REPORT

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Economic Contributions of the U.S. Fertilizer Manufacturing Industry

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1. EXECUTIVE SUMMARY

Fertilizers are well known for their contribution to the world's food supply. They provide nutrients to soils to support increased yields of healthy crops that feed the world's populations. One often cited statistic regarding this contribution is that fertilizers are responsible for between 40 and 60 percent of the world's food supply.[1] While this is an impressive contribution, there is another significant economic contribution that has not received the same level of attention – the economic value and jobs provided by the fertilizer manufacturing industry.

The United States has a significant fertilizer manufacturing industry, with production plants and distribution facilities across the country that provide jobs, create value for investors, and support a large network of suppliers that also provide jobs and create value. The economic contribution of the U.S. fertilizer manufacturing industry is an increasingly important topic. The industry faces serious challenges from changes in energy markets and proposed federal policies such as climate change legislation.

The following is a summary of the estimated contributions of the U.S. fertilizer manufacturing industry in the year 2006:

- The industry directly employed over 24,800 people who worked to produce over $15.1 billion in output. These jobs had an average compensation of $76,000, which was almost 80 percent greater than the U.S. average compensation across all industries.

- The purchase of materials and services to support fertilizer manufacturing led to an additional 73,000 jobs along the supply chain.

- The total economic contribution of the industry was $57.8 billion. This value includes direct contributions of the manufacturers, contributions through suppliers, and household and government spending related to compensation, investment returns, and taxes. The total number of jobs provided was over 244,500.

- Economic contribution can be evaluated by sector: The sectors are defined by the three main nutrient types: nitrogen, phosphorus, and potassium.

    - Nitrogenous fertilizer manufacturing – This sector provided a total economic contribution of $23.7 billion and 80,000 jobs, of which $10.3 billion and 7,565 jobs were direct. The sector purchased a significant amount of its inputs from the domestic natural gas production and pipeline sectors. The

[1] W.M. Stewart et al., "The Contribution of Commercial Fertilizer Nutrients to Food Production," in *Agronomy Journal*, January-February 2005, pp.1

economic activity was predominantly located in states with ammonia plants or large wholesalers of fertilizer. The states with the most economic activity in this sector included Oklahoma, Louisiana and Iowa.

- Phosphatic fertilizer manufacturing – This sector provided a total economic contribution of $21.2 billion and almost 90,000 jobs, of which $6.6 billion and 7,410 jobs were direct. The sector purchased a significant amount of goods and services from the domestic mining, trucking, and rail sectors. The economic activity was predominantly located in states with phosphate mines and production plants. The states with the most economic activity in this sector included Florida (with half of the direct contribution), North Carolina, Idaho and Louisiana.

- Potash fertilizer manufacturing – Economic contribution data for the potash fertilizer manufacturing sector is not as available as the other sectors due to non-disclosure rules. Despite the significant U.S. consumption of potassium fertilizers, there are only a few potash producing facilities in the United States. Over 85 percent of potash consumed in the United States is from international sources, primarily Canada. The potash manufactured in the United States is produced in New Mexico, Michigan and Utah. While total economic contribution was not calculated for this sector, a survey of firms provided an estimate of 1,774 direct jobs.

The contribution values omit some other areas of economic contribution of the fertilizer manufacturing industry. First, there is value in maintaining a domestic fertilizer manufacturing industry versus relying on imports. This value is difficult to quantify, but avoiding the risk of supply constraints of a major and necessary input in our food production system from unstable countries provides a real economic value. Second, there is a “use” value of domestically produced fertilizer in terms of its contribution to the agricultural sector and world food supplies. Quantifying fertilizer “use” value is not the purpose of this report, although it is discussed qualitatively in the final section of the report.

This report provides an analysis of the economic contributions of the U.S. fertilizer manufacturing industry. Section 1 provides a background of the industry. The approach and methodology are briefly discussed in Section 2 (a more detailed methodology is provided as Appendix A). Section 3 presents the economic contribution analysis, including analysis by sector and a focus on two states with significant economic activity in fertilizer manufacturing. Section 4 further expands on the economic value of using domestically produced fertilizer.

2. INTRODUCTION

This report provides an analysis of the economic contributions of the U.S. fertilizer manufacturing industry. The contributions are considered along the entire fertilizer value chain, although the focus is on the manufacturing and mixing activities. The report examines the economic contributions of the entire fertilizer manufacturing industry as a whole and also as separate sectors for each of the three main types of fertilizer nutrients (nitrogen, phosphorus and potassium) and an additional sector focused on the mixing of fertilizer products.

2.1. THE U.S. FERTILIZER INDUSTRY

The fertilizer manufacturing industry has existed in the U.S. since the early 1800s. Initially used to mend nutrient deficient soils resulting from poor colonial farming practices, fertilizers emerged as the key to improving agricultural productivity. New technologies and growing demand in the early 1900s caused the fertilizer industry to become one of the largest in the country.[2] The U.S. is currently the second ranked fertilizer producing country in the world, behind China. [3] The country is both a major exporter (third in the world) and importer (first in the world) of fertilizer products. Table 14 in Appendix B shows the top three countries in fertilizer activity in terms of consumption, production, imports and exports.

Nutrient types define the sectors within the industry

To understand the U.S. fertilizer manufacturing industry, it is important to differentiate between the three major types of fertilizer nutrients that are produced and consumed in the U.S.: nitrogen, phosphorus and potassium. The differentiation is important because each of the three primary plant nutrients has unique production characteristics and each is derived from different natural resources.

> **Nitrogen** – A primary building block for all organisms, nitrogen is found in abundance in the earth's atmosphere. However, the majority of plants cannot fix nitrogen from the air, and thus rely on nitrogen from the soil which is usually added through fertilizers, as natural replacement rates cannot support the high levels of growth required in modern agriculture.
>
> Anhydrous ammonia is the source of nearly all the nitrogen fertilizer used in the United States. It is synthesized through the Haber-Bosch process, a chemical process that combines atmospheric nitrogen with hydrogen. Nitrogen can be obtained from the air, but the hydrogen is derived predominantly from natural gas. Anhydrous ammonia may be applied directly to the soil or converted into other

[2] Nelson, Lewis, *History of the U.S. Fertilizer Industry*, Tennessee Valley Authority, 1990, pp. 99.

[3] International Fertilizer Industry Association data for 2005-2006. (see Appendix B, Table 14).

nitrogen fertilizers such as urea, ammonium nitrate, nitrogen solutions and ammonium sulfate. These nitrogen materials can be transported by ship, rail or truck, and in the case of anhydrous ammonia, also via pipeline.

The U.S. nitrogenous fertilizer manufacturing sector has decreased its production over the past several years and imports now provide over 55 percent of the nation's supply.[4] A total of 26 U.S. ammonia plants have closed since 1999, representing 42 percent of the U.S. nitrogen fertilizer production capacity.[5] The key driver for the closures has been increasing domestic natural gas prices, which can constitute over 90 percent of the input costs for a manufacturer.

Phosphorus – Phosphorus is an element found in every living cell and plays vital roles in shaping DNA and providing energy for cell activity. It is not found in its elemental form in nature. To produce phosphatic fertilizer, phosphate rock is mined and treated with sulfuric acid. This process creates phosphoric acid, which is the basic material for most phosphatic fertilizers. The reliance on phosphate rock means that the sector is heavily integrated with phosphate mining and plants are mostly located near the largest reserves of phosphate rock. The United States is fortunate to be endowed with 6.8 percent of the world's phosphate rock reserves (third behind Morocco and China using government supplied numbers) and in 2007 had 19 percent of the world's production.[6] Florida is by far the most active state in the production of phosphatic fertilizer.

Potassium – Potassium is a nutrient that is essential for the plant growth process, especially water utilization and the regulation of photosynthesis. It is found in potash, a name for various mined and manufactured salts that contain potassium in a water-soluble form. Despite significant consumption of potash in the United States, the domestic potash manufacturing sector is smaller than those for nitrogenous and phosphatic fertilizer manufacturing. This is due to mineral reserve locations. The majority of potash consumed in the United States is imported, primarily from Canada, the largest potash producer in the world. The potash manufactured in the United States is produced in New Mexico, Utah and Michigan.

The fertilizer value chain includes a diverse network of firms

There are many types of firms operating along the fertilizer value chain, including: suppliers, manufacturers, mixers, wholesalers, retailers and equipment suppliers and operators. As mentioned, the suppliers vary by nutrient type. While most suppliers do not exist solely to

[4] Computed from fertilizer production and trade data reported by the U.S. Dept of Commerce.

