

International Fertilizer Supply and Demand¹

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Executive Summary

This paper provides an overview of the world agricultural situation and a forecast of fertilizer supply and demand for the period from 2006 to 2011.

Global fertilizer consumption has started a new demand-driven cycle, supported by an exponential growth in biofuels crops and a recovery in fertilizer use in the main consuming regions. Grain consumption is rising, driven by strong demand for food, feed and biofuels production, leading to very tight grain market conditions and a severe contraction of the world stock-to-use ratios well below critical levels. In 2006, global fertilizer consumption expanded by a massive increase of 6 Mt nutrients, providing a strong foundation for a sustained 2.7 per cent annual growth rate between 2007 and 2011. The need to rebalance fertilization will favour potash and phosphate application. The bulk of the increase in demand will occur in Asia and Latin America.

For all nutrients, the global supply and demand situation will be relatively tight to balance until 2008, due to stronger demand than expected. The global nitrogen supply/demand balance will remain in a relative surplus situation, which will expand rapidly after 2009. Urea supply will grow at a much faster rate than that of demand, leading to a quickly rising surplus after 2009, provided all planned projects are completed on schedule. World phosphate rock supply will mostly grow in a few countries, essentially for captive use. High quality rock will become scarcer. Phosphoric acid markets will face a negligible surplus until 2010, while DAP supply/demand shows a sustained balance until 2011. Potash supply is increasing in most exporting countries, but strong demand worldwide will lead to tightening market conditions in the short to medium term. A marginal growth of the surplus will develop by 2010.

Global Context

According to the Food and Agricultural Policy Research Institute (FAPRI - based in Ames, USA), the global economic growth remained very firm in 2006 at 4 per cent, supported by strong expansion in the USA and in emerging Asia. Economic expansion is expected to slightly decelerate in 2007 and 2008, at 3.3 and 3.6 per cent respectively. In the medium term, global growth will remain firm, with annual rates above 3 per cent.

Income growth in emerging economies stimulates food diversification towards more meat, fish, fruits, vegetables, sugar and vegetable oils and less cereals and pulses per capita. Increased meat production will require greater amounts of coarse grains and oilseeds. Fruit and vegetable production expands also very quickly.

Policy Aspects

Food security and self-sufficiency objectives, environmental concerns and, more recently, biofuels development are the key drivers of world fertilizer consumption.

Environmental concerns have a great impact on fertilizer demand in developed countries, but increasingly in developing countries as well. More and more countries are drafting regulations for water, air and soil quality. These regulations impact the way nutrients are used, requiring farmers to optimize the recycling of organic nutrient sources and to implement nutrient budgeting at the farm or field level. In this context, nitrogen use efficiency

¹ This paper draws on two reports presented at the 75th IFA Annual Conference held in Istanbul in May 2007: *Medium-Term Outlook for World Agriculture and Fertilizer Demand: 2006/07 – 2011/12* (P. Heffer), and *Global Fertilizers and Raw Materials Supply and Supply/Demand Balances: 2007 – 2011* (M. Prud'homme).

has greatly improved over the past two decades in the developed countries. The trend is still different in most developing countries. In response to efforts from the fertilizer industry and other stakeholders, a reversal of the trend could emerge towards the end of the outlook period in some developing countries.

Crude oil prices have declined from their record high of last year, but still remain above US\$ 60 per barrel. Such prices have a dual effect on fertilizer demand, firstly impacting fertilizer prices and secondly, stimulating biofuels production.

In 2005, 37 billion litres of biofuels were produced in the world, requiring the cultivation of some 14 million hectares of land. Bioethanol accounted for 85 per cent of the world production of biofuels and biodiesel for 15 per cent, in terms of oil equivalent. During the past five years, world growth of biofuels has averaged about 15 per cent per annum. The main producing countries/regions of bioethanol were the USA and Brazil. The main producing country of biodiesel was Germany. The advantages claimed for biofuels are that they lessen dependence on fossil fuels, reduce emissions of greenhouse gases, have a positive energy balance, are made from renewable vegetable materials, boost the revenues of the agricultural sector and stimulate rural employment. Disadvantages are that they may cost more to produce than fossil fuels, often occupy land that could otherwise be used to produce food crops, may trigger deforestation and conversion of pastures to cropping and are subject to weather uncertainties. The feedstocks used for the production of bioethanol comprise sugar crops, mostly sugar cane, and cereals, mostly maize. Biodiesel is usually produced from vegetable oil, notably from oil palm, soybean and rapeseed.

