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INTERNATIONAL FERTILIZER ASSOCIATION

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Summary Report
Medium-Term Fertilizer Outlook 2024 – 2028

IFA Market Intelligence Service

This report is a summary of IFA's Medium-Term Outlook, prepared by the Market Intelligence Service to accompany IFA's Medium-Term Outlook Presentation, which is available to IFA members.

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Notes and definitions:

- ✓ All volume data presented in this report is expressed in nutrient metric tonnes unless stated otherwise. Nutrient tonnes reflect the N, P_2O_5 and K_2O content of nitrogen, phosphate and potash fertilizers respectively, rather than the physical weight of the product being used (product tonnes).
- ✓ The terms nitrogen, phosphate and potash are used to denote groups of nutrient-bearing fertilizers which are produced and traded globally. The terms nitrogen, phosphorous and potassium refer to the nutrients required by plants.
- ✓ Annual periods refer to the calendar year unless stated otherwise, and when FY precedes a year, it refers to the Fertilizer Year. The reference period used to report fertilizer consumption varies depending on the country. Countries report fertilizer consumption statistics in 12-month periods that start either in January or in another month.
- ✓ In this report, "fertilizer year" (FY) refers to all 12-month periods. FY 2022 refers to the year starting in January 2022 for most countries in Latin America, Africa, East and Southeast Asia and EECA. For other regions including North America, WCE and South Asia, FY 2022 started in Q2 or mid-2022 and will end in Q2 or mid-2023. Fertilizer years do not always match crop marketing years used to report statistics on crop area, yield and production.

BACKDROP TO THE FERTILIZER OUTLOOK

The fertilizer markets stabilized in 2023 and H1 2024, despite continued global disruption across commodity markets. Fertilizers remain exposed to global risks spanning geopolitics, conflict, economics and climate. Macroeconomic drivers remain highly influential as inflation and high interest rates have reduced borrowing power for producers and consumers alike. However, fertilizer affordability was much improved in H1 2024 compared to the previous 18 months. This trend supported a recovery in fertilizer consumption in FY 2023 after two years of decline, which was particularly felt for phosphate and potash fertilizers.

High profile disruptions in global trade and shipping continued in early 2024, from changing export routes out of Russia and Belarus to events in the Red Sea and low water levels in the Panama Canal, all of which made it harder to ship fertilizers around the world. These issues have been mostly overcome, although risk and insurance costs remain major factors for traders to consider. Decarbonization trends continue with investment activity in low-carbon ammonia. However, as outlined later in this report, delays have occurred in projects working towards financing, or relying on government support to be detailed or implemented.

A year of potential political change is playing out in 2024, with almost 2 billion people in more than 70 countries due to vote in national elections (based on recent voter turnout). Many topics will be on the table in these elections, several of which will have implications for fertilizers such as positions on foreign policy, food security, agricultural subsidies and decarbonization.

SUPPLY FORECAST

Fertilizer supply increased across the board in 2023, to varying degrees. Nitrogen production volumes broke away from recent trends to reach record levels in 2023, while phosphate and potash output partially recovered from the challenging events of 2022.

Global ammonia output is estimated to have reached 185.6 Mt in 2023, up by 2% compared to 2022. Urea production is estimated to have increased significantly to reach 195.5 Mt in 2023, up by 6% compared to 2022

Higher production levels were observed in countries that have recently witnessed a cycle of investments in new capacity, notably in China, India, Africa (Egypt and Nigeria), the US and Russia. Despite improved affordability of natural gas feedstock, European production remained constrained and ammonia output fell by 2% in 2023 compared to 2022. In Central Europe, urea production fell by 26% in 2023 compared to 2022. Despite the reactivation of ammonia output in Venezuela, production fell by 11% in Latin America due to gas supply issues and stoppages elsewhere. Natural gas supply issues also occurred in Trinidad, Egypt, Turkey, Mexico, Brunei, Bangladesh and Pakistan.