[5] *North America Fertilizer Capacity*, International Center for Soil Fertility and Agricultural Development, December 2008, and data provided to The Fertilizer Institute (TFI) by Blue, Johnson and Associates.

[6] U.S. Geological Survey, *Mineral Commodity Summaries*, January 2006. (see Appendix B, Table 19).

support the fertilizer manufacturing industry (*e.g.,* natural gas production), there are some that would not exist without it (*e.g.,* phosphate mines). The major manufacturing firms tend to focus on a particular nutrient type, but there are several diversified firms that produce all three types in various locations across the country.

Once raw fertilizer ingredients are made at fertilizer production plants, they are either mixed on-site or distributed for mixing in multiple locations across the country. The mixing facilities may either be owned by the manufacturers or by separate entities, including large wholesalers. The mixing and warehousing companies range in size from small rural co-ops with less than five employees to major wholesalers with brand name fertilizer products that can be found on retail shelves across the country. A variety of retailers exist to support the farmers, landscapers and household consumers of fertilizers. The application of fertilizer to fields and yards is supported by equipment manufacturers and equipment operators.

2.2. APPROACH

The economic contributions of the U.S. fertilizer manufacturing industry can be evaluated along the entire value chain, from the production of raw materials used in manufacturing fertilizer all the way to the product's role in bringing food products to consumers. To analyze the contributions along the value chain, segmentation was required. Focus began on the direct contributions of manufacturers, then "upstream" activities were considered (materials sourcing, support services, etc.), and finally the "downstream" value of U.S.-produced fertilizer was examined. The following categories of contributions were considered:

1. **Direct contributions of manufacturing** – These contributions include direct value added by the fertilizer manufacturers and mixers. They include employee compensation, returns to investors, income on property and payments to government business taxes.

2. **Indirect contributions of manufacturing** – These contributions result from the payments to industries that support and supply fertilizer manufacturers and mixers. The payments to suppliers lead to payments to other suppliers, who pay other suppliers, and so on, in a ripple effect that ends with leakage out of the region. This leakage mostly occurs through the purchase of imported goods. The payments to suppliers are transferred to employees, investors and government in a manner similar to the way direct contributions are distributed.

3. **Induced contributions of manufacturing** – The industry's economic contributions do not end when it prints paychecks for employees, pays its suppliers, distributes dividends to its shareholders or remits taxes to the government. That money is filtered back into the economy by household and government spending, thus greatly increasing the contribution of the industry.

4. **Value of U.S.-produced fertilizer** – The production value of fertilizer is captured in the direct contributions of manufacturing. However, the value of the fertilizer

produced can actually be greater than the revenues of the manufacturing industry. First, there are “downstream” industries that gain value from the fertilizer, such as garden stores and fertilizer equipment manufacturers. Second, there is significant value created by the fertilizer’s application in the agricultural sectors.

The first three categories of economic contributions (direct, indirect and induced contributions of manufacturing) were calculated using the IMPLAN model. IMPLAN aggregates industry information from a variety of public data sources and quantifies the relationships between industries at the national, state and local levels. The year 2006 was selected as it is the most recent year for which IMPLAN provides segregated data for the various fertilizer manufacturing sectors (nitrogenous fertilizer manufacturing, phosphatic fertilizer manufacturing and fertilizer mixing). These sectors are defined by 6-digit NAICS codes. A detailed description of the methodology for using IMPLAN in this analysis, including a description of the sectors, is provided in Appendix A. The results are in Section 3 of this report.

The final category of economic contributions focuses on: 1) the value of maintaining a domestic fertilizer manufacturing industry versus relying on imports, and 2) the “use” value of domestically produced fertilizer in terms of its contribution to the agricultural sector and world food supplies. These two analyses were more qualitative and are found in Section 4 of this report.

3. ECONOMIC CONTRIBUTIONS OF THE U.S. FERTILIZER MANUFACTURING INDUSTRY

The economic contributions of the fertilizer manufacturing industry can be segmented by types of contributions (direct, indirect and induced), as well as by sectors within the industry.

3.1. DIRECT CONTRIBUTIONS

Table 1 shows the share of direct contributions of the fertilizer manufacturing industry by sector for both 2002 and 2006. The direct contributions include output, value added and employment, which are addressed separately in this section.

Table 1: Fertilizer manufacturing industry output, value added and employment

2006	*% of industry total*		*jobs*
	Output	Value Added	Employment
Nitrogenous Fertilizer Manufacturing	57%	57%	7,565
Phosphatic Fertilizer Manufacturing	29%	20%	7,411
Fertilizer Manufacturing, Mixing Only	13%	22%	8,094
Total	100%	100%	**23,070**
Potash Fertilizer Manufacturing/Mixing			*1,774*
Total (including potash)			*24,844*

2002	*% of industry total*		*jobs*
	Output	Value Added	Employment
Nitrogenous Fertilizer Manufacturing	35%	42%	8,728
Phosphatic Fertilizer Manufacturing	41%	27%	7,767
Fertilizer Manufacturing, Mixing Only	25%	32%	8,245
Total	100%	100%	**24,739**

Percent change, 2002 to 2006	*% change in total*		
	Output	Value Added	Employment
Nitrogenous Fertilizer Manufacturing	195%	93%	-13%
Phosphatic Fertilizer Manufacturing	28%	8%	-5%
Fertilizer Manufacturing, Mixing Only	-5%	0%	-2%
Total	77%	41%	-7%

Output [7]

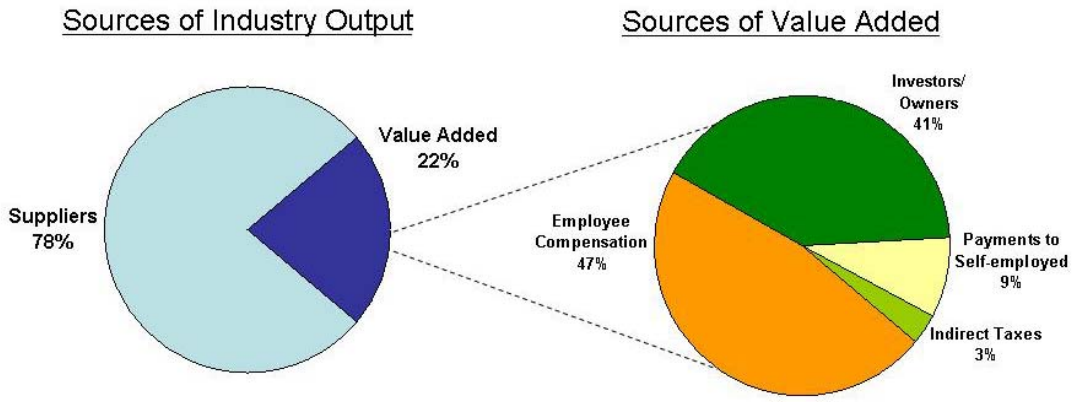
The U.S. fertilizer manufacturing industry's 2006 calendar year production value, or output, was $15.1 billion. Combined production values for the sectors in the fertilizer industry were actually $21.1 billion, but $6.0 billion of that involved sales between and within the industry's sectors. This output value represents a 77 percent increase since 2002,[8] when the U.S. fertilizer industry output was $8.5 billion (or combined sector production values of $10.5 billion).

The most significant increase in output was seen in the nitrogenous fertilizer manufacturing sector, which went from representing a third of the industry total to over half. The production value increase in this sector was not driven by quantity of sales, as plants were actually closing during that time period, but rather by an increase in prices. The price for a ton of anhydrous ammonia rose by 100 percent from 2002 to 2006.[9]

Value Added

Another measure of the contribution of an industry is its value added, which is the value of an industry's output that is not created by other industries, but rather through the industry's productive activities. In 2006, the value added by the fertilizer manufacturing industry was $3.7 billion. As seen in Figure 1, this represents 22 percent of the output value for the industry.

Figure 1: Sources of fertilizer manufacturing industry output and value added



[7] Output is computed as industry outlays (purchases) plus value-added. It can also be considered as the value of sales adjusted for changes in inventories. The output for the fertilizer manufacturing industry is equal to the combined production values of the individual sectors, adjusted for the sales that occur within the industry. This figure does not include potash manufacturing/mining.

[8] All percentage changes from 2002 to 2006 are nominal.

[9] Data collected by TFI from *Green Markets*, a publication of BNA Subsidiaries, LLC., and from *Fertilizer Week America*, a publication of CRU.

The value added by an industry is returned to its employees and investors and remitted to the government in the form of taxes. Of the $3.7 billion added by the fertilizer manufacturing industry, over $2 billion was returned to employees in the form of compensation. Compensation is calculated as the industry's payroll costs, which include wages, salaries and benefits.

