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FAOSTAT ANALYTICAL BRIEF 27

Inorganic fertilizers

1961–2019

HIGHLIGHTS

- **Global agricultural use of inorganic fertilizers has risen significantly between 1961 and 2019, from about 10 million to close to 110 million tonnes for nitrogen, from about 10 million to close to 45 million tonnes for phosphorus (as P₂O₅), and from less than 10 million to over 35 million tonnes for potassium (as K₂O).**
- **A few countries with a high share of the total dominate the global use. In the last decade, China represented almost 30 percent of the global agricultural use. The four largest consumers (Brazil, China, India and the United States of America) represented together almost 60 percent of the world total for nitrogen, and close to 65 percent for phosphorus and potassium.**
- **The expansion of inorganic fertilizers use since the 1960s has been stronger in Asia. In 1961–1964 it represented less than 20 percent of the world total, compared to over 50 percent of the total, for all three nutrients, in 2015–2019. In the last five years, however, Asia showed no growth overall in inorganic fertilizers use.**
- **In Africa, use of inorganic fertilizers is much lower than in Asia, the Americas or Europe, although it has expanded over time. In 2015–2019 Africa represented over 3.5 percent of global agricultural use for nitrogen and phosphorus, and over 2 percent for potassium.**

FAOSTAT INORGANIC FERTILIZERS

BACKGROUND

FAOSTAT provides statistics at country, regional and global level on the production, trade and agricultural use of inorganic (mineral or chemical) fertilizers, by nutrient and by product.

The nutrients covered are the three *primary nutrients*: nitrogen, phosphorus and potassium, which are used in large quantities by plants. Oxygen, carbon and hydrogen are also essential elements that plants use in large quantities, but plants obtain those directly from the air and water. Other nutrient categories are the *secondary nutrients* (calcium, magnesium and sulphur), which are required in smaller but still significant quantities, and the *micronutrients*, which are also essential but are required in very small quantities (FAO, 1984).

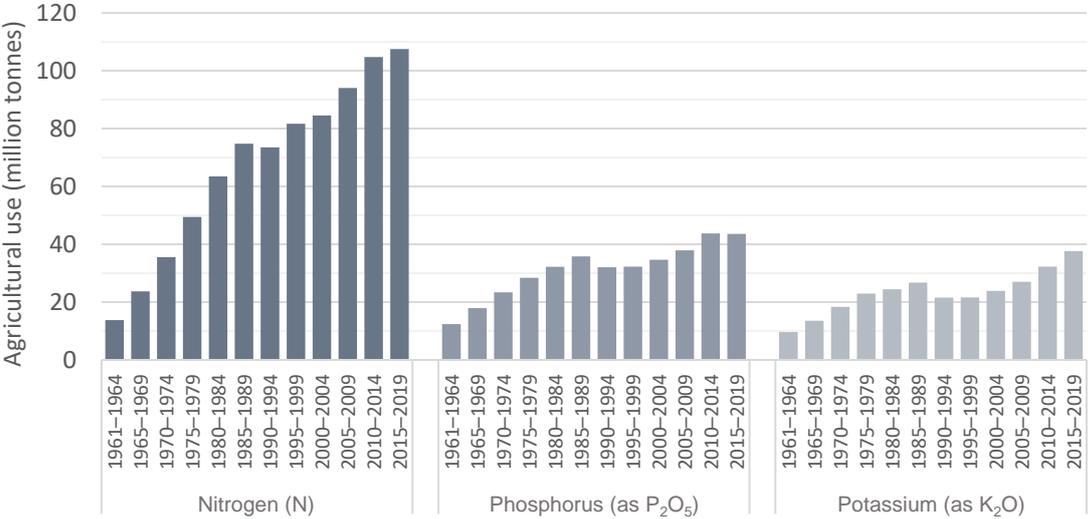
This brief provides estimates of agricultural use of inorganic fertilizers from 1961 to 2019, both globally and by major region (Africa, the Americas, Asia, Europe and Oceania). At country level, it presents the

top producers and top consumers and their share of the world total. The brief also provides maps with the country ratios of fertilizer use with respect to the area of cropland.

