



# BRIEFING

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## Global Fertilizer Production

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### Introduction

Fertilizer products are manufactured in many countries and used globally by agricultural producers, horticulturalists, foresters, and gardeners. Typically, fertilizer manufacturers produce a range of products which contain differing quantities and combinations of the three most essential plant nutrients -- Nitrogen (N), Phosphorus (P), and Potassium (K) – and, often, micronutrients such as sulfur and iron.

substantial natural gas reserves and phosphate ore deposits. As a result, the United States is the third largest producer of nitrogen, the fourth largest producer of ammonia, and the second largest producer of phosphate (International Fertilizer Industry Association). However, the U.S. agricultural sector is a major user of fertilizer and, therefore, the United States is also a net importer of many fertilizer products.

Since 1960, global agricultural fertilizer production has steadily increased (Figure 1). Fertilizer plant locations are heavily influenced by access to natural resources, especially natural gas reserves and both phosphate and potash ore deposits. The United States has

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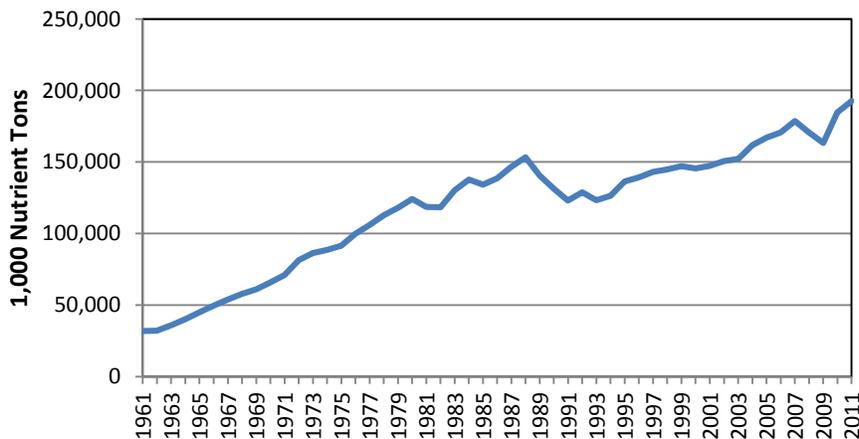
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**Objective  
Analysis For  
Informed  
Decision Making**

**Figure 1: Total World Production of N, P, and K Nutrients, 1961-2011**

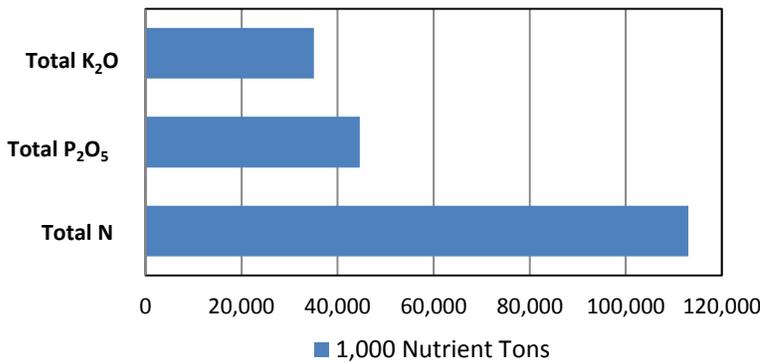


Source: IFIA

## Global Fertilizer Production

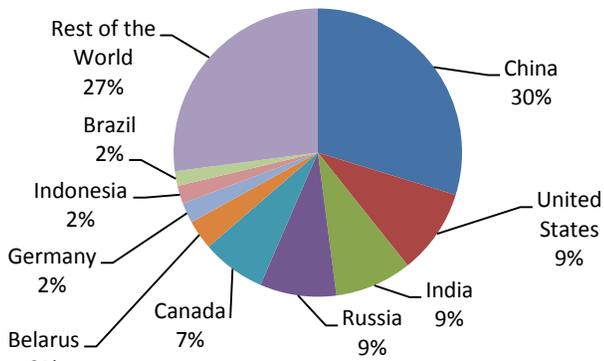
In 2011, world fertilizer production (N, P, and K) totaled 192.7 million nutrient tons (Figure 2). The U.S. share of world fertilizer production was 9 percent, making it one of the top four producers of agricultural fertilizer products along with China, India, and Russia (Figure 3).