Russian nitrogen production rebounded strongly in 2023 as export routes were reopened and sanctions clarified. However, ammonia trade remains disrupted due to the continued closure of the pipeline connecting Russian producers to the Black Sea. Investment is underway to construct alternative terminals at the Baltic and Taman Seas, but ammonia exports from Russia remain dramatically lower than normal levels, totaling 0.5 Mt in 2023, down almost 70% from 1.8 Mt in 2022 and 4.6 Mt in 2021. This was not fully offset by higher exports from West Asia and North America, and global ammonia trade is estimated to have fallen by 8% in 2023.

Phosphoric acid production is estimated to have increased by 1% to 85 Mt in 2023 while total MAP+DAP production is estimated to have increased by 3% year-on-year to 64.3 Mt. Despite the partial recovery, global MAP+DAP output did not return to 2020 levels following three years of decline. Lower output levels in Africa (Morocco) were offset by higher production in China and West Asia (Saudi Arabia, Jordan, Iraq). The growth in MAP+DAP production in China in 2023 was underpinned by capacity

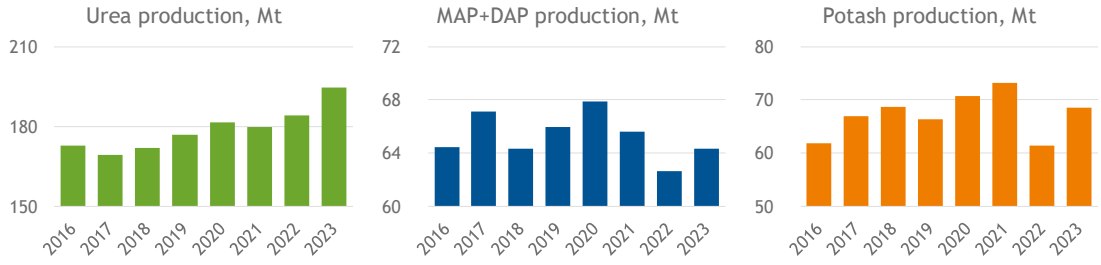
changes, with new plants commissioning while older and idle plants permanently closed – resulting in operational plants working harder to meet recovering demand in 2023.

Global potassium (MOP) production is estimated to have risen by 13% to 69.3 Mt in 2023. The EECA region was the largest driver behind this recovery due to higher output from Belarus and Russia. Furthermore, MOP production in Laos grew by 67% in 2023 vs 2022, enough to offset China's domestic production decline.

MOP exports from Belarus recovered by 82% in 2023 to 8.2 Mt, having plummeted in 2022 on the back of western sanctions. A further 1.3 Mt could be potentially stored at Russian ports if overland routes are taken into account, however exact destination markets could not be traced in IFA's analysis.

New routes to export markets were found in 2023, replacing lost volumes through the previous route via Lithuania that the bulk of Belarusian MOP exports previously took. Belarus has increased exports to China by rail and to seaborne markets via Russian ports. Major port investment is taking place at the Russian port of Murmansk, which has been cited as a potential future route for Belarusian exports.

N supply broke away in 2023 while P and K partially recovered



Source: IFA

Capacity forecasts show regional investment hubs across N, P and K

IFA's forecasts of capability (the measure of theoretical supply based on typical maximum operating rates) begin with announced capacity increases. The fertilizer capacity investment cycle has changed in two main ways:

1. Lower fertilizer prices have weakened the investment case to fund new capacity;
2. The industry is becoming more sustainable, underpinned by the energy transition, which raises project costs.

Nitrogen capacity investment remains driven by access to feedstocks and their competitive position. Most of the expected nitrogen capacity investments in the next five years are located in low-cost regions with abundant natural gas resources such as Russia, and in countries with strong support for decarbonization activities, such as the US where the Inflation Reduction Act (IRA) has spurred a wave of investments in ammonia capacity with carbon capture, utilization and storage (CCUS).

China continues to operate a major portion of its nitrogen industry using coal as feedstock. Efficiency improvements and technology upgrades have been the focus in China rather than switching feedstock from coal to natural gas or renewable sources.

