CHAPTER 4

The Role of Fertilizer Trade in Enhancing Food Security in Africa

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1. Introduction

A comprehensive approach to understanding the relationship between food security and trade must include the trade and accessibility of agricultural inputs. Fertilizers (organic and mineral) are crucial for delivering essential nutrients to crops, significantly boosting agricultural productivity and, in turn, enhancing food security. Increased fertilizer use can help make food more available and affordable by generating higher crop yields, lowering farmers' production costs, and increasing supply. In addition, by achieving higher crop yields on the same land area, fertilizers can reduce the need to expand agricultural land, helping to prevent deforestation.

Fertilizer application rates in Africa are among the lowest in the world. In 2018, sub-Saharan Africa averaged a fertilizer application rate of just 22.3 kilograms per hectare (kg/ha), significantly lower than the global average of 139 kg/ha (Odjo et al. 2024). This low level explains the region's markedly lower crop yields, especially for cereals, whose yields are estimated to be only 40 percent of global averages (FAO 2025a). Gains in agricultural production in sub-Saharan Africa have primarily come from expanding cropland rather than improvements in productivity.[1] The critical need to boost fertilizer use in Africa is acknowledged in continentwide initiatives. For example, the target fertilizer application rate in the 10-year African Fertilizer and Soil Health Action Plan unveiled at the 2024 Summit in Kenya is 54 kg/ha by 2034.

While there is consensus on the need to increase fertilizer use in Africa, the continent still relies heavily on imports, especially for nitrogen and potash, raising serious concerns, despite increasing nitrogen production in countries like Nigeria. Global fertilizer markets are highly concentrated, with the majority of exports supplied by a limited number of countries. For example, the top three exporters supply 57 percent and 80 percent of the global trade of potash and phosphates, respectively (Hebebrand and Laborde 2022), putting the continent at risk of price spikes and supply disruptions, as occurred when the Russia–Ukraine war began in 2022. With the implication of Belarus, the conflict region involved three of the largest players in global fertilizer markets. Overall, more than one-half of African countries import fertilizer from either Russia or Ukraine, with countries such as Benin, Nigeria, and the Central African Republic showing import dependency ratios above 45 percent (Laborde, Matchaya, and Traoré 2023).

Africa's high dependence on fertilizer imports and the highly concentrated nature of world fertilizer markets raise the question of the continent's vulnerability to external shocks and the strategies needed to cope with the associated risks. Indeed, the negative impacts registered in the wake of the Russia–Ukraine crisis pushed many analysts and policymakers to consider boosting intra-African trade in fertilizer as a diversification mechanism and risk-coping strategy. Both the 2024 Nairobi Declaration, which followed the Africa Fertilizer and Soil Health Summit, and the associated 10-year Action Plan advocate for the promotion of regional trade and emphasize the use of the African Continental Free Trade Area (AfCFTA) to double intra-Africa fertilizer trade by 2034.

Against this background, this chapter analyzes the role of fertilizer trade in enhancing food security in Africa. This timely, specialized topic is embedded in the broader question of trade and food security, which constitutes the common thread of this report. The complex links between fertilizer trade and food security are examined in the context of increased global crises, shifting regional dynamics, and climate change. The latter is of utmost importance as Africa is highly subject to rising temperatures, extreme weather events, plant diseases, and rainfall variability, all of which seriously threaten agricultural production, requiring more and better use of fertilizers.

1 See Chapter 3 of this report for an illustration with rice.

The chapter is organized as follows. Section 2 presents an overview of the supply side of Africa's fertilizer sector. Section 3 analyzes trade flows in fertilizers and the associated policies. Section 4 summarizes the main findings and concludes with some policy recommendations.

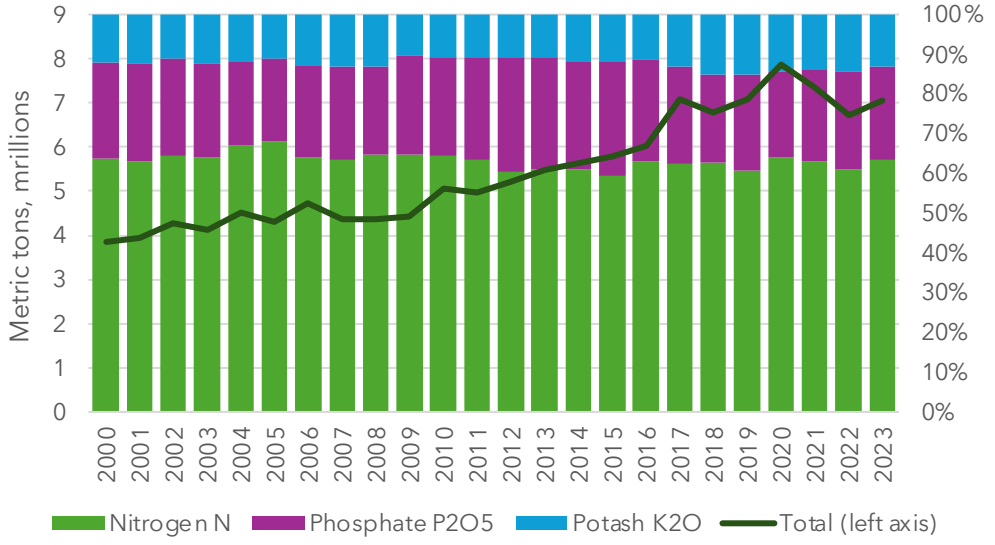
2. Overview of Fertilizers in Africa

Fertilizers are crucial for maintaining soil fertility, improving agricultural productivity, and ensuring food security. This section examines recent trends and regional patterns in inorganic and organic fertilizer consumption and production in Africa.

Inorganic fertilizer use in African agriculture

The use of inorganic fertilizers in agriculture has significantly increased since 2000, with slight decreases in more recent years (Figure 4.1). The combined amount of the three main nutrients (nitrogen, phosphate, and potash) used doubled between 2000 (3.9 million nutrient tons) and 2020 (7.9 million nutrient tons). The total fell 14 percent in 2022 (to 6.7 million nutrient tons) before recovering somewhat in 2023 (to 7 million nutrient tons). Nitrogen-based fertilizer products are the most applied, with nitrogen (N) representing 63 percent of the total nutrient content in inorganic fertilizers used across the continent. The most common nitrogen-based fertilizer products include urea (the most widely used), ammonium nitrate, and ammonium sulfate. Phosphate accounted for 23 percent of the nutrient content of all inorganic fertilizers used between 2019 and 2023, while potash contributed 14 percent. Rock phosphate, single superphosphate, and triple superphosphate are the most widely used phosphate-based fertilizer products. Potassium chloride, also known as muriate of potash, dominates the potash-based fertilizer products used. Nitrogen-phosphorus-potassium (NPK) blends, diammonium phosphate (DAP), monoammonium phosphate (MAP), and calcium ammonium nitrate are the most commonly used compound fertilizer products in African agriculture.

