-specific mix of part-time, full-time, and seasonal employment. It is an annual average that accounts for seasonality and follows the definition used by BLS and BEA. While this employment data accounts for seasonality, it does not indicate the number of hours worked in a day. As a result, it is not full-time equivalent (FTE) numbers.

The 3 primary datasets used in the model's employment data are the BLS' *Census of Employment and Wages (CEW)*, the Census Bureau's *County Business Patterns (CBP)*, and the BEA's *Regional Economic Accounts* data.

The CEW dataset provides IMPLAN annual average wage and salary establishment counts, employment counts, and payrolls by NAICS code. Ultimately, this data captures more than 95% of employment.

The CBP dataset provides IMPLAN additional employment numbers by industry by North American Industry Classification System (NAICS) code and is a point-in-time estimate. The CBP data helps to develop a picture of the industrial structure of a region and helps to fill in gaps in the CEW data from non-disclosure.

The CEW and CBP datasets are less developed in some industries such as agriculture, construction, railroads, and self-employment, so the BEA data helps to supplement the other datasets in these industries. The drawback to this dataset is the level of granularity in the NAICS code digit level. For this reason, all of these data sets contribute to the employment data used in the analysis.



The IMPLAN Model

The key goal of this study is to quantify the broader economic impacts of the fertilizer industry and to estimate supported jobs, GDP, and total economic output.

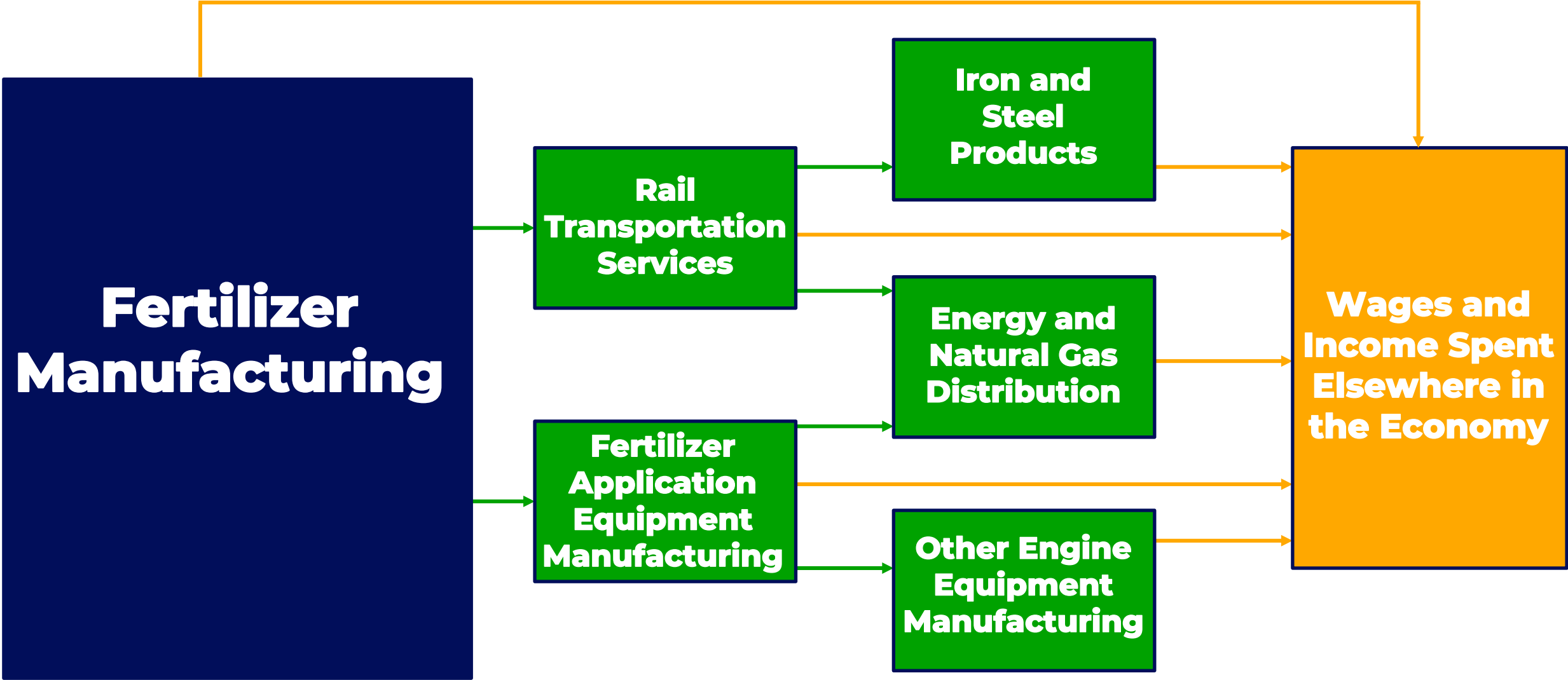
To do this, IMPLAN economic input-output software is used. The various Direct Impacts discussed previously in this methodology are used as inputs into these models. The results of these models are created in 3 different types of impacts: Direct Impacts, Indirect Impacts, and Induced Impacts.

Direct Impacts are the impacts that represent the industries where the economic value is generated. In this case, it is reflected as direct impacts in the fertilizer manufacturing, mining, wholesaling, and retail industries. These industries each have their own direct impacts in terms of jobs, GDP, and economic output.

Indirect Impacts are additional impacts that occur in upstream industries that supply inputs and services to the directly impacted industry. An example in this case would be a fertilizer mine purchasing machinery; the equipment supplier would be the indirectly impacted industry. This is an example of the first ring of these “ripple effects” which will continue to spread as the fertilizer industry purchases its own inputs from other businesses.

Induced Impacts are the impacts generated through changes in spending of wages and profits by the employees and owners of the various impacted industries. Workers in these economies will spend their income on everything from going out to eat to paying their rent. This can be thought of as even further out rings in the “ripple effects” of the fertilizer industry.

Example of How Direct, Indirect, and Induced Impacts Interact



**Direct
Impact**

**Indirect
Impact**

**Induced
Impact**



The IMPLAN Model

The combination of these different impact types gives us our results in terms of jobs, GDP, and economic output. In the case of an individual state, GDP can be thought of as Gross State Product. Employment data in IMPLAN follows the same definition as the BEA and BLS data, which is defined as a full-time/part-time annual average and not a full-time equivalent.

When interpreting these results, it is important to understand that these outputs are interrelated. While we can arrive at total impacts by adding direct, indirect, and induced impacts, we cannot add output, GDP, and Labor Income, as this will result in double-counting. This is because GDP is already included in the equation for economic output.

Those who are interested in digging more into the intricacies of how the Leontief production function operates or how IMPLAN works can read about it [here](#) and [here](#). The image to the right illustrates how these variables are all related (i.e. that output is a function of value-added, which is in turn a function of labor income).

Additionally, one should not add across all the states and compare the whole U.S. as these numbers will not match. When modeling an individual state, money “leaks” out of the region as industries purchase from out-of-state suppliers. However, when modeling the entire U.S., the process captures these transactions between states.

The Leontief Production Function