Global ammonia capacity is forecast to grow by 8% from 192 Mt N to 207 Mt N between 2023 and 2028. Central Europe aside, capacity additions are expected in all regions, notably in China (+4%), India (+4%) West Asia (+14%), Africa (+11%) and EECA (+11%). The US is also expected to significantly grow its ammonia capacity

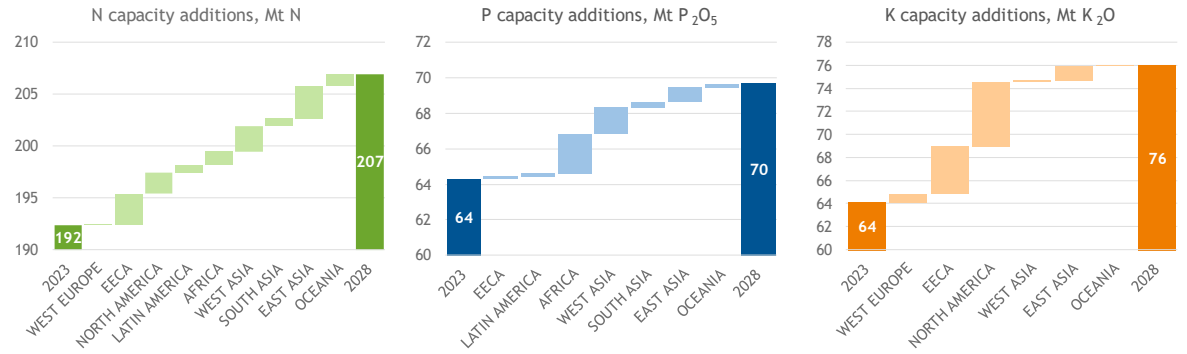
(+11%) in the next five years on the back of tax credits introduced as part of the IRA in 2022.

Electrolysis-based (green) ammonia capacity continues to be pursued by many investors, but successful commissioning of projects is expected to remain marginal in the next five years. IFA forecasts 2.8 Mt N of green ammonia capacity to commission by 2028, equivalent to 1% of global ammonia capacity. Much larger volumes of green ammonia capacity are expected to commission beyond the next five years, with close to 120 Mt N being tracked by IFA as under consideration and working towards final investment decisions.

Phosphoric acid capacity is forecast to increase by 10% between 2023 and 2028, reaching 70.6 Mt P_2O_5 globally by the end of the next five years. The most significant capacity growth is projected in 2026 and 2027, resulting from sizeable investments already underway. Capacity additions are mainly expected to come from existing producers in Morocco and Saudi Arabia while smaller additional capacities are also expected in India, Brazil and Egypt.

Potash capacity is projected to grow by 19% to 76 Mt K_2O in 2028 compared to 2023. Both Laos and Russia are forecast to be the major contributors to this growth until 2026. A second wave of new capacity is expected from 2027, with new mine investments expected to begin production in Canada, Russia and Belarus.

N, P and K capacity additions are forecast to total more than 35 Mt nutrient in the next five years



Source: IFA

Capability will be driven by new capacity start-ups and recovering output in sanctioned countries

Ammonia capability is forecast to increase from 162.7 Mt N in 2023 and 165.9 Mt N in 2024 to 177.8 Mt N in 2028 (+9% over the period), averaging 1.5% growth per year. Capability growth will be driven by new capacity additions in EECA (Russia and Uzbekistan), the US, Africa (Egypt and Nigeria), West Asia (Iran, Qatar, Saudi Arabia), India, China and Australia. With total ammonia capability forecast to grow at a slightly faster pace than demand over the next five years, the nitrogen balance is expected to loosen from a theoretically available surplus of 3.6 Mt N in 2024 to 5.9 Mt N in 2027, before receding slightly in 2028 to 5.1 Mt N. IFA's nitrogen demand forecasts include conventional industrial nitrogen uses but do not yet include new low-carbon ammonia demand likely to emerge from uses including power generation, hydrogen carriers and maritime fuels.