The value added by the industry increased by 41 percent during the period from 2002 to 2006. This increase can be compared to the growth in U.S. GDP, which is essentially a sum of the value added by all industries in the country. The total value added by all industries in the U.S. economy grew by 26 percent from 2002 to 2006.

Employment

In 2006, the fertilizer manufacturing industry directly employed over 24,800 workers. This number includes the 1,774 jobs reported by firms in the potash fertilizer sector. The non-potash jobs in the industry were fairly evenly distributed between the industry sectors, as shown in Table 2. The compensation per employee was considerably higher than the U.S. average, at $75,701 per employee vs. a U.S. average of $42,636 across industries. These higher salaries, wages, benefits and other forms of compensation were a result of a very high output per employee ratio. The fertilizer industry generates over $900,000 in output per worker, which is over six times the U.S. average across industries. These per employee numbers are even higher if the mixing sector is excluded.

Table 2: Fertilizer manufacturing industry employment and compensation (excluding Potash)

	Nitrogenous	Phosphatic	Mixing	Fertilizer Total	US Average
Employment	7,565	7,411	8,094	23,070	
Output per worker	$1,359,213	$891,339	$517,173	$913,488	$141,793
Compensation per worker	$87,738	$84,484	$56,408	$75,701	$42,636

There is a diverse range of types of jobs in the fertilizer manufacturing industry. There is also diversity in the size of firms for which the employees work. Table 15 in Appendix B shows the employment in the fertilizer manufacturing industry by firms' employment size. Employment in the nitrogenous and phosphatic manufacturing sectors is more centralized than in the mixing sector. This is due to the large plants in the first two sectors versus the geographically dispersed mixing facilities, which are located closer to consumption.

3.2. ADDITIONAL CONTRIBUTIONS

In addition to direct contributions, the industry also provides additional value to the economy through the secondary impacts of its payments to suppliers, employees, investors and the government. Suppliers' productive activities result in payments to other suppliers, who in turn pay other suppliers. Value distributed to households and government is returned to the economy through consumption, which is distributed across all industries. These impacts represent a multiplier effect for all purchases made in a single industry.

In the case of the fertilizer industry, these additional contributions are larger than the direct contributions. The total economic contributions of the fertilizer industry in 2006 were $57.8 billion in output and 244,500 jobs, as shown in Table 3.

Table 3: Fertilizer manufacturing industry total economic contributions

Output

	Direct Contribution	multiplier	Total Contribution
Nitrogenous Fertilizer Manufacturing	$10,282	2.3	$23,711
Phosphatic Fertilizer Manufacturing	6,606	3.1	20,780
Fertilizer Manufacturing, Mixing Only	4,186	3.2	13,307
Total	$21,074		$57,798

Combined total (adjusted for intra-industry sales)	*$15,068*

Employment

	Direct Contribution	multiplier	Total Contribution
Nitrogenous Fertilizer Manufacturing	7,565	10.6	80,083
Phosphatic Fertilizer Manufacturing	7,410	11.9	88,180
Fertilizer Manufacturing, Mixing Only	8,096	6.8	55,128
Potash Fertilizer Manufacturing/Mining	1,774	11.9 *	21,111
Total	24,845		244,502

** assumes potash emploment multiplier = phosphatic employment multiplier*

The most striking number in the above table is the large number of jobs supported by the industry that are not considered direct jobs. This high "employment multiplier" is driven by the exceptional level of output per worker and employee compensation in the industry. High output per worker suggests a significant number of jobs with suppliers that receive payments from the fertilizer manufacturing industry. The higher levels of compensation lead to higher than average consumption levels by employees.

3.3. Regional Distribution of Contributions

The economic contributions of the fertilizer manufacturing industry can be examined on a regional level. Contributions were examined for the four regions defined by the U.S. Census Bureau, as shown in Figure 2.

Figure 2: Regions evaluated for economic contribution

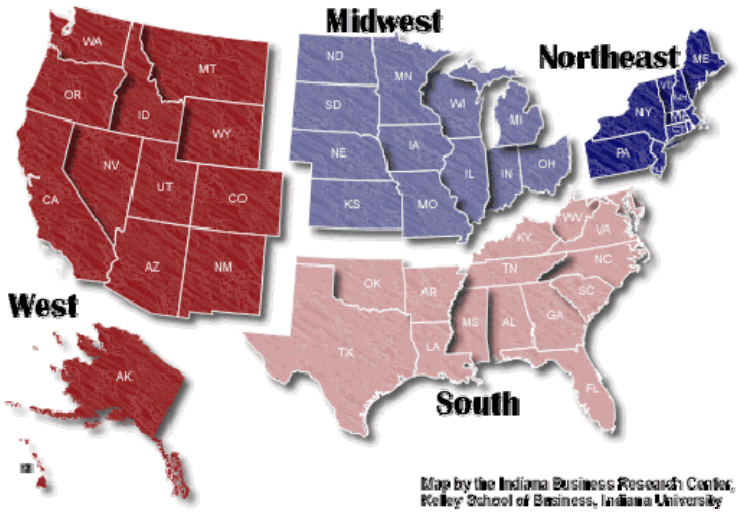


Table 4 shows the total economic contributions of the fertilizer manufacturing industry by region. Individual sectors of the industry tend to be concentrated in some regions more than others. For example, phosphatic fertilizer manufacturing is naturally more concentrated in states with phosphate resources, which places a majority of the activity in the South. Despite the natural tendency to cluster near key natural resource inputs, fertilizer manufacturing activities as an aggregate occur in all parts of the U.S. The main exception is the Northeast, which has neither production facilities nor significant amounts of agricultural productivity (only 0.4 percent of U.S. farmland acreage in 2006, according to the USDA) and therefore has lower contribution levels than the other regions. Additional regional detail is available in Table 17 of Appendix B.

Table 4: Regional distribution of total economic contributions

Region	All	Nitrogenous	Phosphatic	Mixing
Northeast	9%	8%	9%	12%
Midwest	28%	33%	17%	37%
South	42%	35%	57%	32%
West	21%	24%	18%	18%
Total	100%	100%	100%	100%

3.4. Detail on Economic Contributions by Type of Fertilizer

3.4.1. Nitrogenous fertilizer manufacturing

In 2006, the U.S. nitrogenous fertilizer manufacturing sector (NAICS: 325311) produced a total economic contribution of $23.7 billion in output and over 80,000 jobs. These contributions were located across the country, but the greatest contributions were reported in states with either ammonia plants (*e.g.,* Louisiana, Oklahoma) or large wholesalers and retailers. Table 5 shows the economic contribution of the sector, including a list of the top contributing states that have ammonia plants.

Table 5: Economic contribution at state and national level, nitrogenous fertilizer manufacturing (states with plants)

	Contribution to state economies			
	Direct		**Total**	
	Output (billion)	**Employment**	**Output (billion)**	**Employment**
Louisiana	$0.8	621	$1.3	3,396
Oklahoma	$0.8	272	$1.5	4,004
Iowa	$0.7	494	$1.3	3,125
Alabama	$0.4	297	$0.6	1,855
Other states w/ plants	$3.3	2,233	$7.2	22,989
States w/out plants	$4.3	3,648	$11.8	44,714
US Total	$10.3	7,565	$23.7	80,083

For states with ammonia plants, their contributions mirror their shares of total U.S. production capacity. Table 6 shows the top five states in the United States by ammonia production capacity in 2006, which account for 66 percent of all U.S. capacity. Note that these states are generally located near major natural gas production facilities or pipelines.

Table 6: Ammonia plant capacity by state (2006)

State	**Capacity per year***	**Percent**
Louisiana	2,810	24%
Oklahoma	2,590	22%
Iowa	791	7%
Georgia	758	6%
Kansas	694	6%
Others	4,023	34%
Grand Total	11,666	100%

*(*Thousand short tons per year)*

A second category of states, those without ammonia plants, show high levels of economic activity that can be attributed to the wholesalers and distributors in those states reporting to the BLS under the nitrogenous fertilizer manufacturing NAICS code. Ohio is home to the

headquarters for the largest fertilizer wholesalers in the U.S., one of which employs over 1,000 individuals in its headquarters. California and Florida have high levels of agricultural activity that requires significant fertilizer distribution and manufacturing-related activity, and thus also have a number of enterprises who identify themselves as being part of the nitrogenous fertilizer manufacturing sector, albeit without manufacturing capacity *per se* within the state. According to the USDA, California's agricultural production represented over 11 percent of the U.S. total in 2007, by value. Both of these states produce fruits and vegetables that require greater fertilizer application rates than grains and oilseeds.