**Figure 2: Total World Production of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O, 2011**



Source: IFIA

**Figure 3: World Producers of N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O, 2011**

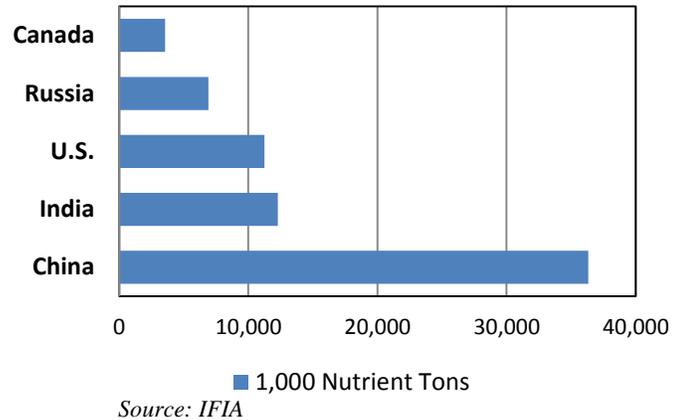


Source: IFIA

## Global Nitrogen Production

Nitrogen fertilizer production requires natural gas, which accounts for between 50–90 percent of ammonia and nitrogen fertilizer production costs.<sup>1</sup> The four largest producers of nitrogen fertilizer -- China, India, the United States, and Russia -- are also countries with large natural gas reserves (Figure 4).

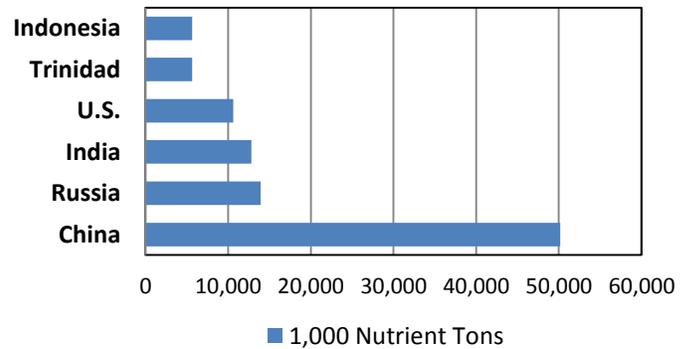
**Figure 4: Major Nitrogen Producers, 2011**



Source: IFIA

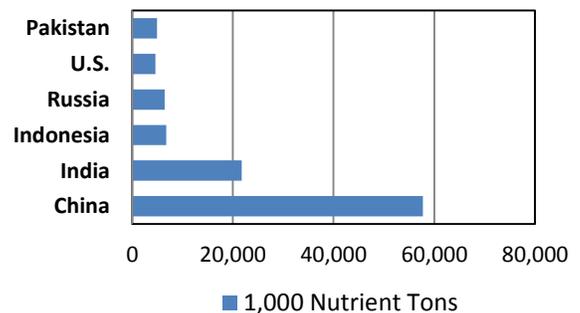
In 2011, the United States was the fourth largest producer of ammonia (10.6 million tons), which is the most important input in the production of most fertilizers (Figure 5). The United States was also the world's second largest producer of urea (4.6 million tons), which is typically manufactured in plants that also produce ammonia to take advantage of production efficiencies (Figure 6)

**Figure 5: Major Ammonia Producers, 2011**



Source: IFIA; Global Fertilizer Trade Map

**Figure 6: Major Urea Producers, 2011**



Source: IFIA; Global Fertilizer Trade Map

<sup>1</sup> [www.farmandranchguide.com/news/crop/spotlight-on-economics-dynamic-changes-in-the-competition-for-fertilizer/article\\_62e5c978-e695-11e3-b003-001a4bcf887a.html](http://www.farmandranchguide.com/news/crop/spotlight-on-economics-dynamic-changes-in-the-competition-for-fertilizer/article_62e5c978-e695-11e3-b003-001a4bcf887a.html)

### Potential Changes in U.S. Nitrogen Production

Beginning in the mid-1990s, U.S. ammonia production decreased primarily because of higher production costs associated with increases in natural gas prices. Concurrently, low crop prices reduced domestic fertilizer demand, which reduced profit margins for fertilizer plants (Figure 7). Between 2000 and 2002, natural gas prices increased by more than 300 percent while the prices of major crops (such as corn and wheat) were relatively low. As a result, U.S. nitrogen fertilizer production declined by 25 percent and eight U.S. fertilizer plants closed (GAO). Following a second natural gas price spike in 2003, the U.S. fertilizer industry operated only 50 percent of its remaining production capacity. Over the next ten years, more than 40 percent of total ammonia plant capacity was decommissioned. A new ammonia manufacturing plant has not been built in the United States for 34 years.

The decade-long downward trend in U.S. fertilizer production capacity may, however, be about to end for two reasons (Wilson 2014). First, domestic and foreign fertilizer demand has increased along with crop prices, corn production, and the adoption of more-intensive agricultural technologies. Second, technological innovations in oil and gas extraction have substantially increased the production of natural gas in the northern Great Plains. The resulting decline in natural gas prices has provided incentives for capital investments in new ammonia and nitrogen fertilizer production facilities. For example, while most fertilizer plants have traditionally been located in Oklahoma, Louisiana, Texas, and the Midwest, 12 to 15 new fertilizer plants have been proposed to be built in the upper Midwest and northern Great Plains regions. Each new plant could produce between 0.5 million to 3.7 million tons of fertilizer products annually.