Phosphoric acid capability is forecast to increase from 54.3 Mt P_2O_5 in 2023 to 60.3 Mt P_2O_5 in 2028, an 11% growth rate. Both Africa and West Asia remain the main drivers of this growth. After being relatively tighter in 2021, the phosphate balance has loosened since then and is forecast to be better balanced in the next five years. The phosphate theoretically

available surplus is projected to remain at 14% of supply capability in 2028 vs the same % in 2023. Slowing phosphate demand growth and a lack of any sizeable projects outside of existing suppliers drives a stable phosphate balance in the coming years. IFA's demand forecast does not include widespread roll out of phosphate use in lithium iron phosphate (LFP) batteries in the next five years outside of China.

Potash capability is forecast to increase from 52.1 Mt K_2O in 2023 to 58.9 Mt K_2O in 2028, a 13% growth rate. This is primally driven by capacity expansions by existing producers in Laos and Russia, and new sizeable project expected in Canada and Russia. Higher output levels are forecast to be maintained in Belarus, in line with its recovered export capability. With theoretically available supply growing at a faster pace than demand, the potash balance is expected to loosen in 2028 showing a surplus of 9.1 Mt K_2O, up from 8.6 Mt K_2O in 2023.

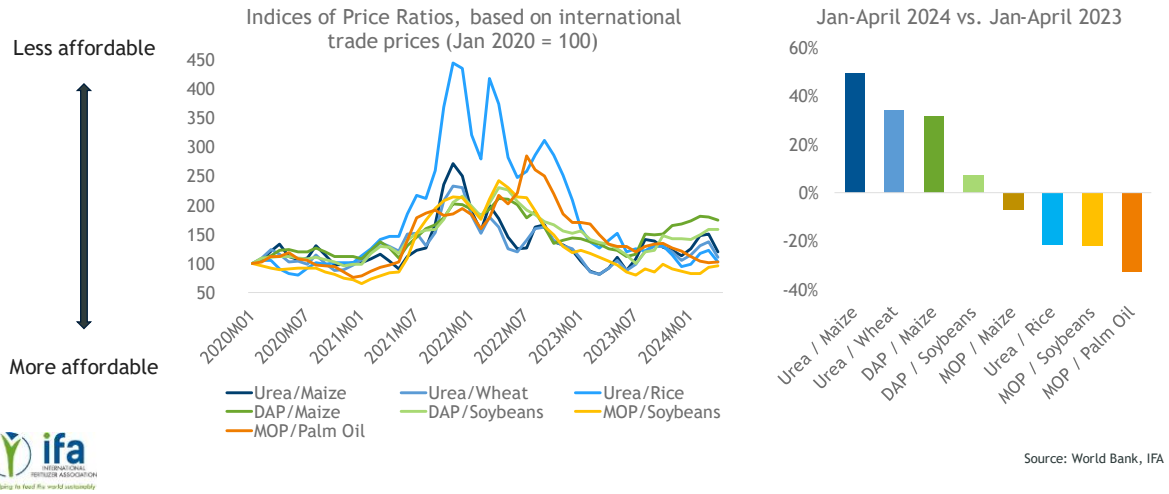
FERTILIZER CONSUMPTION FORECAST

IFA's methodology to prepare global fertilizer demand outlooks is based on a survey of ~50 country experts, representing around 90% of global fertilizer consumption. The results of this survey are complemented with agricultural and trade data, as well as latest market information.

Global fertilizer use recovers and exceeds FY 2020 level

After declining for two consecutive years, global fertilizer use (N + P_2O_5 + K_2O) is forecast to increase by 4% in FY 2023 and by 3% in FY 2024. Consumption is forecast to reach 203.7 Mt nutrients in FY 2024, slightly above the previous record reached in FY 2020. This recovery can be primarily explained by improved affordability on the back of falling fertilizer prices since their peak in May 2022. Fertilizer affordability improved considerably for grains (excluding rice) and oil crops in the second half of 2022 and in the first half of 2023, before stabilizing in the second half of the year. In the first quarter of 2024 the affordability of N and P_2O_5 fertilizers for grain production was poorer than in early 2023, but the affordability of K_2O fertilizers remained better, particularly for oil crops.