Table 7: Economic contribution at state level, nitrogenous fertilizer manufacturing (states without plants)

	Direct Contribution		Total Contribution	
	Output (billion)	Employment	Output (billion)	Employment
Ohio	$2.1	1,470	$3.4	9,256
California	$1.5	1,284	$3.2	9,711
Florida	$0.6	515	$1.3	4,896

One interesting trend to note is the significant increase in economic contribution of this sector over time. Between 2002 and 2006, the direct output of the sector increased from $3.1 billion to $10.3 billion, an increase of 233 percent. This increase in production value occurred during a time when ammonia plants were shutting down and the employment in the sector decreased by 13 percent. The increase in value was attributable to a rise in fertilizer prices, which was driven by an increase in energy and feedstock costs and increased global demand. The contribution of this sector to the U.S. economy was rising, but its share of global supply was simultaneously falling. Thus, despite booming growth in its economic contribution, the U.S. manufacturing facilities were losing ground to international sources, and the U.S. was becoming more reliant on imports to meet its needs.

Natural gas represents 70-90 percent of production costs. The production of one ton of anhydrous ammonia requires about 32.5 million British thermal units (MMBtu) of natural gas. In 2002, one MMBtu of natural gas cost customers in the industrial sector $3.94 per MMBtu, and by 2006, it cost $7.72 per MMBtu.[10] During this time, the average wholesale value of ammonia increased from $137 to $301 per ton.[11]

Given the input share of natural gas, the majority of suppliers to the nitrogenous fertilizer manufacturing sector are related to producing or delivering natural gas. Table 8 shows the top ten sectors in terms of input value.

[10] EIA natural gas industrial prices from: http://tonto.eia.doe.gov/dnav/ng/hist/n3035us3a.htm (converted to $/MMBtu).

[11] Data collected by TFI from *Green Markets*, a publication of BNA Subsidiaries, LLC.

Table 8: Value added and sector inputs: nitrogenous fertilizer manufacturing

	Value (millions)	% of Output
Value Added by the sector	**$2,134**	**21%**
Inputs from sectors not in fertilizer manufacturing industry		
Oil and gas extraction	$3,500	34%
Pipeline transportation	751	7%
Petroleum refineries	478	5%
Natural gas distribution	301	3%
Management of companies and enterprises	191	2%
Wholesale trade	163	2%
Power generation and supply	123	1%
Scientific research and development services	74	1%
Legal services	48	0%
Truck transportation	45	0%
Other	845	8%
Total	**$6,518**	**63%**
Inputs from fertilizer manufacturing sectors		
Nitrogenous fertilizer manufacturing	$1,631	16%
Total	**$1,631**	**16%**
Sector Ouput	**$10,282**	

3.4.2. Phosphatic fertilizer manufacturing

In 2006, the U.S. phosphatic fertilizer manufacturing sector (NAICS: 325312) produced a total economic contribution of $21.2 billion in output and almost 90,000 jobs. These contributions were located across the country, but the greatest contributions were reported in states with either phosphatic fertilizer plants (*e.g.,* Florida, North Carolina) or large wholesalers and retailers. Table 9 shows the economic contribution of the sector.

Table 9: Economic contribution to state economies, phosphatic fertilizer manufacturing

	Contribution to state economies			
	Direct		**Total**	
	Output (billion)	**Employment**	**Output (billion)**	**Employment**
Florida	$3.3	3,666	$6.0	23,690
North Carolina	$0.9	1,023	$1.8	6,768
Idaho	$0.7	756	$1.1	4,340
Louisiana	$0.4	444	$0.9	3,274
Texas	$0.3	340	$1.1	5,155
Others	$1.0	1,181	$10.2	6,934
US Total	$6.6	7,410	$21.2	89,741

The distribution of contribution levels across states closely reflects the distribution of phosphate mining activity across the United States. This is expected as production facilities are often collocated with phosphate mines due to the relatively high cost of transporting phosphate rock versus the cost of transporting derived products. Florida is the key example as it is the most productive state for phosphate mining and also represents more than half of the direct contribution for the sector. Table 10 shows the location of phosphate mines in the United States and the phosphate rock capacities by state. It also shows the capacities by state for production of wet phosphoric acid, the basic material for producing most phosphatic fertilizers.

Table 10: Phosphate rock mining and phosphoric acid production by state

	Phosphate Rock			**Wet Phosphoric Acid**	
State	**Number of Mines**	**Capacity**	**Percent**	**Capacity**	**Percent**
Florida	7	24,300	60%	6,082	58%
North Carolina	1	6,600	16%	1,325	13%
Idaho	3	5,594	14%	863	8%
Louisiana	-	-	-	1,053	10%
Texas	-	-	-	400	4%
Utah	1	4,000	10%	-	-
Others	-	-	-	820	8%
	12	40,494	100%	10,543	100%

(capacity in thousand short tons per year)

The key suppliers to the phosphatic fertilizer manufacturing sector include mining and transportation, as shown in Table 11. The mining contribution is expected considering that over 90 percent of phosphate rock mined in the United States is used to produce phosphoric acid, predominantly used for fertilizer manufacturing.[12] In regards to transportation, phosphatic fertilizer relies more heavily on the trucking and rail sectors than nitrogenous fertilizer, which is often shipped in a gaseous or liquid state via pipeline. There are over 7,000 jobs in the trucking sector that are supported by the phosphatic fertilizer manufacturing sector.

Table 11: Value added and sector inputs: phosphatic fertilizer manufacturing

	Value (millions)	% of Output
Value Added by the sector	**$755**	**11%**
Inputs from sectors not in fertilizer manufacturing industry		
Truck transportation	791	12%
Other basic inorganic chemical manufacturing	494	7%
Pesticide and other agricultural chemical manufacturing	377	6%
Other nonmetallic mineral mining	303	5%
Wholesale trade	255	4%
Management of companies and enterprises	192	3%
Oil and gas extraction	176	3%
Rail transportation	89	1%
Power generation and supply	76	1%
Other	934	14%
Total	**$3,686**	**56%**
Inputs from fertilizer manufacturing sectors		
Nitrogenous fertilizer manufacturing	$1,551	23%
Phosphatic fertilizer manufacturing	613	9%
Total	**$2,165**	**33%**
Sector Ouput	**$6,606**	

[12] Jasinski, Stephen M., *2007 Minerals Yearbook: Phosphate Rock*, U.S. Geological Survey, August 2008, p.56.1.

3.4.3. Potash fertilizer manufacturing

An analysis similar to those for the nitrogenous and phosphatic fertilizer manufacturing sectors is not feasible for the potash fertilizer manufacturing sector using IMPLAN. Data for the potash manufacturing sector is buried within NAICS code 32518, Other Basic Inorganic Chemical Manufacturing. The reason for this is the low number of potash mining facilities in the country, which causes nondisclosure issues. The government is not permitted to publish most output and employment data if it can be traced back to particular firms or facilities.

In lieu of publicly available data, a recent survey conducted by TFI was used to determine that there were 1,774 direct jobs in the sector in 2006. Total jobs can be estimated by using the direct-to-total jobs ratio, or multiplier, that was calculated for the phosphatic fertilizer manufacturing sector. It was determined that this sector was the closest match for potash. Using the phosphatic multiplier, it was estimated that the potash manufacturing sector was responsible for 21,111 total jobs in the U.S..

3.4.4. Fertilizer mixing

In 2006, the U.S. fertilizer mixing sector (NAICS: 325314) produced a total economic contribution of $13.5 billion in output and over 56,000 jobs. These contributions were located across the country. Table 12 shows the economic contribution of the sector, including a list of the top contributing states.

Table 12: Economic contribution to state economies, fertilizer mixing

	Contribution to state economies			
	Direct		**Total**	
	Output (billion)	**Employment**	**Output (billion)**	**Employment**
Indiana	$0.8	1,365	$1.5	5,084
Florida	$0.4	781	$0.9	4,205
Texas	$0.4	751	$1.0	4,302
California	$0.4	717	$1.1	5,427
Ohio	$0.2	415	$0.6	2,521
Others	$2.1	4,067	$8.4	34,550
US Total	$4.2	8,096	$13.5	56,089

The economic activity in the fertilizer mixing sector is more disperse than in the nitrogenous and phosphatic fertilizer manufacturing sectors. This is because the economic activity in this sector is not concentrated in large plants, but rather at numerous smaller facilities located near the cropland where mixed products are consumed. One study estimates that there are up to 6,000 fertilizer mixing facilities located across the country.[13]

The main suppliers to the fertilizer mixing sector are actually the other sectors within the fertilizer manufacturing industry. As shown in Table 13, over 53 percent of the output of the sector results from inputs from the nitrogenous and phosphatic fertilizer manufacturing sectors. This is expected as mixing operations exist to purchase fertilizers, process them (mixing), and then sell them to wholesalers or retailers.