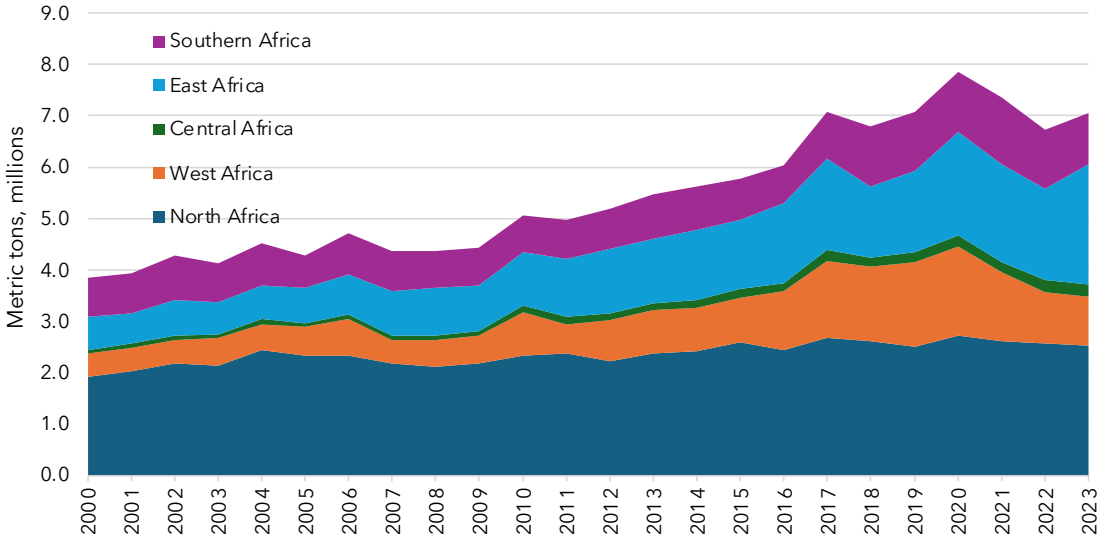
Figure 4.1 Africa's agricultural use of fertilizers by nutrient content, million nutrient tons, 2000–2023



Source: Authors based on FAOSTAT online database, accessed October 2025.

Regional disparities arise in the use of fertilizers (Figure 4.2). North Africa dominates the use of inorganic fertilizers in agriculture, representing 36 percent of the continent's fertilizer consumption over 2019–2023, down from 50 percent in 2000 and 46 percent over 2009–2013. This reduction is mainly due to the larger increase in fertilizer use in West Africa and East Africa. East Africa is the second-largest user; its share trended upward from 17 percent in 2000 to 33 percent in 2023. Over 2019–2023, West Africa and Southern Africa accounted for 19 percent and 16 percent, respectively, of fertilizer use in African agriculture, while Central Africa represented only 3 percent. West Africa's share is trending upward, in contrast to Southern Africa's.

Figure 4.2 Africa's agricultural use of inorganic fertilizers by region, 2000–2023



Source: Authors based on FAOSTAT online database, accessed October 2025.

Figure 4.3 displays the leading fertilizer users within each region. Inorganic fertilizer consumption is concentrated in a few countries (left panel). Egypt, South Africa, Ethiopia, Nigeria, and Morocco accounted for 60 percent of the continent's consumption of inorganic fertilizers on average for the 2019–2023 period. These five countries, along with Kenya, Zambia, Tanzania, Malawi, and Ghana, are the top 10 fertilizer users, accounting for 76 percent of total consumption.

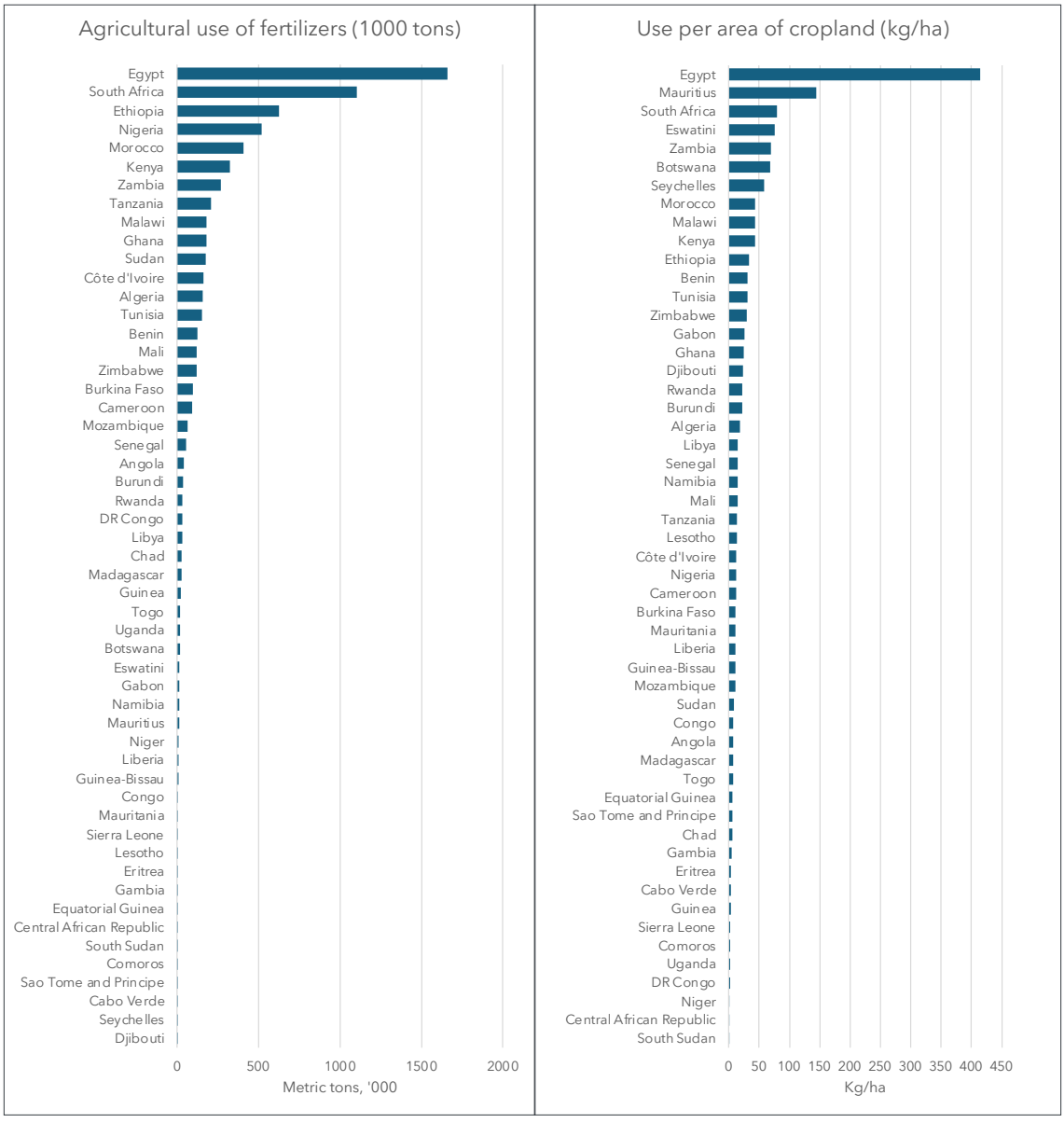
Fertilizer use intensity is measured by the quantities of inorganic fertilizers used in individual African countries divided by the area of cropland (Figure 4.3, right panel). The continental average was 23 kg/ha in 2023 versus 186 kg/ha in Asia and 83 kg/ha in Oceania. A few countries use more than 50 kg/ha, the target for 2015 set in the African Union's 2006 Abuja Declaration.[2] Egypt is particularly remarkable, with 414 kg/ha achieved on average over 2019–2023. Mauritius (144 kg/ha), Zambia (70 kg/ha), and Seychelles (58 kg/ha) are the most intensive fertilizer users in East Africa. South Africa (80 kg/ha), Eswatini (76 kg/ha), and Botswana (68 kg/ha) achieved the most intensive use in Southern Africa. At 44 kg/ha, Morocco is the second-most intensive fertilizer user in North Africa after Egypt. In West Africa, fertilizer use intensity is highest in Benin (30 kg/ha), followed by Ghana (25 kg/ha). Gabon (26 kg/ha) and Cameroon (12 kg/ha) are the most intensive fertilizer users in Central Africa. Fertilizer use intensity is less than 25 kg/ha in 37