As a result of the surging biofuels production, industrial grain uses have been growing at much faster rates than food and feed uses in recent years. Between 2003/04 and 2007/08, the use of industrial maize will rise 80 per cent worldwide, while food and feed uses would increase by 5 per cent during this period. In the USA, it is estimated that 17 per cent of the domestic maize output served for ethanol production in 2005/06, and that this share would increase to almost 30 per cent in 2007/08. Elsewhere, biofuels developments will lead to an expansion of sugarcane and soybean production in Brazil, of rapeseed in the EU, and of oil palm in South-east Asia.

Agricultural Situation and Outlook

During the period from 2002 to 2006, world cereal consumption increased by 2 per cent annually while world production rose by 1 per cent per year only, resulting in seven years of deficit over the past eight campaigns. This situation continued in 2006/07, as global cereal output is projected to decline to 1.99 billion tonnes (Bt). In response to the strong industrial demand, coarse grain consumption is forecast to expand by 4.5 per cent over 2005. World inventories would contract by 15 million tonnes (Mt) or 4.6 per cent, to 305 Mt. The global cereal stock-to-use ratio would decline to 14.5 per cent, its lowest level in more than two decades. The coarse grain stock-to-use ratio would fall to 11 per cent, corresponding to less than 40 days of consumption.

In the medium term, growing the food and fiber requirements of a steadily increasing world population, food diversification, development of biofuels and environmental concerns are the key factors that will impact this outlook. Significant shifts in crop mix are projected in key producing countries and increasing productivity will be required, due to limited availability of additional agricultural land worldwide.

- In May 2007, FAPRI assessed that global wheat, maize and rice production would increase by 10.6, 17.8 and 3.5 per cent respectively between 2006/07 and 2011/12. According to the OECD and the FAO, the world cereal harvest would reach 2.2 Bt in 2011/12. The global cereal output is likely to increase steadily over the next five years, ranging between 2.05 and 2.25 Bt, depending on the weather and market conditions.
- In a five-year perspective, about two-thirds of the increase in wheat production will come from yield gains and the remaining third from increased acreage. The planted area and productivity of maize would rise by 3 per cent annually. The world output of rice will respond to higher yields, as its area planted would be slightly lower.
- Most of the cereal consumption increase is expected to come from industrial uses in the developed countries and from feed uses in the developing countries. Global annual maize consumption would grow much faster (11 per cent) than for wheat (6 per cent) and rice (3 per cent) due to maize's strong demand from the ethanol and feed industries.
- In the medium term, the stock-to-use ratio will likely remain low and relatively stable for all three cereals, around 20-21 per cent for wheat, 19 per cent for rice and 12 per cent for maize. Therefore, crop prices should remain strong during the outlook period, while remaining very volatile and increasingly linked to crude oil futures.

Global and Regional Fertilizer Demand

Driven by strong demand for biofuels crops and a recovery of fertilizer use in the main consuming regions, global fertilizer consumption in calendar year 2006 rose 6 Mt nutrient over 2005, to 161.8 Mt, followed by another projected increase of 6 Mt nutrient in 2007, to 167.6 Mt. This has set the foundation for a sustained 2.7 per cent annual growth rate between 2007 and 2011, to reach 183.4 Mt in 2011. The need to rebalance fertilization and to improve nitrogen use efficiency results in a stronger annual increase in the demand for potash (3.2 per cent) and phosphate (2.9 per cent) than for nitrogen (2.4 per cent).

At the regional level, the bulk of the increase in demand is expected to come from Asia and, to a lesser extent, Latin America. South Asia and East Asia together would account for one-third of total growth.

