

## World Trends in Fertilizer Use and Projections to 2020

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Fertilizers have played an important role in increased crop production, especially in cereal yields, and will continue to be a cornerstone of the science-based agriculture required to feed the expanding world population. Fertilizers replenish the nutrients removed from soils by harvested crops, encourage adoption of high-yielding varieties, and increase biomass in the nutrient-poor soils of the tropics.

### Fertilizer Use Until the 1990s

Global fertilizer use increased at an annual rate of 5.5ápercent from 27.4 million nutrient tons in 1959/60 to 143.6ámillion tons (in this paper, all tons are nutrient tons) in 1989/90. Over the next five years, it decreased by 20 million tons. In all developing regions, fertilizer use increased significantly, during 1960-90, at annual rates ranging from 8 percent in Latin America and Sub-Saharan Africa to 12 percent in South Asia (Table 1).

Table 1--Fertilizer use, 1959/60, 1989/90, and 2020

Region/Nutrient	Fertilizer User			Annual Growth	
	1959/60	1989/90	2020	1960-90	1990-2020
	(million nutrient tons)			(percent)	
Developed countries	24.7	81.3	86.4	4.0	0.2
Developing countries	2.7	62.3	121.6	10.5	2.2
East Asia	1.2	31.4	55.7	10.9	1.9
South Asia	0.4	14.8	33.8	12.0	2.8
West Asia/North Africa	0.3	6.7	11.7	10.4	1.9
Latin America	0.7	8.2	16.2	8.2	2.3
Sub-Saharan Africa	0.1	1.2	4.2	8.3	3.3
World total	27.4	143.6	208.0	5.5	1.2
Nitrogen	9.5	79.2	115.3	7.1	1.3
Phosphate	9.7	37.5	56.0	4.5	1.3
Potash	8.1	26.9	36.7	4.0	1.0

Sources: FAO data, and authors' calculations for 2020.

Notes: East Asia excludes Japan. West Asia/North Africa excludes Israel.

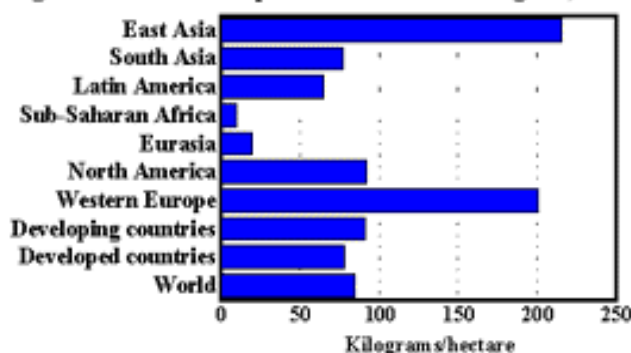
In contrast to the higher annual growth rates of the 1960s (8.9 percent) and the 1970s (5.6 percent), growth in global fertilizer use was slow in the 1980s (2.8 percent) due to low grain prices and land set-aside programs in the developed countries and debt crises, foreign exchange shortages, and removal of subsidies in some African and Latin American countries. In the early to mid-1990s, fertilizer use actually declined by 3.1 percent a year, primarily due to reduced consumption in Eurasia (the former Soviet Union) and Eastern Europe, where fertilizer use and crop production suffered from the economic reform process. As economic recovery begins in these countries, global fertilizer use may increase, but overall growth in the 1990s may continue to be slow, picking up after the turn of the century.

Although the use of all three nutrients--nitrogen, phosphate, and potash--increased during 1960-90, nitrogen use grew much faster. In 1994/95, nitrogen fertilizers accounted for 64 percent of the fertilizers consumed by developing countries, phosphate for 25 percent, and potash for 11 percent. This emphasis on nitrogen has contributed to nutrient imbalances in many developing countries.

In 1959/60, the developing countries used less than 3 million tons of fertilizer nutrients, most of it on export crops (Table 1). The launching of the Green Revolution in the mid-1960s in India and subsequently in other East and South Asian countries accelerated the growth in fertilizer use in developing countries. Fertilizer use increased in both developed and developing countries, but the developing countries recorded substantially higher annual growth rates (10.5 percent), albeit from a small base, increasing their share of global fertilizer consumption from 10 percent in 1959/60 to 31 percent in 1979/80 and 58 percent in 1994/95. East Asia consumes half of the fertilizer used in the developing world. Despite appreciable annual growth, Sub-Saharan Africa accounts for less than 1 percent of global fertilizer use and 2 percent of the developing-country total.

In East and South Asia, 66 to 72 percent of total fertilizer use goes to food crops, a result of a high degree of political commitment to food production and a favorable policy environment for adoption of seed-fertilizer technologies. In contrast, Latin American and Sub-Saharan African countries devote a relatively larger share of fertilizer use to export crops. East and South Asia also dominate other developing regions in fertilizer use intensity. In 1994/95, fertilizer use per hectare averaged more than 216 kilograms in East Asia and 77 kilograms in South Asia, compared with 10 kilograms in Sub-Saharan Africa and 65 kilograms in Latin America (Figure 1).