2 The Nairobi Declaration of 2024 marks a paradigm shift from the Abuja Declaration of 2006, focusing not on increasing fertilizer use but on adopting methods adapted to local specificities that take into account soil health, soil diversity, and climate for sustainable productivity. https://cgspace.cgiar.org/server/api/core/bitstreams/67ff26c5-9492-4a49-ade2-f7e9c61719c8/content#

of the 53 countries shown. While relatively low fertilizer use per hectare is a concern for food security in some countries, excessive use of fertilizers can be detrimental if nutrients are not sufficiently taken up by crops, leading to nutrient losses to the environment.

Figure 4.3 Country rankings by fertilizer use ('000 tons) and fertilizer use intensity (kg/ha), 2019–2023 average

(a) Agricultural use of fertilizers ('000 tons) **(b) Use per area of cropland (kg/ha)**



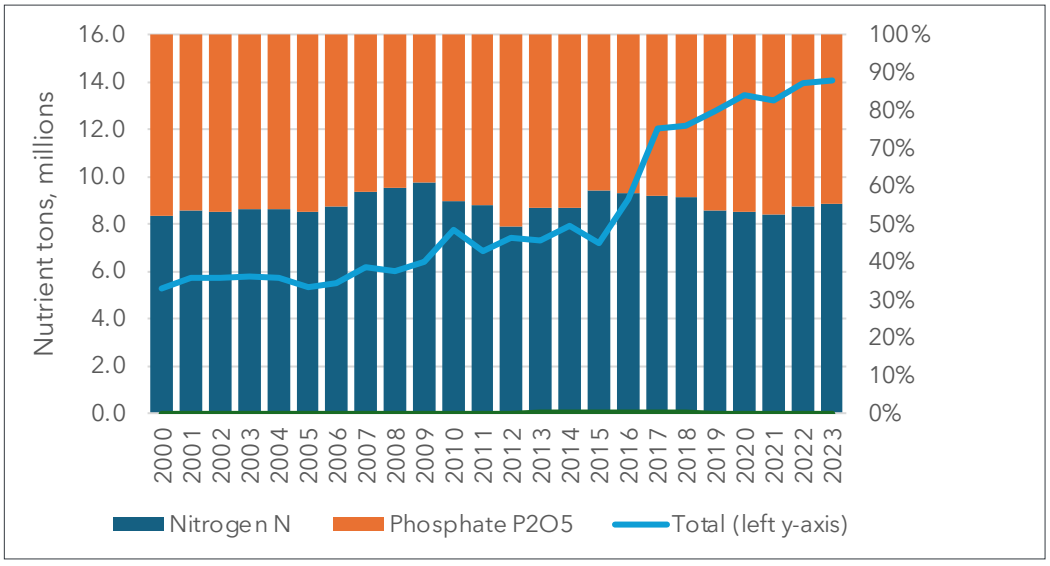
Source: Authors based on FAOSTAT online database, accessed October 2025.

We now shift from examining fertilizer use across regions and countries to explore recent trends and patterns in fertilizer production in Africa.

Production of inorganic fertilizers in Africa

The production of inorganic fertilizers in Africa increased by 165 percent between 2000 and 2023, more than doubling from 5.3 million metric nutrient tons to 14.1 million metric nutrient tons, and outpacing consumption across the continent (Figure 4.4). Most of the production consists of nitrogen and phosphorus fertilizers, which on average accounted for 54 percent and 46 percent, respectively, over 2019–2023. Common fertilizer products produced in Africa include: nitrogen-based fertilizers such as urea and ammonium nitrate; phosphate-based fertilizers such as diammonium phosphate (DAP), MAP, and superphosphates; and various NPK compound fertilizers.

Figure 4.4 Africa's inorganic fertilizer production by nutrient content, million nutrient tons, 2000–2023



Source: Authors based on FAOSTAT online database, accessed October 2025.

North African countries are the major producers of inorganic fertilizers (Table 4.1), with Morocco and Egypt contributing 79 percent of Africa's total production over 2019–2023. Algeria and Tunisia accounted for an additional 11 percent, raising North Africa's overall contribution to 90 percent. Nigeria, South Africa, and four other countries contributed the remaining 10 percent. More specifically, Morocco dominated phosphate production and was the second-largest producer of nitrogen after Egypt. Conversely, Egypt was the leading producer of nitrogen and the second-largest producer of phosphate. Algeria and Senegal produced more nitrogen than phosphate, while Tunisia, South Africa, and Zimbabwe produced more phosphate. Nigeria and Libya produced only nitrogen, while Tanzania produced only phosphate. Growth in fertilizer production was mixed over recent years, expanding by 5.4 percent in Morocco, 17.8 percent in Nigeria, 32.4 percent in Zimbabwe, and 41.6 percent in Tanzania, but decreasing by 24.6 percent in Libya, 18.9 percent in Senegal, and 3.2 percent in South Africa. The result was a slow continentwide production growth rate of 2.7 percent annually.