GLOBAL

Inorganic fertilizer use strongly increased between 1961 and 2019, particularly for nitrogen (Figure 1). World agricultural use of nitrogen (N) was about 10 million tonnes in 1961, rising to close to 110 million tonnes in 2019. For phosphorus (expressed as P₂O₅), the data show an increase from about 10 million tonnes in 1961 to close to 45 million in 2019, and for potassium (expressed as K₂O), from less than 10 to over 35 million tonnes. Cropland area also expanded during the 1961–2019 period, but at a much more limited pace, about 15 percent (FAO, 2021c).

Figure 1. World agricultural use of inorganic fertilizers (by nutrient, as N, P₂O₅ and K₂O)

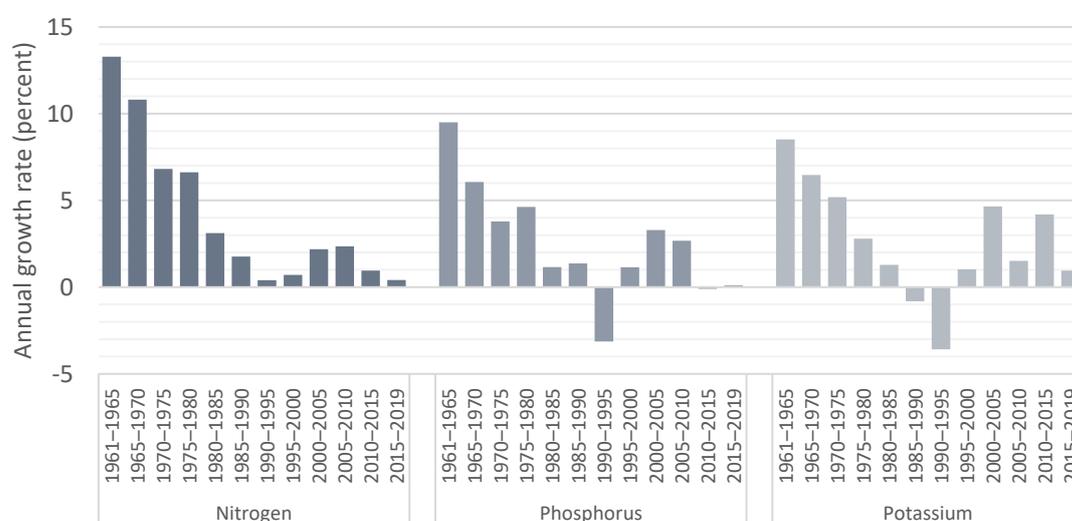


Source: FAO, 2021a.

The global growth rates¹ in use of inorganic fertilizers are shown in Figure 2, by nutrient. They were especially low around 1990–1994, led by a contraction in fertilizer use in Europe at the time of the dissolution of the former Union of Soviet Socialist Republics (USSR). The total growth rates have also been low in the last five years, 2015–2019, particularly influenced by Asia, which shows no growth overall in this period. Determining the exact level of growth at these low values is however limited by the data uncertainty. The International Fertilizer Association (IFA, 2021) provides estimates on fertilizer use, which are also considered in the quality control and the imputation of the Food and Agriculture Organization of the United Nations (FAO) data. The global values from IFA are close to the FAO estimates presented here, but they show for instance some growth in the agricultural use of phosphorus during the last decade.

¹ Annual growth rates calculated as geometric averages: $[(X_n / X_0)^{(1/n)} - 1] * 100$ (ESCAP, 2015).

Figure 2. Annual growth rate of agricultural use of inorganic fertilizers (by nutrient)



Source: FAO, 2021a.

REGIONAL

The expansion of the agricultural use of inorganic fertilizers during the last six decades has been stronger in **Asia**, as shown in Figures 3 and 4. Nitrogen consumption in this region represented less than 20 percent of the world total in 1961–1964, and it has risen to almost 60 percent in 2015–2019. For phosphorus, the share of the region has risen from close to 10 percent in 1961–1964 to over 55 percent of the world total in 2015–2019, and for potassium from less than 10 percent to over 50 percent. During the last five years, however, the estimates show no growth in the use of inorganic fertilizers (for about a decade in the case of nitrogen and potassium). This is driven mainly by the data for China, which during the last decade represented about 50 percent of the values for the region in all three nutrients.