- In East Asia, regional demand will remain firm (2.9 per cent increase annually), essentially due to China, Indonesia, Malaysia and Vietnam. Potash demand is projected to increase much faster than that of phosphate and nitrogen. A progressive slow-down of the nitrogen demand growth is forecast over the outlook period.
- Fertilizer demand is anticipated to remain very strong in South Asia (4.8 per cent growth annually) as greater amounts of fertilizer are needed to achieve food self-sufficiency policy objectives. The need to rebalance fertilization points to significantly stronger growth rates for phosphate and potash than for nitrogen.
- In North America, fertilizer consumption will grow moderately at 1.1 per cent annually, following a 3.4 per cent increase in 2006, due to surging domestic ethanol demand and the resulting changes in crop mix.
- Fertilizer consumption in Latin America and the Caribbean is forecast to recover at rates close to 4 per cent annually.
- In the EU, aggregate consumption is expected to remain stable, with an anticipated decline in phosphate and potash demand offset by an increase in nitrogen consumption.
- Fertilizer demand in West Asia would increase by 2 per cent annually, as current crop production expands to meet the growing domestic food and feed demand.
- Fertilizer consumption in Africa is forecast to grow by 2.9 per cent per annum, mostly driven by a steady expansion of the irrigated area and higher yields in Egypt.

- Sustained growth of fertilizer demand is anticipated in Eastern Europe and Central Asia (3.1 per cent annually), supported by increasing crop exports and a slow recovery in fertilizer use since the early 1990s.
- Fertilizer consumption in Oceania is projected to grow modestly (0.9 per cent annually), recovering from the series of droughts that have affected Australia over the past few years.

Global Fertilizer Supply Medium Term Outlook

As regards supply, 2006 was a record production year for most nutrients, with the exception of potash due to contractual delays. The prices of fertilizer products in late 2006 and early 2007 reached record levels for the past 10 years. The year 2007 will mark a major turning point for the international fertilizer industry, as buoyant demand will stretch the industry's capability of meeting global requirements.

Global Nitrogen Outlook

Since 2000, the rising trend and volatility of energy prices, especially natural gas, have impacted the economics of ammonia production in key producing and consuming countries. Countries or regions with a large consumption base and heavy import reliance for natural gas have seen a steep decline in ammonia capacity. Countries benefiting from low-cost feedstock supplies have expanded their ammonia capacity, mostly dedicated for export. This capacity trend will likely continue in the near future.

Global ammonia capacity will increase by 33 Mt, from 172 Mt in 2006 to 205 Mt product in 2011. Three-quarters of this increase will be used in domestic markets, while the remaining 25 per cent will be for export. The bulk of the growth will occur in East Asia, West Asia, EECA, Africa and South Asia. Ammonia capacity is projected to remain static in Europe and Oceania and to potentially decrease in North America.

During the period from 2007 to 2011, the consumption of nitrogen is projected to increase by an overall 7.3 per cent, equating to an annual growth rate of 1.8 per cent. World fertilizer nitrogen consumption is forecast at 107.2 Mt N in 2011, compared to 99.8 Mt N in 2007. Urea will take the bulk of this growth. Total nitrogen demand will reach 137.2 Mt in 2011. The global nitrogen supply/demand balance shows a surplus of 5 Mt N in 2007, rising to 17 Mt N in 2011. Starting in 2008, the rapid growth of capacity will ease the relative global supply/demand tightness, putting pressure on uncompetitive plants. The surplus will expand after 2009, when new large plants come on stream.

World seaborne ammonia capacity is projected to grow from 17.1 Mt product in 2006 to 20.2 Mt in 2011. Close to two-thirds of this increase will occur in the region covering East of Suez, reaching 6.7 Mt product in 2011. New tonnage of merchant ammonia will come from Egypt, Iran, Qatar and Saudi Arabia in the East of Suez region and mostly from Algeria in the West of Suez region. The five-year outlook for seaborne ammonia trade shows an increase of 3.0 Mt product, to 19.6 Mt in 2011, representing a growth rate of 4 per cent per annum.

As regards urea, IFA's capacity survey shows that close to 50 new urea plants would come on stream between 2007 and 2011. During this period, global urea capacity is forecast to expand by an overall 22 per cent, to 192.5 Mt product in 2011. This corresponds to a compound annual growth rate of 5.2 per cent over 2007. West Asia and East Asia will contribute two-thirds of the expansion. The other main sources of new capacity are Africa and South Asia.