Table 4.1 Africa's inorganic fertilizer production by country, '000 tons, 2019–2023 average

	Quantity ('000 tons)			Share in Africa's fertilizer production (%)	Annual growth rate (%)
	Nitrogen	Phosphate	Total		
Morocco	1575.5	5353.4	6928.9	51.2	5.4
Egypt	3437.6	318.0	3755.5	27.8	0.8
Algeria	1043.2	32.4	1075.6	8.0	0.0
Nigeria	918.0		918.0	6.8	17.8
Tunisia	135.0	283.9	419.0	3.1	0.3
South Africa	145.5	188.1	333.6	2.5	−3.2
Zimbabwe	7.4	34.6	42.0	0.3	32.4
Senegal	14.9	7.4	22.3	0.2	−18.9
Libya	17.5		17.5	0.1	−24.6
Tanzania		9.8	9.8	0.1	41.6
Africa, total	7294.7	6227.6	13522.2	100.0	2.7

Source: Authors based on FAOSTAT online database, accessed October 2025.

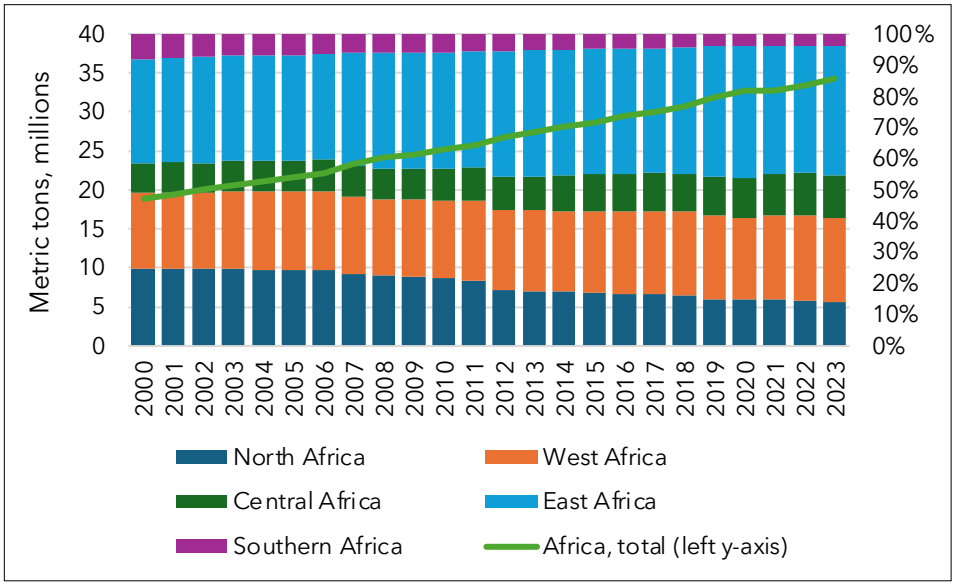
Livestock manure is another valuable source of nutrient inputs to agricultural soils. The production of livestock manure nitrogen across African regions and countries is analyzed next.

Livestock manure (nitrogen content)

Livestock manure supplies essential macronutrients and micronutrients to soils and plants. The NPK content of manure varies by animal type, feed, bedding, and storage conditions. While NPK concentrations in animal manure are relatively low compared with inorganic fertilizers, manure offers other important benefits: it improves soil structure, increases organic matter content, promotes microbial activity, and releases nutrients gradually. The FAOSTAT database provides estimates of nitrogen inputs from livestock manure by animal type and by country, with global coverage, over the period 1961–2023 (FAO 2025b). These estimates are compiled using official FAOSTAT statistics on animal stocks and by applying the internationally approved Guidelines of the Intergovernmental Panel on Climate Change (IPCC). However, estimates of other nutrient inputs to agricultural soils from livestock manure are not available. The following analysis is hence restricted to the nitrogen content of livestock manure.

The total amount of nitrogen content in total excreted livestock manure increased steadily at a compound annual growth rate of 2.6 percent, from 19 million metric tons in 2000 to 34 million metric tons in 2023 (Figure 4.5). East Africa produced the largest share of manure nitrogen (42 percent) over 2019–2023, followed by West Africa (27 percent), North Africa (15 percent), Central Africa (13 percent), and Southern Africa (4 percent). The shares of North Africa and Southern Africa decreased over the period of analysis, while East Africa's expanded. Overall, Ethiopia, Nigeria, Chad, Sudan, and Tanzania—countries with high populations of livestock—provided the largest amounts of manure nitrogen (Figure 4.6). Together, they represented 47 percent of the continentwide nitrogen content of manure.

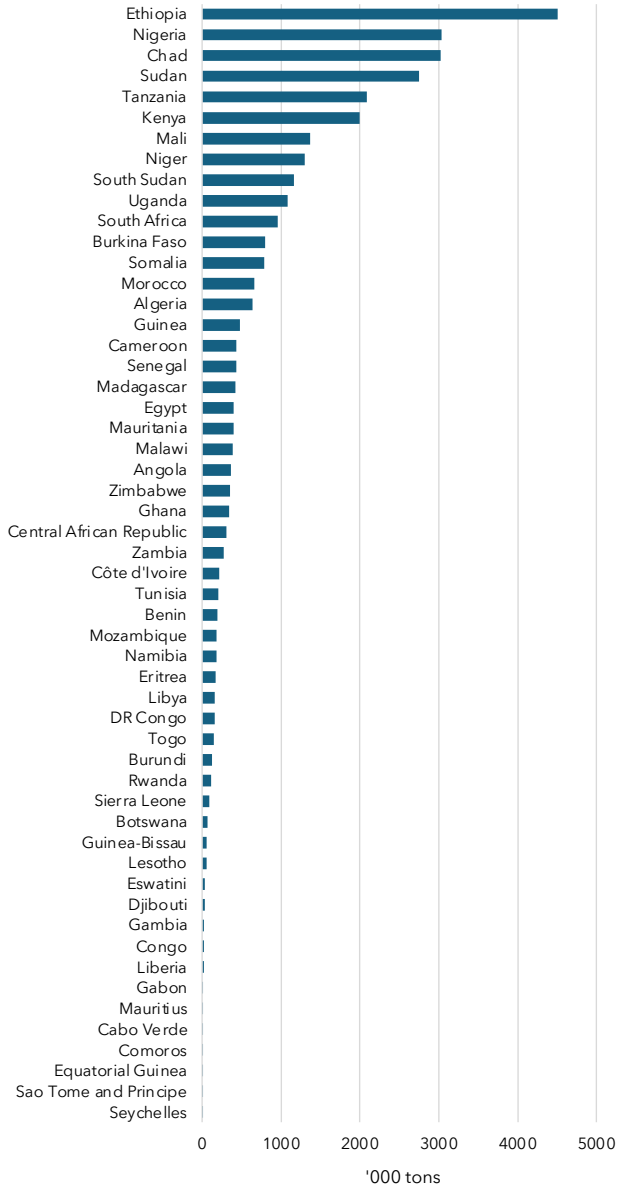
Figure 4.5 Manure nitrogen produced (million tons) by African region (%), 2000–2023



Source: Authors based on FAOSTAT online database, accessed October 2025.