[13] Adrilenas, Paul and Harry Vroomen, *Seven Farm Input Industries, Fertilizer*, U.S. Department of Agriculture, September 1990.

Table 13: Value added and sector inputs: fertilizer mixing

	Value (millions)	% of Output
Value Added by the sector	**$832**	**20%**
Inputs from sectors not in fertilizer manufacturing industry		
Other basic inorganic chemical manufacturing	149	4%
Wholesale trade	143	3%
Coated and uncoated paper bag manufacturing	107	3%
Management of companies and enterprises	105	3%
Truck transportation	93	2%
Stone mining and quarrying	51	1%
Scientific research and development services	40	1%
All other miscellaneous professional and technical	36	1%
Other	421	10%
Total	**$1,143**	**27%**
Inputs from fertilizer manufacturing sectors		
Nitrogenous fertilizer manufacturing	$1,389	33%
Phosphatic fertilizer manufacturing	821	20%
Total	**$2,210**	**53%**
Sector Ouput	**$4,186**	

4. ECONOMIC VALUE OF DOMESTIC FERTILIZER PRODUCTION

The sizable output, value added, and employment contributions of the U.S. fertilizer manufacturing industry described in Section 3 exist because the manufacturing occurs domestically. That is, those specific domestic manufacturing activities drive economic outcomes in a range of other domestic sectors. For example, if there were no domestic nitrogenous fertilizer manufacturing sector due to a complete shift to imports, there would be a decrease in demand for the U.S. 'oil and gas extraction' sector. These economic contributions are additional to the enormous value of the fertilizers themselves in driving agricultural productivity. The latter could be gained even with 100 percent imported fertilizers, as long as such supplies were cheap and highly reliable. However, one can also argue that the economic contribution of a robust *domestic* manufacturing capability exceeds the measurable contributions documented in Section 3 because excessive reliance on imports could create unacceptable risks for the stability of the supply chain of U.S. agriculture, which directly accounts for hundreds of billions of dollars of U.S. output, and indirectly contributes to far more of the U.S. economy.

This additional, unmeasured value can be thought of as a "risk premium." It derives from several dimensions of supply chain assurance, including fertilizer price stability and limiting our nation's dependence on potentially risky international sources of supply.

4.1. LIMITING DEPENDENCE ON UNSTABLE IMPORTS

Excessive reliance on imports can be an added supply security concern if the non-domestic sources are in countries that are not generally among the most stable, politically or economically. The United States is already the largest importer of fertilizer in the world, with more than half of its nitrogen and over 85 percent of its potash coming from international sources.[14] In the case of potash, this is not a major concern as the majority of imports come from Canada, a stable trading partner. However, nitrogenous fertilizer productive capacity is most likely to increase in natural gas producing countries – particularly those that are not easily able to export their gas to supply centers. These countries are not generally considered to be as politically and economically stable as countries such as Canada.

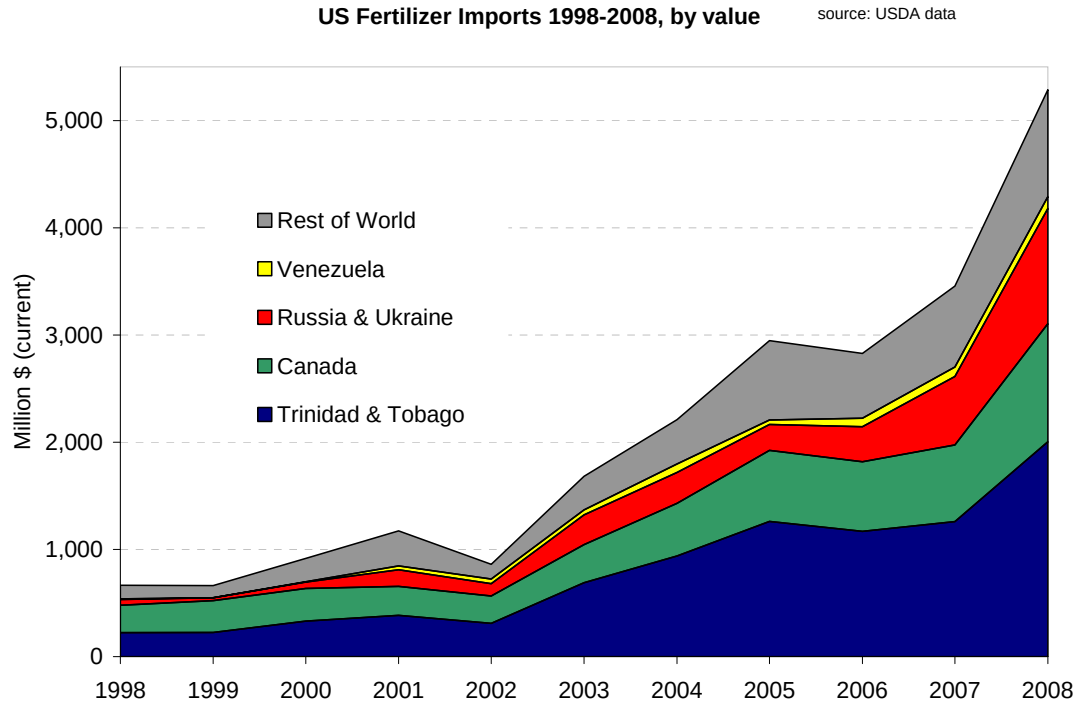
The top supplier of nitrogen fertilizer products to the United States in 2008 was Trinidad. Several U.S. firms have production facilities in that country which take advantage of the relatively cheaper natural gas supplies. The second largest supplier is Canada. However, the fastest growing suppliers include Russia and the Ukraine, the top two exporters of nitrogen in the world. Recent history in the European natural gas markets show that there is risk in relying on these countries for a significant share of commodity supply. Another

[14] U.S. Department of Agriculture, data from "*US Fertilizer Imports/Exports, 2008*," Economic Research Service.

growing source of imports for the U.S. is Venezuela. Figure 3 shows the increasing level of U.S. fertilizer imports and their countries of origins.

An unstable U.S. fertilizer supply would introduce significant risk not just to U.S. agriculture but, by extension, to the entire world food supply. There is economic value in the continued presence of a U.S.-based nitrogenous fertilizer manufacturing industry to the extent that it minimizes reliance on global sources that may one day prove unreliable.

Figure 3: U.S. fertilizer imports from 1998 to 2008



4.2. "USE" VALUE OF FERTILIZER

The United States is the third largest consumer of fertilizer in the world, behind China and India. This fertilizer consumption supports an agriculture industry that produces a large share of the world's food supply. The agricultural products grown using fertilizer are not only consumed in the United States, but are also sold into the world markets and delivered to developing countries as aid. In 2006, 22 percent of U.S. agricultural commodity production

was exported.[15] In 2008, the value of U.S. agricultural exports was $115 billion (compared to imports of $80 billion, for a trade balance of $35 billion).[16]

It is estimated that fertilizers are responsible for between 40 and 60 percent of the world's food supply.[17] A quick calculation shows that if 50 percent of U.S. agricultural production is dependent on fertilizer, fertilizer use in the United States alone provides an economic value of up to $300 billion. [18] If even half of the fertilizer is assumed to be domestically produced, that translates to a domestic "use" value of $150 billion, or 10 times the production value for the industry. There are obviously very significant assumptions that go into such a calculation, but it serves to show just how large the economic contribution might be.

The "use" value goes beyond economic value to the U.S. agriculture industry. In a world market struggling to keep food supplies apace with growing demand, agricultural products and fertilizers exported from the United States are important on a humanitarian level. If costs of U.S. agricultural products are increased as a result of a less-than-stable U.S. supply of fertilizers, the economic consequences could be large. This value of the U.S. fertilizer industry could well exceed the substantial measurable portion of the economic contributions of domestic fertilizer manufacturing that were estimated in this report.