Potash fertilizers are more affordable than last year, particularly for oil crops



Source: World Bank, IFA

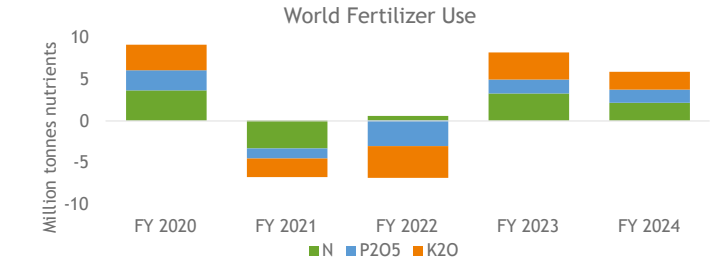
While the global picture shows improved fertilizer affordability, international prices do not always reflect prices paid by farmers due to exchange rate fluctuations, transport costs, and domestic regulations. In addition, interest rates remain high in many countries, affecting farmers' financial health and their ability to procure inputs.

The recovery in global fertilizer use is expected to take place against a strong El Niño event between mid-2023 and April 2024. This climate pattern significantly affected 2023/24 crops in the southern hemisphere, including those being harvested in the first half of 2024. Severely dry weather damaged grains and oil crops in the center west of Brazil and southern Africa, and rice crops and palm oil plantations in Southeast Asia. El Niño also brought welcome rains to Argentina and the south of Brazil. In the northern hemisphere, spring conditions for winter crops and new sowings were overall favorable in the second quarter of 2024, but the situation remained mixed in northern Europe.

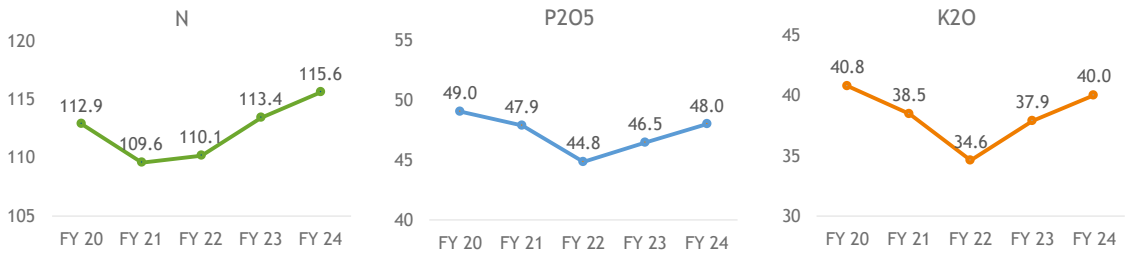
Preliminary USDA forecasts (as of May 2024) indicated stable grains area in 2024/25 with a small expansion in rice area offset by a contraction in maize area. By contrast, soybean area is forecast to expand for the fourth consecutive year. As a result, the stocks-to-use ratio for soybeans is expected to improve, while that of maize is expected to tighten. As of late May 2024, the probability of a La Niña event was increasing for the second half of 2024, only a year after a triple La Niña concluded.

The fall and subsequent recovery in global fertilizer use has not been equally shared between the three major nutrients. K_2O use fell by 6.2 Mt (-15%) between FY 2020 and FY 2021, followed by P_2O_5 by 4.2 Mt (-9%) and N by 2.7 Mt (-2%). The recovery is expected to be driven by N increasing by 5.5 Mt (+5%), K_2O by 5.4 Mt (+16%), and P_2O_5 by 3.3 Mt (+7%). As a result, by FY 2024, N consumption should be 2% above its FY 2020 level, whereas consumption of P_2O_5 and K_2O is expected to remain 2% lower.