Data for **Europe**, in contrast, showed a strong reduction in agricultural use levels around 1990–1994, the time of the dissolution of the former USSR.² Use of inorganic fertilizers in Europe remained quite flat overall since then, at about 14 million tonnes for N and about 4 million tonnes each for P₂O₅ and K₂O. These levels represent about 14 percent, 9 percent and 11 percent of the world total in 2015–2019 (for N, P₂O₅ and K₂O, respectively).

The **Americas** have remained, during most of the period 1961–2019, the region with the second highest levels of inorganic fertilizers use (with Europe initially in the first position and currently Asia). Growth in the Americas, however, has been less intense than in Asia, and in 2015–2019 use levels in the Americas were about 35 percent of those in Asia for nitrogen, about 50 percent for phosphorus, and about 65 percent for potassium.

² In FAOSTAT, Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan are classified in Asia, whereas the former USSR is classified entirely in Europe. This reallocation of areas explains most of the increase in cropland area for Asia around 1990 shown in Figure 3, and the corresponding decrease in Europe. However, this reallocation from Europe to Asia contributes very little to the reduction in fertilizer use observed for Europe at that time (the reallocation represents 5 percent or less of the decrease, for each nutrient).

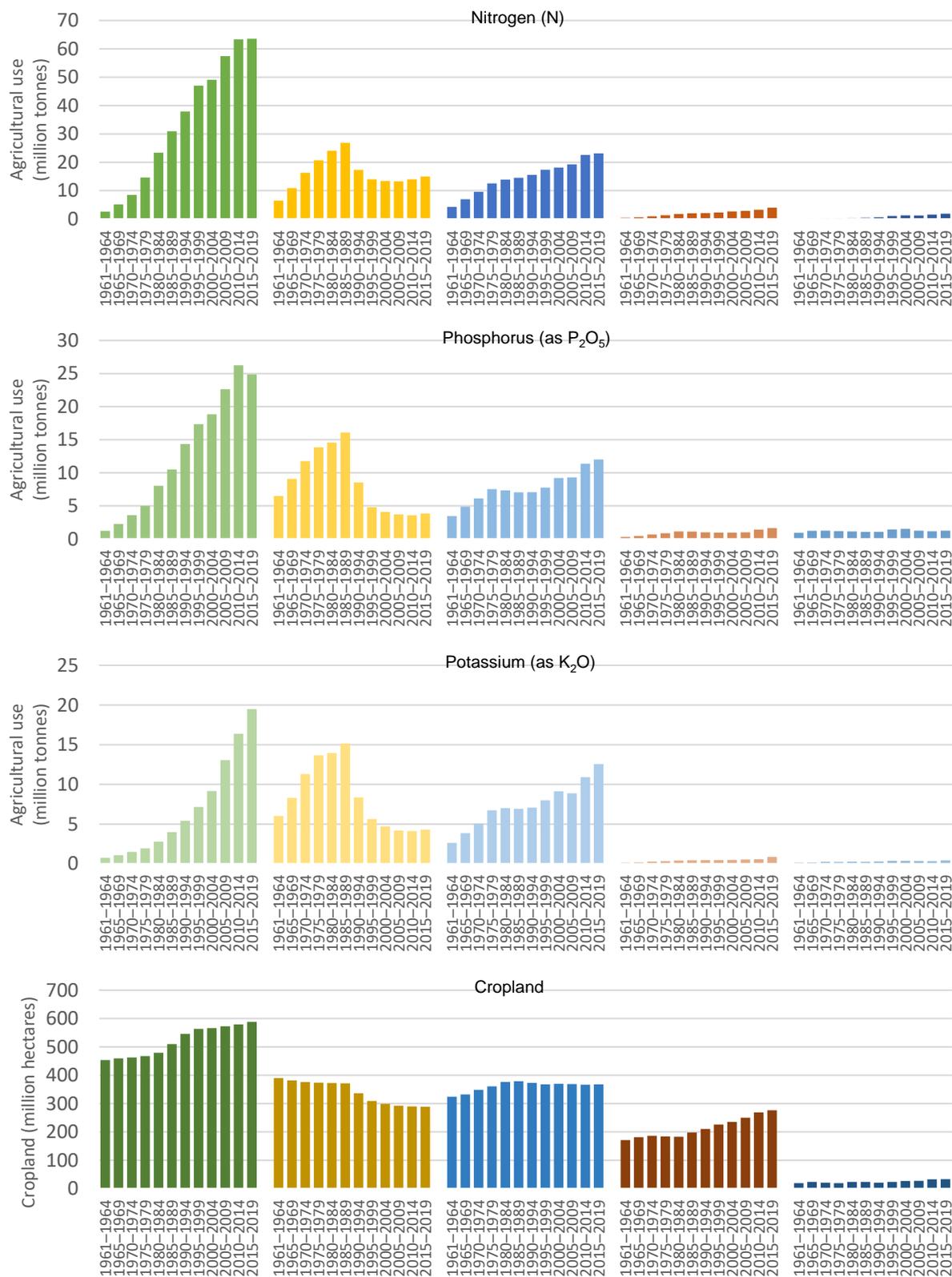
Africa represents a much lower share than Asia, the Americas or Europe in the global agricultural use of inorganic fertilizers. In 1961–1964, it represented about 3 percent of the world total for nitrogen, close to 2.5 percent for phosphorus, and slightly over 1 percent for potassium. However, fertilizer use has been rising in this region over time and Africa has increased its share in the three nutrients, reaching over 3.5 percent of the world total for nitrogen and phosphorus and over 2 percent for potassium in 2015–2019.