Figure 1--Fertilizer use per hectare in selected regions, 1994/95



Source: Derived from FAO data on fertilizer assumption and land use.

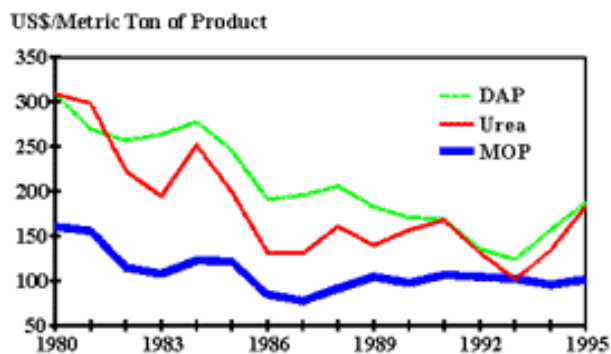
## Production Trends

To meet the growing demand, fertilizer production increased rapidly from 27.7 million tons in 1959/60 to 152.9 million tons in 1989/90, then decreased by about 17 million tons over the next five years, largely because of the reduction in fertilizer production in countries of Eurasia and Eastern Europe. Based on the current projections for production capacity, global fertilizer supply may reach 157 million tons (86.7 million tons of nitrogen, 41.5 million tons of phosphate, and 28.8 million tons of potash) by the year 2000.

## Trends in Prices

Since the early 1980s, fertilizer prices have been declining in real terms (Figure 2) and were not high enough to attract additional investment in fertilizer production. But recent increases in fertilizer use in North America, reduced supplies from Eurasia, and increased imports by China and India forced fertilizer prices to rise rapidly in 1994 and 1995. Increased grain prices also contributed to this unexpected surge in fertilizer prices. Although this phenomenon has engendered some alarm about potential fertilizer shortages, the structural parameters do not support a long-run trend to higher prices. Nevertheless, restoring the fertilizer sector to viable operating conditions in Eurasia is essential for sustaining stability in the global pricing environment.

**Figure 2--World fertilizer prices, 1980-95**



Source: World Bank, *Commodity Markets and the Developing Countries*, February 1996.

Note: Urea prices are f.o.b. bagged Western Europe, and diamonium phosphate (DAP) and muriate of potash (MOP) prices are f.o.b. bulk U.S. Gulf and Vancouver (Canada), respectively. All prices are in 1990 U.S. dollars.

## Projected Trends in Use, Requirements, and Production

By 2020, global fertilizer demand is projected to increase to 208 million tons--86 million tons in developed countries and 122 million tons in developing countries (Table 1). In all regions, fertilizer demand is projected to grow at a slower pace than it did in the past. These lower growth rates reflect a higher base, limited potential for further growth, and changing policy environments.

Because of the already high application rates, environmental concerns, reduction in farm support programs, and trade liberalization policies, fertilizer use in developed countries is projected to increase only modestly. In East Asia, existing high application rates minimize the potential for future growth. Most of the growth in East Asia will be in phosphate and potash fertilizers, which will contribute to improved nutrient balance and reduced loss of nitrogen to the atmosphere. In other developing regions, demand for all nutrients is expected to grow by 2 to 3 percent a year.

The projected fertilizer demand in developing countries is expected to fall short of the amount needed by 2020 to meet goals for food security (estimated at 185 million tons) and sustainable agriculture (251 million tons for resource conservation and nutrient replenishment). Hence, additional efforts must be made to promote higher levels of fertilizer use, especially in Sub-Saharan Africa. Assuming that the long-term elasticity of cereal output to fertilizer use is 0.4 to 0.5, a 4 percent annual growth rate in cereal production in Sub-Saharan Africa may mandate an annual increase in fertilizer consumption of 8 to 10 percent, in contrast to the projected annual growth rate of 3.3 percent.

To meet the projected demand of 208 million tons in 2020, about 51 million tons of additional capacity (28.6 million tons of nitrogen, 14.5 million tons of phosphate, and 7.9 million tons of potash) will be needed. Technology, raw materials, and capital resources are unlikely to be constraints to meeting future needs. East Asia, South Asia, Latin America, and Sub-Saharan Africa are likely to be the major importing regions, whereas North America, Eurasia, and West Asia/ North Africa will remain the major exporting regions. Macro-economic policy (including exchange rate stability and an adequate supply of foreign exchange) will play a critical role in meeting the fertilizer requirements of the importing regions, especially Sub-Saharan Africa, where most countries currently depend on aid to meet fertilizer requirements. Overall, a conducive and stable policy environment, including macroeconomic stability, price incentives, credit availability, efficient organizational arrangements, research and extension support, regulatory frameworks, and environmental monitoring, will be essential to promote environmentally friendly growth in fertilizer use and supply to 2020.

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"A 2020 Vision for Food, Agriculture, and the Environment" is an initiative of the International Food Policy Research Institute (IFPRI) to develop a shared vision and consensus for action on how to meet future world food needs while reducing poverty and protecting the environment. Through the 2020 Vision initiative, IFPRI is bringing together divergent schools of thought on these issues, generating research, and identifying recommendations. The *2020 Briefs* present information on various aspects of the issues.