N and K_2O drive up global fertilizer use in FY 2023 and FY 2024



FY 2024 vs FY 2020	
N	+2.4%
P_2O_5	-2.1%
K_2O	-1.8%
Total	+0.5%



Source: IFA, May 2024

Latin America and East Asia drive growth while WCE and South Asia slow

Over the four years separating the two peaks in global fertilizer use, Latin America and East Asia are each expected to add over 2 Mt nutrients to their respective consumption. In contrast, West and Central Europe and South Asia are forecast to contract their fertilizer use by 2 Mt and 1.1 Mt respectively. Among smaller consuming

regions, Africa is forecast to expand its fertilizer use by 0.5 Mt, but Oceania and EECA are expected to contract by 0.6 Mt and 0.4 Mt, respectively. North America and West Asia are forecast to increase consumption by less than 200 kt nutrients each. K_2O drives the growth in Latin America and the decrease in South Asia, and N accounts for most of the consumption gains in East Asia. In WCE consumption of all three nutrients is expected to decline.

Latin America: partial recovery in fertilizer use in FY 23 despite El Niño

The expected 8% increase in fertilizer use in Latin America between FY 2020 and FY 2024 (including a 15% drop in FY 2022), mostly reflects increased agricultural production. Between crop years 2020/21 and 2024/25, soybean production in South America is expected to grow by 18% and maize production by 25%, driven largely by area expansion. In Brazil, the largest fertilizer market in the region, area planted with soybeans, sugarcane and cotton increased in 2023/24. In Argentina, a strong rebound in crop area and yields is expected after three successive La Niña events. In Mexico, government support for fertilizers (urea and DAP) significantly increased in recent years, offsetting some of the impact of higher international fertilizer prices.

China: partial rebound in N use

China accounted for 24% of global fertilizer use in FY 2023, and 75% of consumption in East Asia and has recently experienced a trend reversal in its fertilizer use. N use in China decreased steadily between FY 2014 and FY 2021, with an average rate of -4%, driven by domestic policies to reduce overapplication. However, since FY 2021 consumption has returned to growth on the back of a renewed domestic food security focus and government-implemented agricultural subsidies.

After dropping in FY 2021, K_2O consumption in China has also rebounded, supported by improved affordability and continued growth in fruits and vegetable production. In parallel, the Chinese government continues to push for improved efficiency of fertilizers.

India: stronger government support for N and P_2O_5 leaves K_2O consumption behind in the short term

South Asia reduced its fertilizer use between FY 2020 and FY 2024, driven by India which accounts for 80% of regional fertilizer use. The reduction was predominantly due to lower K_2O consumption. Since 2022, the Indian government increased its support for P_2O_5 fertilizers through Nutrient Based Subsidies to offset some of the rise in international prices. It also continued to subsidize urea at a fixed Maximum Retail Price, well below international levels. Support for K_2O fertilizers saw minimal additional support in comparison. As a result, consumption of both N and P_2O_5 is expected to return to FY 2020 levels by FY 2024, but K_2O consumption is expected to remain lower.

WCE: consumption not recovering completely

West & Central Europe is expected to reduce its fertilizer use by 12% or 2 Mt nutrients between FY 2020 and FY 2024. Consumption of P_2O_5 and K_2O is particularly affected, with respective drops of 17% (0.5 Mt) and 22% (0.7 Mt). Consumption of N is expected to decrease by only 7% (0.8 Mt). Many WCE farmers prioritized applications of N to maintain their yields but decreased their application of P_2O_5 and K. Farmers in WCE have been facing difficult circumstances in recent years: in addition to high input prices, weather patterns have been volatile, with either too much rain (Northern Europe) or too little (Southern Europe). A severe drought in 2022 was followed by uneven weather in 2023 and a wet start to 2024. In addition, regulations on the use of N fertilizers have recently been implemented in some top consuming countries and are under discussion in others. The expansion of organic crop area also continues to reduce mineral fertilizer use.