Oceania in 1961–1964 represented less than 0.5 percent of the global use of inorganic fertilizers in terms of nitrogen and less than 1.5 percent in terms of potassium. For phosphorus, in contrast, data show a much higher share at the time, about 7.5 percent of the world total. The levels of phosphorus use have remained quite stable over time, but this implied a decline of the global share, to below 3 percent of global agricultural use in 2015–2019. The share for nitrogen has risen instead, to over 1.5 percent of the world total in 2015–2019. For potassium, use levels have increased slightly but the global share declined, although remaining over 1 percent in 2015–2019.

Figure 3 also shows the area of **cropland** for these five regions. Cropland is the sum of arable land (temporary crops, temporary meadows and pastures, and land with temporary fallow) and permanent crops. In Figure 3, the level of fertilizer use in each region can be compared with the extension of cropland, and it can be observed, for instance, that at present the share of global fertilizer use in Asia is higher than its cropland share, whereas fertilizer use in Africa is much lower than its global cropland share.



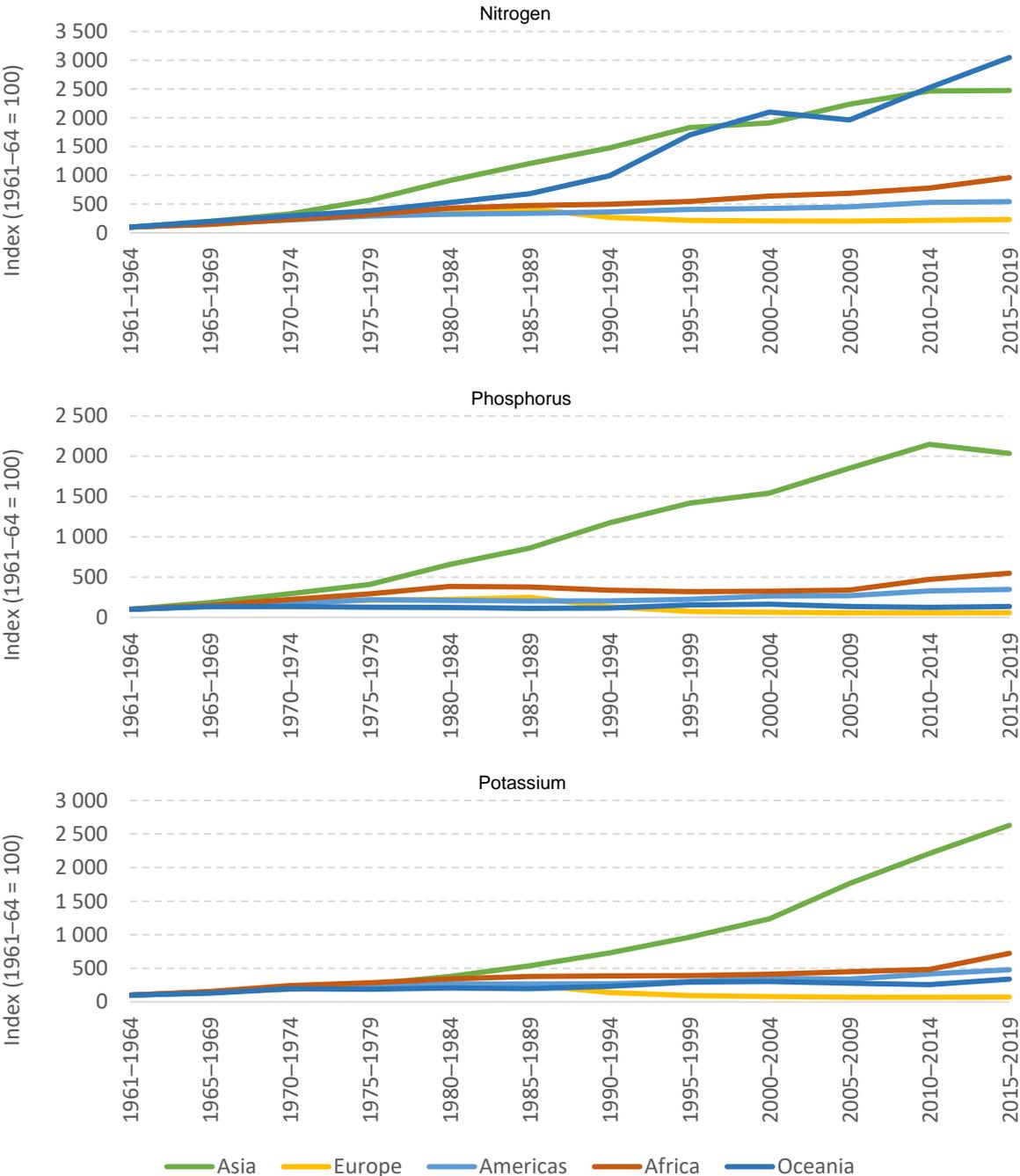
Figure 3. Fertilizer use (N, P₂O₅ and K₂O) and cropland area, by region



Source: FAO, 2021a and 2021b.

Figure 4 shows the evolution by region of each nutrient as an index, with the same starting point (average use in 1961–64 as 100). Africa, with much lower starting levels, shows a higher growth in relative terms than Europe and the Americas, up to 2019. This growth strengthens in the last decade. Similarly, Oceania shows a strong growth in use of nitrogen in relative terms. This is led by Australia (which represented 75 percent of nitrogen use in the region in 2015-2019) and to a lesser extent by New Zealand (which represented 24 percent of the regional total in the same period).

Figure 4. Agricultural use of inorganic fertilizers by region (as index, 100 = 1961–64 average)



Source: FAO, 2021a.

COUNTRIES

A few countries representing a high share of the total dominate the profiles observed in Figures 1 to 4. Figure 5 shows that, for all three nutrients and for both production and agricultural use, the top seven countries represent at least 60 percent of the world total.

At present, China, India, the Russian Federation and the United States of America are the largest producers of inorganic fertilizers for nitrogen and phosphorus (representing together close to 60 percent and over 65 percent of the world total, respectively). Canada, the Russian Federation and Belarus are the largest producers for potassium (they represent together over 60 percent of the world total).

Regarding agricultural use, Brazil, China, India and the United States of America are the largest consumers of inorganic fertilizers, representing almost 60 percent of the world total for nitrogen and almost 65 percent for phosphorus and potassium.

The difference between production and use in their distribution by countries provides an indication of the magnitude of trade. In Figure 5 these differences are the largest for potassium, and indeed potassium is the nutrient with the highest share of trade over total agricultural use. Data on production, agricultural use and trade by country are available in the 'Fertilizers by Nutrient' domain in FAOSTAT (FAO, 2021a).

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