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15 "Statistical Abstract of the United States: Table 813: *Percent of US Agricultural Commodity Exported, 1990 to 2006*." U.S. Census Bureau. Available at: http://www.census.gov/compendia/statab/tables/09s0813.pdf

16 Compiled by U.S. Department of Agriculture, Economic Research Service using data from U.S. Census Bureau.

17 W.M. Stewart et al., "*The Contribution of Commercial Fertilizer Nutrients to Food Production*," in Agronomy Journal, January-February 2005, pp.1

18 In the publication *Amber Waves*, the USDA used BEA statistics to estimate that the agriculture and related industry's share of the U.S. GDP was 4.8%. This translates to $570 billion.(http://www.ers.usda.gov/AmberWaves/June06/)

APPENDICES

APPENDIX A: METHODOLOGY

The goal of this report was to examine the fertilizer manufacturing industry's contributions to the U.S. economy, with a focus on employment and production value. Basic information and data about the industry was gathered from various government agencies, industry associations, and academic studies. Commonly accepted methods/tools for determining economic contributions were used. In order to examine contributions beyond direct employment and output, IMPLAN was selected as the input-output model of choice.

About IMPLAN[19]

IMPLAN (IMpact analysis for PLANning) was originally developed by the U.S. Department of Agriculture Forest Service in 1979 and was later privatized by the Minnesota IMPLAN Group (MIG). The model uses the most recent economic data from public sources such as the U.S. Bureau of Economic Analysis (BEA), the U.S. Department of Labor's Bureau of Labor Statistics (BLS), and the U.S. Census Bureau. It uses this data to predict effects on a regional economy from direct changes in employment and spending. Regions, or study areas, may include the entire U.S., states, counties, or multiple states or counties. Over 500 sectors and their interactions are represented in the data set.

Details of the IMPLAN model can be found in the manual:
http://implan.com/index2.php?option=com_docman&task=doc_view&gid=66&Itemid=65

Using IMPLAN to determine economic contribution

IMPLAN is designed for running economic impact analyses, which are useful in evaluating the economic contribution of a sector of the economy. The contribution can be determined by evaluating the impact of removing the industries' productive activities from the economy and quantifying the effects on all sectors combined. The impacts can be broken into three types: direct, indirect, and induced.

1. **Direct** – These contributions include direct value added by a sector. They include employee compensation, returns to investors, income on property, and payments to government.

2. **Indirect** – These contributions result from the payments to industries that support and supply a sector. The payments to suppliers lead to payments to other

[19] Minnesota IMPLAN Group, Inc., IMPLAN System (19xx/20xx data and software), 1725 Tower Drive west, Suite 140, Stillwater, MN 55082, www.implan.com, 1997.

suppliers, who pay other suppliers, and so on, in a ripple effect that ends with leakage out of the region. This leakage mostly occurs through the purchase of imported goods. These payments to suppliers are transferred to employees, investors and government in a manner similar to the way direct contributions are distributed.

3. **Induced** – The sector's economic contributions do not end when it prints paychecks for employees, pays its suppliers, distributes dividends to its shareholders or remits taxes to the government. That money is filtered back into the economy by household and government spending, thus greatly increasing the contribution of the industry.

For the sake of improving accessibility of this report, the indirect and induced contributions were not presented separately, but rather as "additional contributions" as a subset of total contributions.

Industry selection

NAICS codes were identified for the sectors that together constitute the production segment of the fertilizer value chain. Production was assumed to include mining, manufacturing and mixing. Focusing on the production sectors leaves out the wholesale and retail sectors of the industry which were not a focus of this report.

The nitrogenous fertilizer manufacturing, phosphatic fertilizer manufacturing and fertilizing mixing sectors matched one-to-one with IMPLAN sectors. Mining was accounted for as a supplier, but phosphate rock mining, which exists primarily to support phosphatic fertilizer manufacturing and could be considered part of the fertilizer industry, was not isolated because IMPLAN aggregates it into a more generic mining sector code ("other nonmetallic mineral mining"). However, IMPLAN data shows that the mining sector does represent a significant portion of the input into the phosphatic fertilizer manufacturing sector, and therefore the output from the phosphate rock mining sector was, to a degree, included in direct output. The jobs in phosphate rock mining appear in the "total contribution" calculation.

Potash manufacturing (which can also be considered "potash mining") was also difficult to isolate. Due to non-disclosure issues related to the low number of facilities, it does not have its own sector designation in IMPLAN. It is included within "other basic inorganic chemical manufacturing." An attempt was made to obtain potash sector data directly from relevant firms, which is how direct employment numbers were included in the report. This sector had at least some of its output included as part of the phosphatic fertilizer manufacturing sector and the fertilizer mixing sectors; however any output that was not sold within the industry was not included in the contributions.

Adjustments for double counting

When evaluating the contribution of an industry that consists of multiple sectors, special attention must be paid to avoid double counting the economic activity that exists between

those sectors. The fertilizer industry is no exception. There are significant intra-industry, and even intra-sector, sales. These were removed from the combined output calculation. This double counting is not an issue in direct employment because those numbers come directly from a public data source and all occur within the respective sectors. Total contributions were also adjusted to prevent double counting.

Regional analysis

IMPLAN data is available at the national, state and county levels. This analysis not only examined economic contributions at the national level, but also contributions to each of the 50 states and the District of Columbia. State-level contributions were calculated as not only the contributions from in-state fertilizer industry activity, but also the activity in each state supporting fertilizer activity in all other states. Induced contributions in each of the states led to a more even distribution of contributions across the country. The state level modeling allowed for the regional analysis, the ranking of states by contribution, and the state analyses for Louisiana and Florida.

Official NAICS definitions for the sectors in the fertilizer manufacturing industry (as listed by the NAICS association (website: http://www.naics.com/search.htm**)**

NAICS 325311: Nitrogenous Fertilizer Manufacturing: This U.S. industry (sector) comprises establishments primarily engaged in one or more of the following: (1) manufacturing nitrogenous fertilizer materials and mixing ingredients into fertilizers; (2) manufacturing fertilizers from sewage or animal waste; and (3) manufacturing nitrogenous materials and mixing them into fertilizers.

Ammonia, anhydrous and aqueous, manufacturing
Ammonium nitrate manufacturing
Ammonium sulfate manufacturing
Anhydrous ammonia manufacturing
Fertilizers, mixed, made in plants producing nitrogenous fertilizer materials
Fertilizers, natural organic (except compost), manufacturing
Fertilizers, of animal waste origin, manufacturing
Fertilizers, of sewage origin, manufacturing
Nitric acid manufacturing
Nitrogenous fertilizer materials manufacturing
Plant foods, mixed, made in plants producing nitrogenous fertilizer materials
Urea manufacturing

NAICS 325312: Phosphatic Fertilizer Manufacturing: This U.S. industry (sector) comprises establishments primarily engaged in (1) manufacturing phosphatic fertilizer materials or (2) manufacturing phosphatic materials and mixing them into fertilizers.

Ammonium phosphates manufacturing
Defluorinated phosphates manufacturing
Diammonium phosphates manufacturing
Fertilizers, mixed, made in plants producing phosphatic fertilizer materials
Phosphatic fertilizer materials manufacturing
Phosphoric acid manufacturing
Plant foods, mixed, made in plants producing phosphatic fertilizer materials
Superphosphates manufacturing

NAICS 325314: Fertilizer Manufacturing, Mixing Only: This U.S. industry (sector) comprises establishments primarily engaged in mixing ingredients made elsewhere into fertilizers.

Compost manufacturing
Fertilizers, mixed, made in plants not manufacturing fertilizer materials
Mixing purchased fertilizer materials
Nitrogenous fertilizers made by mixing purchased materials
Phosphatic fertilizers made by mixing purchased materials
Potassic fertilizers made by mixing purchased materials
Potting soil manufacturing