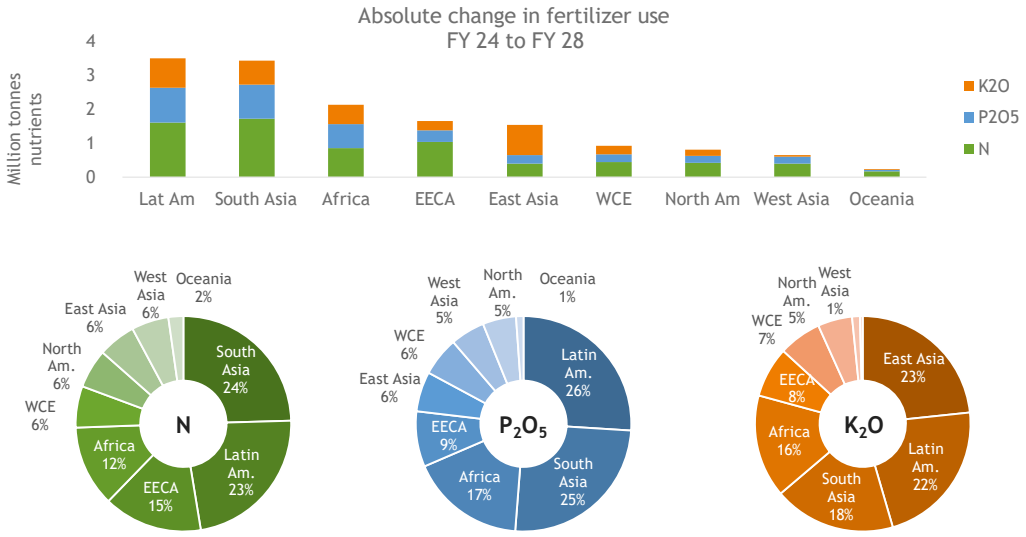
FY 2024 to FY 2028: slowing growth in global fertilizer use, particularly for N

Global fertilizer use is expected to continue expanding in the medium-term, but at a rate

decreasing from 2.2% in FY 2025 to 1.5% in FY 2028. This is consistent with expectations of improved nutrient use efficiency and slowing growth in food production, reflecting slowing population growth.

Consumption of P_2O_5 and K_2O is expected to grow faster than N consumption over the medium-term. Between FY 2024 and FY 2028, consumption growth is forecast at 10% for K_2O compared to 8% for P_2O_5 and 6% for N.

Latin America and South Asia drive growth in N and P consumption



Source: IFA, May 2024

Southern regions are driving medium-term growth in fertilizer use

Latin America and South Asia are expected to be the main engines of global growth in the medium term, adding between 3 and 4 Mt nutrients each between FY 2024 and FY 2028. East Asia is expected to expand by only 2% over these 4 years, but this translates into an additional 1.5 Mt nutrients due to its large market size.

Mature markets such as North America and WCE are expected to grow very little, adding respectively 0.8 and 0.9 Mt to global consumption. Among smaller but more dynamic markets, Africa is forecast to grow the fastest, expanding by 25% or 2 Mt in the next five years.

EECA is forecast to grow consumption by 1.7 Mt (+15%), driven by the recovering agricultural sector in Ukraine.

About half of the additional quantities of N and P_2O_5 consumed between FY 2024 and FY 2028 are expected to be represented by Latin American and South Asian countries. For K_2O, East Asia and Latin America are forecast to account for almost half of the additional quantities, with South Asia ranking third. Africa ranks third in terms of its overall contribution to additional quantities of fertilizers consumed between FY 2024 and FY 2028 (14%), behind Latin America (24%) and South Asia (23%). This is noteworthy given Africa's current small market share (4% in FY 2024).

An important assumption: continuation of government support

IFA's demand outlook assumes continued government support for fertilizer purchases in the countries that already benefit from it.