In short, African fertilizer consumption in agriculture is low compared to international standards and to the African Union's 2006 Abuja Declaration target of 50 kg/ha by 2015. However, Africa's fertilizer production is larger than its consumption, and it is growing faster. On average between 2019 and 2023, production of inorganic fertilizers (13.5 million tons) grew annually by 2.7 percent, compared to 1.0 percent for consumption (7.2 million tons). Both inorganic and manure fertilizers are important for soil fertility, but their use is limited. Inorganic fertilizers are expensive for smallholders, while the use of manure is limited by transportation costs and nutrient loss due to poor storage. Low fertilizer use intensity is associated with low agricultural productivity and ongoing food insecurity on the continent. North Africa and Nigeria dominate both the production and use of inorganic fertilizer, while East Africa dominates the production of manure nitrogen. As discussed in the next section, the facilitation of increased fertilizer trade between these regions and the rest of the continent as part of AfCFTA implementation should be beneficial for productivity improvement and food security.

Figure 4.6 Quantity ('000 tons) of livestock manure nitrogen produced by country, 2019–2023 average



Source: Authors based on FAOSTAT online database, accessed October 2025.

3. Trade in Fertilizers

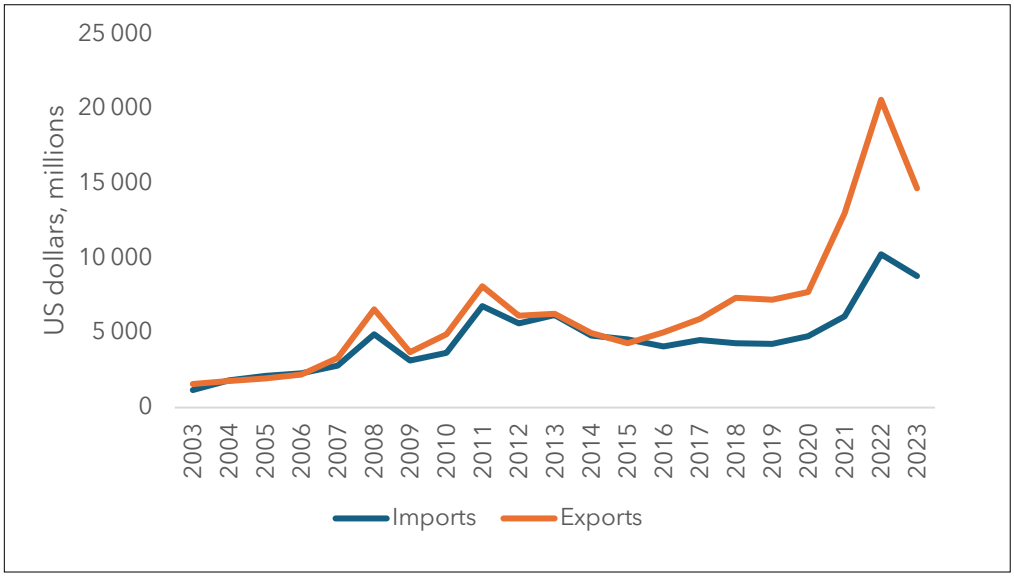
This section analyzes the main export and import patterns of fertilizers, with a special focus on their related policies.

Trade flows

Figure 4.7 shows the evolution of total exports and imports of fertilizers from 2003 to 2023. Overall, Africa is a net exporter of fertilizers, with exports of US$14.7 billion and imports of $8.8 billion in 2023. This surplus of $5.8 billion in 2023 was a large increase from the $0.9 billion surplus in 2016. Before 2016, the trade balance held steady at around $0.45 billion, with

exports more or less equal to imports. The relatively recent increase in performance can be attributed to several factors (Liverpool-Tasie et al. 2025). First, important players in the fertilizer industry increased their production, especially countries north of the Sahara, such as Morocco and Egypt (AGRA 2019). Second, several countries invested heavily in this sector. Two good examples are the green ammonia project in Egypt and Morocco (with low carbon nitrogen) and Dangote's[3] production of urea in Nigeria (Balana and Fasoranti 2022). Third, foreign markets are more attractive since they are larger and have more regular offtakers compared to African markets. Hence, exporting to larger markets is more predictable and more profitable, leading to lower intra-African trade.

Figure 4.7 Total fertilizer exports and imports in Africa (US$ million), 2003–2023

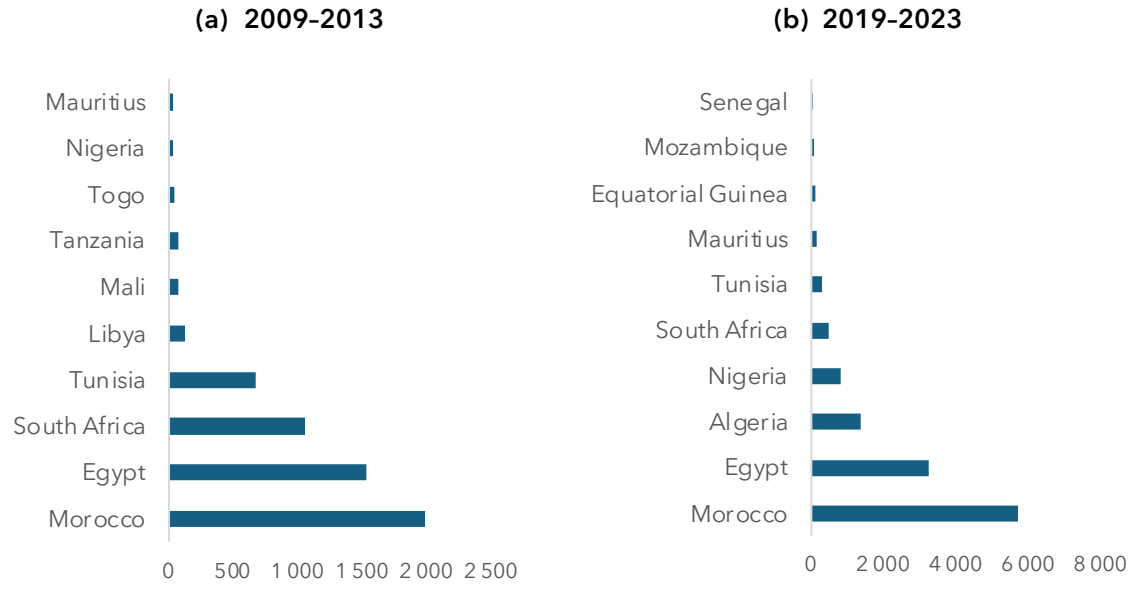


Source: AATM 2025 database.