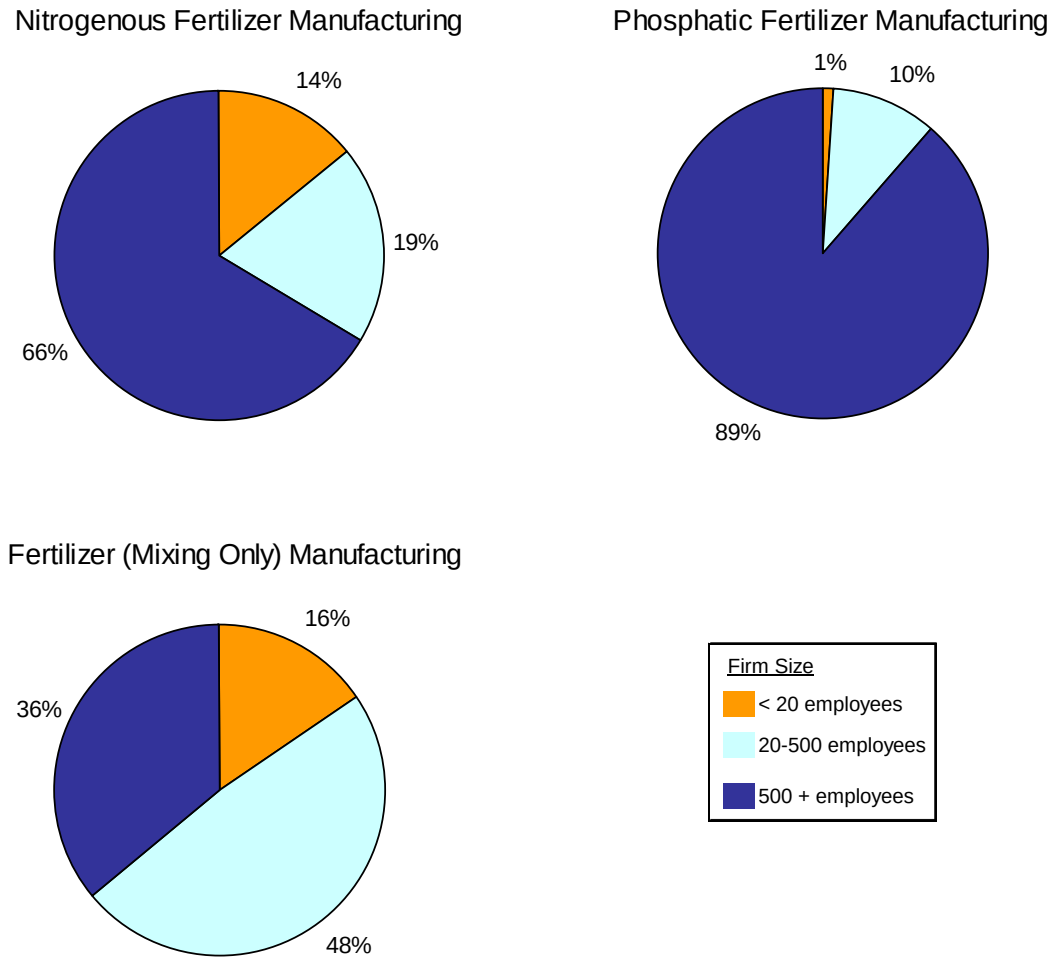
APPENDIX B: ADDITIONAL DATA TABLES

Table 14: Top three countries in fertilizer activity: consumption, production, imports and exports

	All Fertilizer	Nitrogen	Phosphorus	Potash
Consumption				
1	China	China	China	China
2	India	India	India	United States
3	United States	United States	United States	Brazil
Production				
1	China	China	China	Canada
2	United States	India	United States	Russia
3	Russia	United States	India	Belarus
Imports				
1	United States	United States	Brazil	China
2	China	China	India	United States
3	Brazil	Brazil	China	Brazil
Exports				
1	Russia	Russia	United States	Canada
2	Canada	Ukraine	Russia	Russia
3	United States	Canada	China	Belarus

Source: The Fertilizer Institute, *Global Industry at a Glance*, 2005-2006.

Table 15: Employment by firm employment size



Source: *2006 County Business Patterns*, U.S. Census Bureau.

Table 16: Region definitions

Region name	Division name	State
Northeast	New England	Connecticut
		Maine
		Massachusetts
		New Hampshire
		Rhode Island
		Vermont
	Mid-Atlantic	New Jersey
		New York
		Pennsylvania
Midwest	East North Central	Illinois
		Indiana
		Michigan
		Ohio
		Wisconsin
	West North Central	Iowa
		Kansas
		Minnesota
		Missouri
		Nebraska
		North Dakota
		South Dakota
South	South Atlantic	Delaware
		District of Columbia
		Florida
		Georgia
		Maryland
		North Carolina
		South Carolina
		Virginia
		West Virginia
	East South Central	Alabama
		Kentucky
		Mississippi
		Tennessee
	West South Central	Arkansas
		Louisiana
		Oklahoma
		Texas
West	Mountain	Arizona
		Colorado
		Idaho
		Montana
		Nevada
		New Mexico
		Utah
		Wyoming
	Pacific	Alaska
		California
		Hawaii
		Oregon
		Washington

Table 17: Regional distribution of economic contributions, by census division

Division	All	Nitrogenous	Phosphatic	Mixing
New England	1%	4%	2%	3%
Mid-Atlantic	3%	11%	7%	9%
East North Central	19%	18%	8%	23%
West North Central	7%	11%	9%	14%
South Atlantic	29%	14%	41%	15%
East South Central	5%	5%	4%	5%
West South Centra	15%	15%	12%	12%
Mountain	8%	7%	10%	6%
Pacific	14%	16%	8%	12%
Total	100%	100%	100%	100%

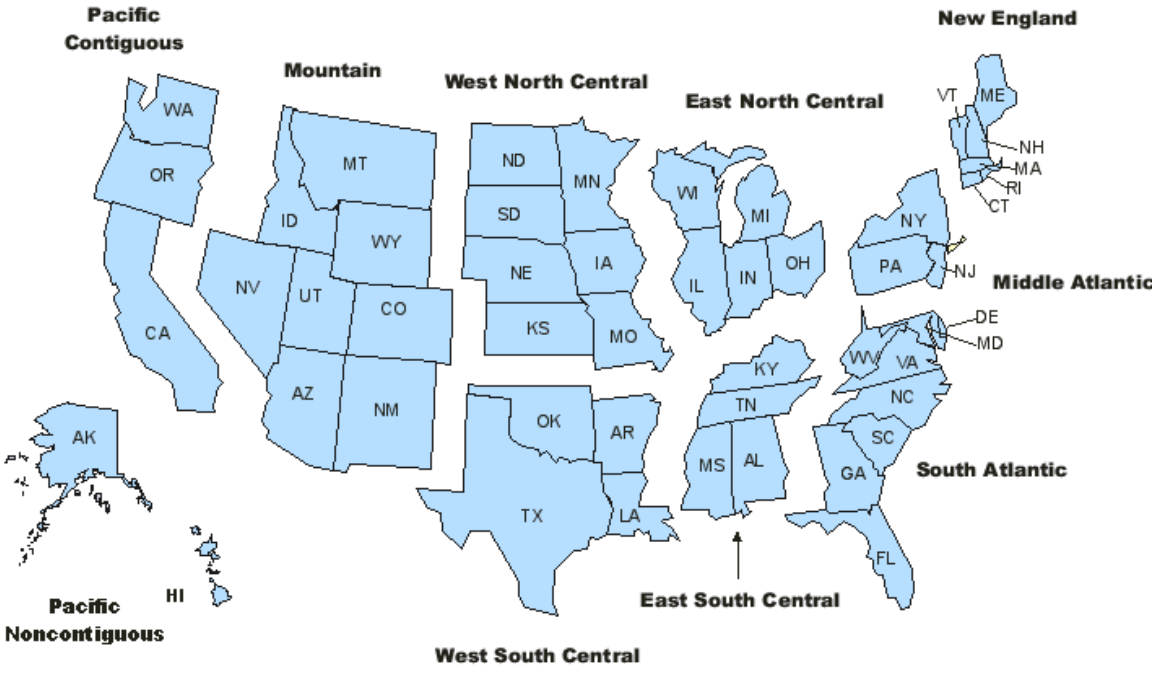


Table 18: Ammonia plant capacity by state

(thousand short tons per year)

State	Capacity	Percent
Louisiana	2,810	24%
Oklahoma	2,590	22%
Iowa	791	7%
Georgia	758	6%
Kansas	694	6%
Ohio	648	6%
Virginia	584	5%
Texas	540	5%
Mississippi	500	4%
North Dakota	391	3%
Illinois	306	3%
Nebraska	292	3%
Alaska	280	2%
Wyoming	196	2%
Alabama	175	2%
Oregon	111	1%
Grand Total	11,666	100%

Source: *North America Fertilizer Capacity*, International Center for Soil Fertility and Agricultural Development (IFDC), December 2008.

Table 19: World phosphate mine production, reserves, and reserve base (2005)

millions of metric tons

Country	Demonstrated Reserves	Currently Economic Recoverable Reserves	Mine production 2005	Mine production 2007
United States	3,400	1,200	38.3	29.7
Morocco and Western Sahara	21,000	5,700	28.0	27.0
China	13,000	6,600	26.0	45.4
South Africa	2,500	1,500	2.0	2.6
Jordan	1,700	900	7.0	5.5
Australia	1,200	77	2.0	2.2
Russia	1,000	200	11.0	11.0
Israel	800	180	3.2	3.1
Syria	800	100	3.0	
Egypt	760	100	2.2	2.2
Tunisia	600	100	8.0	7.8
Brazil	370	260	6.4	6.0
Canada	200	25	1.0	0.7
India	160	90	1.2	1.2
Senegal	160	50	1.8	0.6
Togo	60	30	1.1	0.8
Other countries	2,000	800	4.9	10.6
World total	50,000	18,000	148.0	156

Source: U.S. Geological Survey, *Mineral Commodity Summaries*, January 2006.