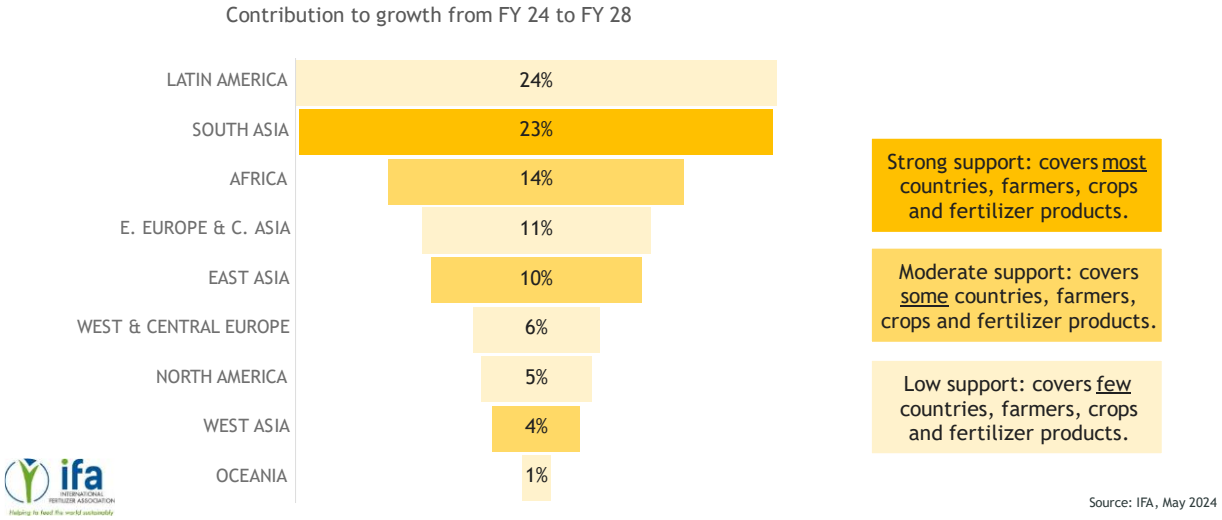
In many countries, farmers benefit from government support to procure fertilizers, often on food security grounds. This support can take various forms, including subsidized prices, distribution of free fertilizers, or restriction of fertilizer exports to limit local price increases.

The targets of this support also vary depending on the country: either all farmers and all crops, or select farmer groups (often smallholders) and specific crops (often cereals). Finally, government support for fertilizers can be relatively permanent, such as in India, or temporary based on short-term conditions.

South Asia is the second largest contributor to global fertilizer consumption growth over the medium term, accounting for almost a quarter of it. But it is also the region where farmers receive the strongest government support for fertilizer procurement. In India, all of the major products are subsidized, with a Maximum Retail Price for urea and Nutrient Based Subsidies for many other products. No farmers or crop types are excluded from this subsidy system. Government support to fertilizer purchases is very stable in South Asia, which means that farmers rely on it year after year.

There are other regions where farmers benefit from government support for fertilizer purchases: in particular Africa, West Asia and East Asia. But support in these regions usually covers fewer products or farmers, is less stable over time, and has a varying budget.

An important assumption: continuation of government support



A major risk: weather variability and extreme weather events

A major uncertainty weighing on this fertilizer demand outlook is weather variability, which is an increasing concern for farmers. The intensity of extreme weather events around the globe has increased in recent years. Not all extreme weather events have an impact on agriculture, and when they do, they do not always affect fertilizer use. The impact of extreme weather events on fertilizer use depends on many factors, including the crop area affected, the types of crops grown at that time, the production system, the stage of production, and the intensity of the weather event. As a result, the impact of extreme weather events on fertilizer use can be felt at the local, national or regional level. Moreover, the impact of extreme weather events on fertilizer use can be two-fold: if agricultural production is reduced, the resulting loss of income for farmers can affect input purchases in the following year.

Examples of recent extreme weather events having affected fertilizer use include the 2022 flood in Pakistan, which prevented mid and late season applications, the la Niña-driven 2023 drought in Argentina that prevented crop planting, and El Niño-caused dryness in Indonesia, which led to lower fertilizer applications on palm trees.

Comparisons to earlier demand outlooks

The decline in fertilizer use expected in FY 2021 and FY 2022 is smaller than expected in IFA's

November 2024 Short-Term Fertilizer Outlook, partly due to strong government support and the trend reversal in N consumption in China. The recovery in FY 2023 and FY 2024 is now expected to be stronger than previously forecast due to improved fertilizer affordability.

Global fertilizer use is still forecast to experience slowing growth in the medium-term, but this outlook has stronger growth rates than in IFA's previous medium-term outlook, published in June 2023.

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