Looking at the performance of individual countries reveals that exports are highly concentrated: the top 10 African exporters represent around 97 percent of Africa's fertilizer exports (Figure 4.8). Notably, Morocco's share of exports was not only high over 2009–2013 (34 percent of Africa's exports), but increased to 45 percent over 2019–2023. Egypt ranked second, with 25 percent of Africa's exports in both periods. Algeria, Tunisia, South Africa, and Mauritius are also among the top African exporters of fertilizers. These trade patterns are chiefly explained by these countries' endowments and their recent policies. For example, Morocco holds around 70 percent of the world's phosphate rock reserves (Cooper et al. 2011). The Moroccan government has supported the development of the phosphate industry through investment in research and development with OCP (Morocco's state-owned phosphate company), the development of tailor-made fertilizers adaptable to different crop and soil varieties, and improvements in soil fertility mapping. Egypt's reserves, while lower than Morocco's, are rich and mainly concentrated in the Abu Tartur region in the Western Desert. The Government of Egypt offered incentives to support and attract investment in this sector and to increase its exports. Nigeria is also a large exporter of nitrogen fertilizers, thanks to its endowments of oil and natural gas.

3 Dangote Industries Limited is a large firm producing in a wide range of sectors including cement, sugar, salt, condiments, packaging, energy, port operations, fertilizer, and petrochemicals in Nigeria and Africa.

Figure 4.8 Top 10 exporters of fertilizers in Africa (US$ million)

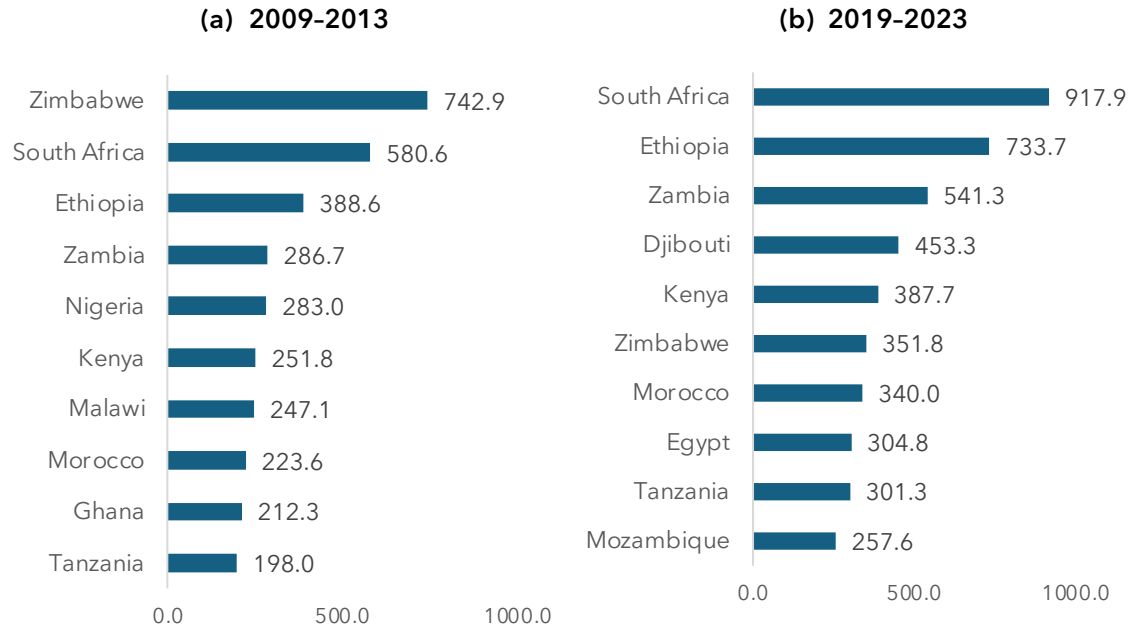


Source: AATM 2025 database.

Three interesting features emerge from examination of the top 10 importers in Africa (Figure 4.9). First, several top African exporting countries—Egypt, Morocco, Mozambique, and South Africa—also import fertilizer, due to the heterogeneity of fertilizers traded. For instance, Egypt exports phosphates but imports potash and urea to meet domestic demand.[4] Likewise, Morocco exports phosphate-based fertilizers but imports ammonia and sulfur. Second, with the exception of these countries, the top importers of fertilizers are Ethiopia, Zimbabwe, and Zambia over the two periods of analysis, pointing to the reliance of their agriculture sectors on imported fertilizers that are essential for agricultural crops and for livestock, which consume forage and feed crops heavily intensive in fertilizers. This can increase the vulnerability of their comparative advantages (for instance, livestock for Ethiopia, livestock and maize for Zimbabwe). Third, South Africa was the third highest exporter over 2009–2013 but dropped to fifth place over 2019–2023. Moreover, already the second-highest importer in the first period, South Africa moved to first place in the second period, with imports reaching almost US$1 billion. This is mainly because South Africa lacks a potassium reserve and is not endowed with complete urea production plants (Benson and Mogues 2018).

4 Figures A4.2a and A4.2b show the top imported and exported products by African countries in 2019–2023. Nitrogenous, urea, whether or not in aqueous solution, diammonium hydrogenorthophosphate, and ammonium dihydrogenorthophosphate and mixtures were the top exported fertilizers. In addition to nitrogenous and urea, fertilizers containing the three (NPK) or two (NP) elements are the top imported ones.