APPENDIX C: STATE-LEVEL FOCUS

4.2.1. Louisiana

The state of Louisiana ranks first among states with ammonia plants in terms of economic contributions of the fertilizer manufacturing industry. In 2006, the direct economic contributions of the fertilizer manufacturing industry in Louisiana totalled $1.3 billion in output and over 1,100 jobs. The total economic contributions, which include additional contributions such as impacts on suppliers and spending by employees, were $2.4 billion and over 7,300 jobs. Table I shows the direct and indirect contributions of the fertilizer manufacturing industry to the state of Louisiana. The contributions are presented for each sector in the industry, with the exception of potash, which was not included in this analysis due to lack of suffficient data.

Table I: Fertilizer manufacturing industry economic contributions to Louisiana (excluding Potash)

Output	Direct Contribution				Total Contribution	
	Louisiana total	% of US total	US rank	*multiplier*	Louisiana total	% of US total
Nitrogenous Fertilizer Manufacturing	$833	8%	# 1 *	*1.6*	$1,323	6%
Phosphatic Fertilizer Manufacturing	401	6%	# 4	*2.2*	902	4%
Fertilizer Manufacturing, Mixing Only	39	1%	# 27	*5.2*	202	2%
Total	$1,273	6%			$2,427	4%

Employment	Direct Contribution				Total Contribution	
	Louisiana total	% of US total		*multiplier*	Louisiana total	% of US total
Nitrogenous Fertilizer Manufacturing	603	8%		*5.6*	3,397	4%
Phosphatic Fertilizer Manufacturing	444	6%		*7.4*	3,274	4%
Fertilizer Manufacturing, Mixing Only	76	1%		*9.1*	689	1%
Total	1,123	5%			7,360	3%

* ranks first among states w/ ammonia plants

Additional data on the fertilizer manufacturing industry's direct employment in Louisiana is provided in Table II. The table shows employment by sector, including output and compensation per employee.

Table II: Louisiana's fertilizer manufacturing industry employment and compensation (excluding Potash)

	Nitrogenous	Phosphatic	Mixing	Fertilizer Total	Louisiana Average
Employment	603	444	76	1,123	
Output per worker	$1,382,792	$902,970	$509,229	$1,133,961	$167,671
Compensation per worker	$112,124	$111,496	$62,603	$108,535	$37,112

The industry's compensation per employee was considerably higher than the Louisiana average, at $108,535 per employee vs. a Louisiana average of $37,112 across industries.

These higher salaries, wages, benefits and other forms of compensation were a result of a very high output per employee ratio. The fertilizer industry in Louisiana generates over $1.1 million in output per worker, which is over seven times the Louisiana average across industries.

The significant economic contributions of the fertilizer manufacturing industry in Louisiana are primarily the result of the productivity of the ammonia plants within the state. In 2006, the state had the greatest ammonia plant capacity in the country, with 24% of the US total. While the majority of plant capacity is located in Ascension Parish, there are economic contributions throughout the state, especially through supplying industries and the spending by employee households. Table III shows the value added and sector inputs into Louisiana's nitrogenous fertilizer manufacturing sector.

Table III: Value added & sector inputs: Louisiana's nitrogenous fertilizer manufacturing sector

	Value (millions)	% of Output
Value Added by the sector in Louisiana	**$166**	**20%**
Inputs from outside Louisiana	**$438**	**53%**
Inputs from Louisiana's sectors not in fertilizer manufacturing industry		
Oil and gas extraction	$49	6%
Petroleum refineries	34	4%
Pipeline transportation	23	3%
Natural gas distribution	12	1%
Management of companies and enterprises	9	1%
Wholesale trade	8	1%
Power generation and supply	6	1%
All other miscellaneous professional and technical	4	1%
Legal services	3	0%
Truck transportation	3	0%
Other	32	4%
Total	**$183**	**22%**
Inputs from Louisiana's fertilizer manufacturing sectors		
Nitrogenous fertilizer manufacturing	$46	5%
Total	**$46**	**5%**
Sector Ouput	**$833**	

4.2.2. Florida

The state of Florida ranks first among states in terms of economic contributions of the phosphatic fertilizer manufacturing sector. Over half of the direct output in the US from this sector is produced in Florida. In 2006, the direct economic contributions of the entire fertilizer manufacturing industry in Florida totalled $4.3 billion in output and almost 5,000 jobs. The total economic contributions, which include additional contributions such as impacts on suppliers and spending by employees, were $8.2 billion and over 32,800 jobs. Table IV shows the direct and indirect contributions of the fertilizer manufacturing industry to the state of Florida. The contributions are presented for each sector in the industry, with the exception of potash, which was not included in this analysis due to lack of suffficient data.

Table IV: Fertilizer manufacturing industry economic contributions to Florida (excluding Potash)

Output	Direct Contribution				Total Contribution	
	Florida total	% of US total	US rank	*multiplier*	Florida total	% of US total
Nitrogenous Fertilizer Manufacturing	$627	6%	# 6	*2.1*	$1,290	5%
Phosphatic Fertilizer Manufacturing	3,292	50%	# 1	*1.8*	5,971	29%
Fertilizer Manufacturing, Mixing Only	412	10%	# 2	*2.2*	896	7%
Total	$4,331	21%			$8,157	14%

Employment	Direct Contribution				Total Contribution	
	Florida total	% of US total	US rank	*multiplier*	Florida total	% of US total
Nitrogenous Fertilizer Manufacturing	515	7%		*9.5*	4,904	6%
Phosphatic Fertilizer Manufacturing	3,666	49%		*6.5*	23,690	27%
Fertilizer Manufacturing, Mixing Only	781	10%		*5.4*	4,205	8%
Total	4,962	20%			32,798	13%

Additional data regarding the fertilizer manufacturing industry's direct employment in Florida is provided in Table V. The table shows employment by sector, including output and compensation per employee. Not that the direct employment totals do not include jobs in supporting industries (such as phosphate mining), which are accounted for in total employment.

Table V: Florida's fertilizer manufacturing industry employment and compensation (excluding Potash)

	Nitrogenous	**Phosphatic**	**Mixing**	**Fertilizer Total**	**Florida Average**
Employment	515	3,666	781	4,962	
Output per worker	$1,217,409	$898,025	$528,240	$872,994	$115,357
Compensation per worker	$62,674	$106,715	$73,364	$96,897	$38,537

The compensation per employee was considerably higher than the Florida average, at $96,897 per employee vs. a state average of $38,537 across industries. These higher salaries, wages, benefits and other forms of compensation were a result of a very high output per employee ratio. The fertilizer manufacturing industry in Florida generates over $870,000 in output per worker, which is almost 8 times the Florida average across industries.

The significant economic contributions of the fertilizer manufacturing industry in Florida are largely attributable to the phosphatic fertilizer manufacturing in the state, which in turn is a result of the state's economically accessible deposits of phosphate. In 2006, 60% of the phosphate rock mining capacity in the country was located in Florida. While the majority of plant capacity is located in central Florida, there are economic contributions throughout the state, especially through supplying industries and the spending by employee households. Table VI shows the value added and sector inputs into Florida's phosphatic fertilizer manufacturing sector.

Table VI: Value added & sector inputs: Florida's phosphatic fertilizer manufacturing sector

	Value (millions)	% of Output
Value Added by the sector in Florida	**$397**	**12%**
Inputs from outside Florida	**$1,651**	**50%**
Inputs from Florida's sectors not in fertilizer manufacturing industry		
Truck transportation	$298	9%
Wholesale trade	115	3%
Other basic inorganic chemical manufacturing	84	3%
Management of companies and enterprises	76	2%
Oil and gas extraction	42	1%
Rail transportation	39	1%
All other miscellaneous professional and technical	28	1%
Power generation and supply	26	1%
Pesticide and other agricultural chemical manufact	22	1%
Other	243	7%
Total	**$973**	**30%**
Inputs from Florida's fertilizer manufacturing sectors		
Phosphatic fertilizer manufacturing	$139	4%
Nitrogenous fertilizer manufacturing	132	4%
Total	**$271**	**8%**
Sector Ouput	**$3,292**	