World's urea supply is estimated at 145.2 Mt product in 2007 and 178.8 Mt in 2011, compared with global demand at 143.3 Mt in 2007 and 163.7 Mt in 2011. The global urea supply/demand balance from 2007 to 2011 shows a relatively tight market situation in 2007, softening in 2008.

A growing surplus will emerge in late 2009, expanding to 15.1 Mt product in 2011. By 2011, the surplus will equate to 8 per cent of global capacity, assuming that all announced projects proceed as planned.

South Asia will remain the world's largest urea importing region. The deficit in North America and West Europe will increase. East Asia will become a net exporting region, with most of the new surplus coming from China.

Global Phosphate Outlook

IFA estimates that world phosphate rock supply will grow at an annual rate of 4 per cent, to 215.7 Mt product in 2011. On a regional basis, rock production is projected to increase in West Asia, Africa, East Asia (mostly China) and Latin America (Brazil, Peru and Venezuela). China will account for one-third of the increase during this period. Elsewhere, most of the expansion of rock supply will be centered in a few countries, essentially for captive use. There is limited additional export availability. On a global basis, the average P_2O_5 content of phosphate rock continues to decrease.

During the period from 2006 to 2011, the global phosphoric acid capacity is forecast to increase by an overall 5.9 Mt to 49.6 Mt P_2O_5 in 2011. Close to three-quarters of this net expansion will be for domestic downstream processing. The main additions to capacity will occur in China and Saudi Arabia. Therefore, no significant addition to merchant phosphoric acid capacity is expected in the near term. The global supply of phosphoric acid is estimated at 36.8 Mt in 2007 and 43.3 Mt P_2O_5 in 2011, growing 4.2 per cent per annum over 2007.

IFA forecasts that the global P_2O_5 fertilizer demand would reach 44.5 Mt P_2O_5 , equating to a 3 per cent annual growth over 2007. Taking into account the increasing share of phosphoric acid-based fertilizers in total phosphorous nutrient consumption and the tonnage used in non-fertilizer sectors, the total demand of phosphoric acid is forecast to grow at a compound annual rate of 3.6 per cent, to 41.5 Mt P_2O_5 in 2011.

The global phosphoric acid supply/demand balance shows relatively tight market conditions during the period from 2007 to 2010, with a marginal surplus equating to less than 2 per cent of global supply. However, a surplus will emerge in 2010/11, reaching close to 1.8 Mt P_2O_5 and equating to 4 per cent of global supply.

Between 2006 and 2011, world phosphate fertilizer capacity developments will essentially focus on DAP in exporting countries and MAP in China and Brazil. The global DAP supply/demand balance shows tight supply conditions in 2007, marginally easing between 2008 and 2010 with a surplus of less than 0.7 Mt P_2O_5 . The balance would then expand into a surplus exceeding 1.6 Mt P_2O_5 in 2011, as new large DAP plants come on stream.

Global Potash Outlook

Global potash capacity is forecast to increase by an overall 16 per cent, from 65.6 Mt MOP in 2006 to 76.3 Mt in 2011. This represents an additional 10.7 Mt of capacity that will occur mostly in Canada, Russia and China, along with new tonnage in Jordan and Argentina. By 2010, the main addition to capacity would come from Argentina. On a regional basis, most of this new capacity will be for export, except in China.

IFA estimates that world potash supply will grow from 38.3 Mt K_2O in 2007 to 43.2 Mt K_2O in 2011, equating to an annual increase of 1.2 Mt K_2O or a rate of 3.2 per cent per annum. The global demand of potash is estimated at 32.4 Mt in 2007 and 36.4 Mt K_2O in 2011. This equates to an average annual growth rate of 3 per cent, or 1 Mt K_2O per annum.

The supply/demand balance for the period from 2007 to 2011 shows a declining surplus until 2009, from 6.0 Mt K_2O in 2007 to 5.1 Mt in 2009. Starting in 2010, the addition of new capacity from expansion and green-field projects will add sufficient supply to reverse the declining surplus trend. By 2011, the global surplus will reach 6.8 Mt K_2O , which would equate to 16 per cent of capacity. Potash demand will expand in South Asia (India) and China. The deficit in Latin America will start to decline in 2011.