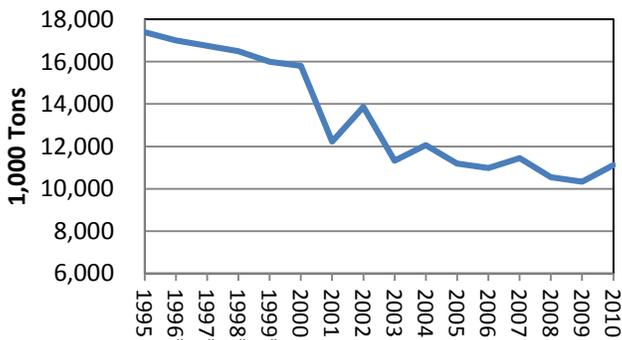
The construction of several facilities has already begun. For example, Orascom Construction Industries is building a \$1.4 billion plant in Iowa (1.5–2 million tons annual capacity) and Ohio Valley Resources is building a \$952 million plant in Indiana (1.9 million tons annual capacity). Furthermore, a proposal by CHS, Inc. to build a \$1.4 billion nitrogen fertilizer plant in North Dakota and additional investments in Texas would increase U.S. urea production by 700,000 tons per year.

Plant expansions and construction could substantially alter the flow and distribution of fertilizer products. These new investments will improve U.S. agricultural producers' access to fertilizer supplies. Such supplies should be more stable because transportation distances, supply uncertainty, and other logistical problems that have affected the distribution of imported fertilizers would be reduced ([see Briefing Paper 109](#)).

### Global Phosphate Production

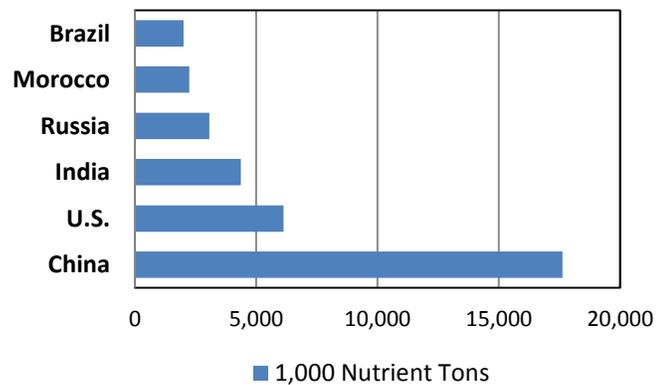
Phosphate production depends on the availability of phosphate mineral ore deposits. China is, by far, the largest phosphate producer followed by the United States, which accounted for 23 percent of global phosphate production in 2011 (Figure 8). Some countries (e.g., India) that do not have access to significant ore deposits import phosphate rock for domestic production purposes.

**Figure 7: U.S. Ammonia Production, 1995 to 2010**



Source: IFIA

**Figure 8: Major P<sub>2</sub>O<sub>5</sub> (Phosphate) Producers, 2011**

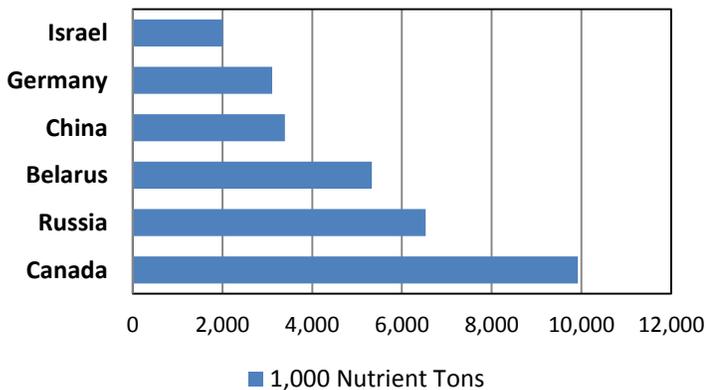


Source: IFIA

## Global Potash Production

Potash production depends on the availability of potash-laden mineral ore deposits. Although the United States produces some potash, quantities are limited because of relatively small potash ore deposits. As a result, the United States produces only three percent of the world's 35 million tons of potash. Canada, Russia, and Belarus are the world's largest potash producers (Figure 9).

Figure 9: Major K<sub>2</sub>O (Potash) Producers, 2011



Source: IFIA

## Summary

Fertilizers are global commodities and are generally produced in countries that have access to low cost natural gas and substantial deposits of phosphate and potash mineral ores. The United States has been a major producer of nitrogen-based fertilizers for many years and recent discoveries of new natural gas sources is contributing to the expansion of the U.S. nitrogen fertilizer industry. The United States produces a relatively large share of world phosphate fertilizers, but a very small component of world potash production.

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