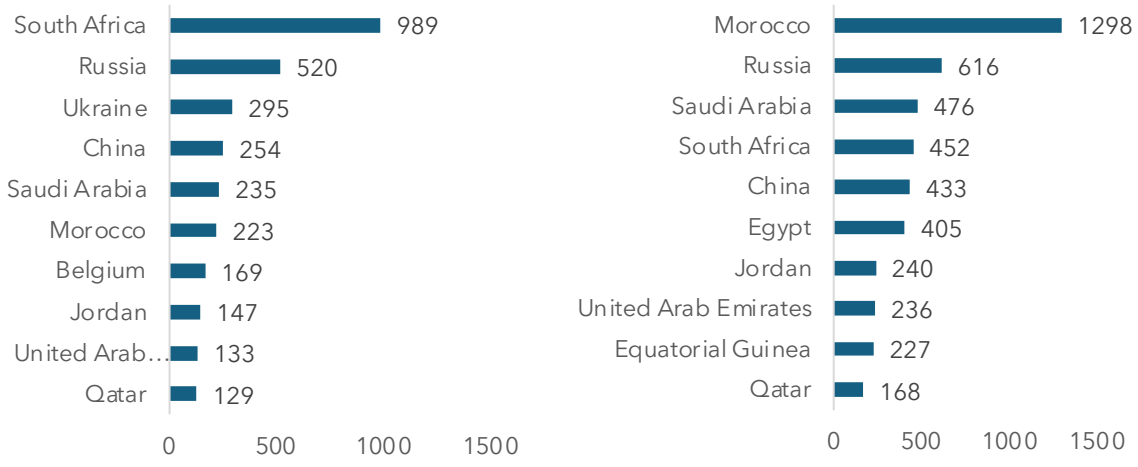
Figure 4.9 Top 10 importers of fertilizers in Africa (US$ million)



Source: 2025 AATM database.

Africa is, in general, dependent on non-African countries such as Russia, China, the United Arab Emirates, Qatar, and Jordan for its fertilizer supply (Figure 4.10). These players remained the top exporters of fertilizer to Africa over the two periods of analysis, while intra-African fertilizer trade was mainly sourced from Morocco, Egypt, South Africa, and Equatorial Guinea. Yet the origin of Africa's fertilizer imports changed significantly between the two periods of analysis for at least two reasons. First, while South Africa was the main supplier of fertilizers to other African countries in the first period, Morocco overtook it in the second. This is rather good news, as Morocco is an important global fertilizer supplier and, with more continental initiatives, could partially meet Africa's fertilizer demand. Second, while Russia maintained its number two position as a fertilizer exporter to Africa, Ukraine disappeared in the second period, revealing Africa's vulnerability to external shocks (Lin et al. 2023). On a positive note, the share of imports sourced from within Africa rose from 24 percent to 36 percent over the two periods of analysis.

Figure 4.10 Countries of origin of imported fertilizer in Africa (US$ million)



Source: AATM 2025 database.

4. Trade policies

As mentioned, even though Africa is a net exporter of fertilizer, it imports a significant quantity to fulfil its increasing demand. Moreover, while some African exporters are important fertilizer suppliers within Africa, large economies dominate the fertilizer market and imposed several protectionist measures in 2023–2024, such as higher tariffs and nontariff measures (export bans, quotas, subsidies, and so on). Subsidies reflect any financial support that can distort the market and thus affect the relative competitiveness of African countries when it comes to their exports or the price and quantity of their imports.

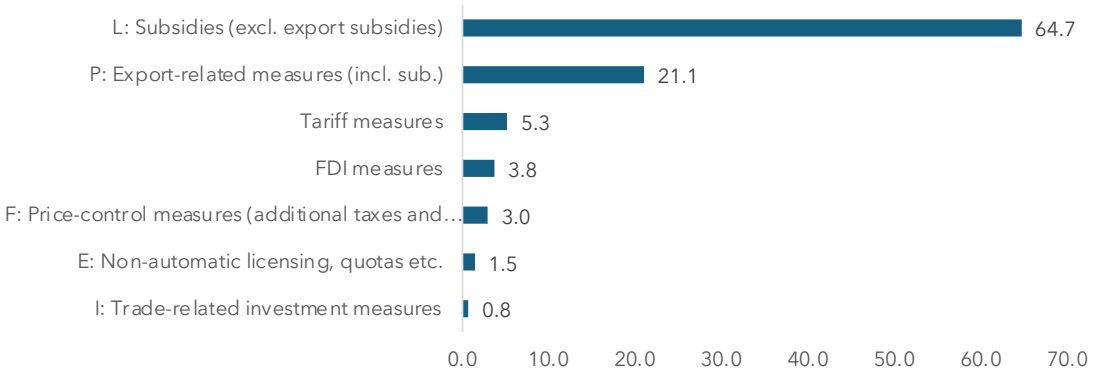
Data from Global Trade Alert show that the measures imposed on fertilizers were mainly subsidies (65 percent of the total number of measures), export-related measures (21 percent), and tariffs (5 percent) (Figure 4.11). Most were imposed by the European Union (EU), followed by China and Turkey (Figure 4.12). Subsidies include, for instance, measures implemented by the United States Department of Agriculture, which provided additional funding to increase American-made fertilizer production or to support the production of organic nutrient fertilizers. EU countries, the United States, and Japan imposed export bans and tariffs mainly on Russia after its invasion of Ukraine. China imposed export restrictions on fertilizers, including a temporary ban on phosphate exports, affecting the supply to African countries. In the same spirit, India imposed an export license for fertilizers such as urea and DAP to ensure that its domestic demand would be satisfied. Similarly, Viet Nam imposed a 5 percent export tax on superphosphate.[5]

Several African countries subsidize fertilizers; the average expenditure on fertilizer subsidy programs was US$35 million between 2017 and 2022 (AGRA 2024), either through universal programs (such as in Burkina Faso and Kenya) or targeted programs (such as in Ghana and Malawi). Some African countries reduced tariffs and export caps. For instance, Egyptian fertilizer companies were previously limited to exporting 45 percent of their production. In 2025, the government allowed firms to export up to 55 percent by reducing the quota related to mandatory government procurement.[6] The literature shows mixed evidence regarding

5 https://www.vietnam.vn/en/hiep-hoi-phan-bon-viet-nam-gop-y-kien-ve-thue-xuat-khau-phan-bon
6 https://www.madamasr.com/en/2025/09/24/news/u/egypt-to-boost-fertilizer-exports-to-offset-planned-slash-to-industrial-energy-subsidies/

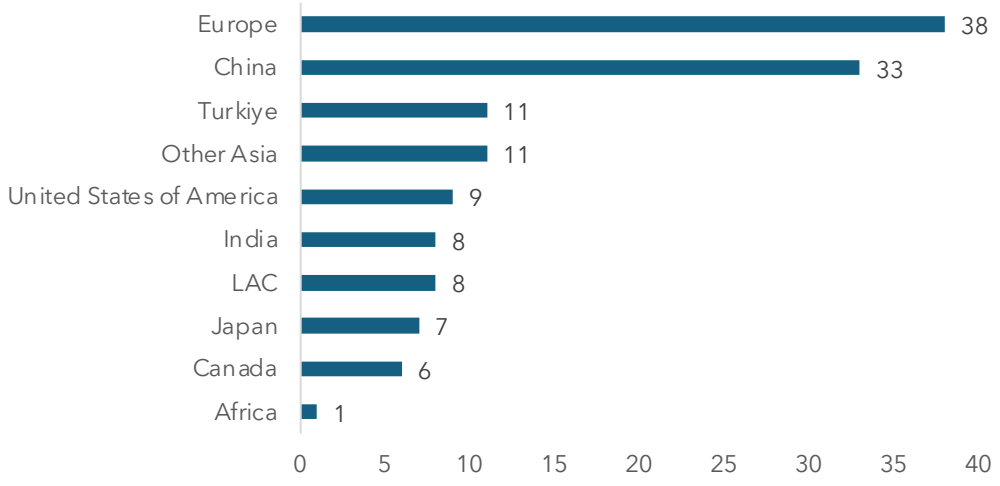
the impact of subsidies on African countries, as they can increase farmer productivity and income, improve fertilizer system efficiency, and lead to higher domestic food production and thus greater food security (AGRA 2024). However, subsidies can incentivize smuggling into neighboring countries that do not subsidize or subsidize at a lower rate (IFDC 2020). Moreover, subsidies can be associated with diversion and leakage of subsidized fertilizer, thereby distorting the market.

Figure 4.11 Share of harmful measures affecting the fertilizer sector by type, 2023–2024



Source: Global Trade Alert online database.
Note: FDI = foreign direct investment. Each letter stands for a nontariff measure chapter following the UNCTAD classification.

Figure 4.12 Number of harmful measures affecting the fertilizer sector by region/country, 2023–2024



Source: Global Trade Alert online database. https://globaltradealert.org/

In addition to the aforementioned trade-related measures, AGRA (2024) argues that trade in fertilizers is still impeded by several barriers at both the extra- and intraregional level. First, several African countries do not have an authority that oversees fertilizer trade. This results in overlapping and conflicting roles of different institutions, which increases the transaction costs of importing, the time to trade, and delays in clearance. Second, intraregional African trade is hindered by deficient infrastructure and poor connectivity. For instance, in Rwanda, it

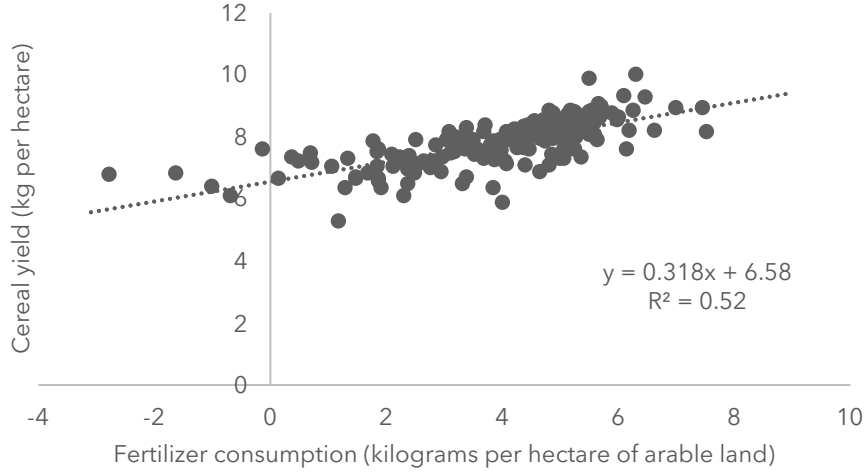
costs approximately US$160 to transport 1 ton of fertilizer from Mombasa or Dar es Salaam to Kigali. This adds around 45 percent to the final retail price charged for that fertilizer, affecting its competitiveness. Therefore, despite the potential supply that can originate from main African exporters such as Morocco and Egypt, these additional costs deter African exporters.

When it comes to the impacts of fertilizers, their use is significantly associated with improved food security through several channels. First, fertilizers can increase crop yields as they are a source of nutrients such as nitrogen and phosphorus. Figure 4.13a confirms this, as fertilizer consumption is positively correlated with cereal yields (kg/ha), which are essential for food security. Second, greater food availability reduces food prices, especially because food demand is generally price inelastic, which increases its affordability, especially for people experiencing poverty, thereby improving food access. This is confirmed by the negative association between fertilizer consumption and the prevalence of undernourishment (Figure 4.13b). In fact, greater yields ensure a higher level of food availability in domestic markets, which can reduce dependence on imported food. However, it is important to note that several countries rely heavily on imported fertilizers (such as African countries). Although imports of fertilizers can increase agricultural yields (especially cereals, as shown in Figure 4.13c), importing countries are always subject to volatile prices and supply disruptions, which can affect future harvests, increase food prices, and reduce food security (Hebebrand and Laborde 2023). In the same vein, Rosa and Gabrieli (2022) show that 1.78 billion people per year rely on imports of either fertilizers or natural gas. Hence, energy shocks that affect natural gas can increase the vulnerability of fertilizer production and thus food production. Moreover, fertilizer use can lead to environmental degradation, soil nutritional imbalances, and suboptimal food production (Penuelas et al. 2023).

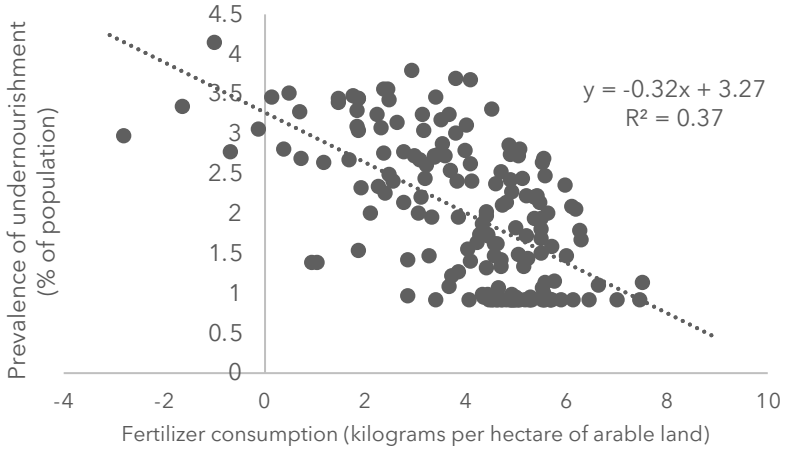
Given the potential physical and chemical degradation of the soil as a result of continuous application of mineral fertilizer, farmers normally invest in organic fertilizers that build up the soil structure and naturally replenish nutrients in the soil with relatively low cost. Moreover, the nutrients supplied by organic fertilizer are available over a longer time horizon compared to nutrients supplied by mineral fertilizer. For example, Jacoby and Mansuri (2008) indicate that field trials in Pakistan revealed that the marginal effects of manure on grain yields persist for at least three years following the initial application, while the productivity effects of mineral fertilizers are essentially limited to the season of application.

Figure 4.13 Correlations between fertilizers and food security variables

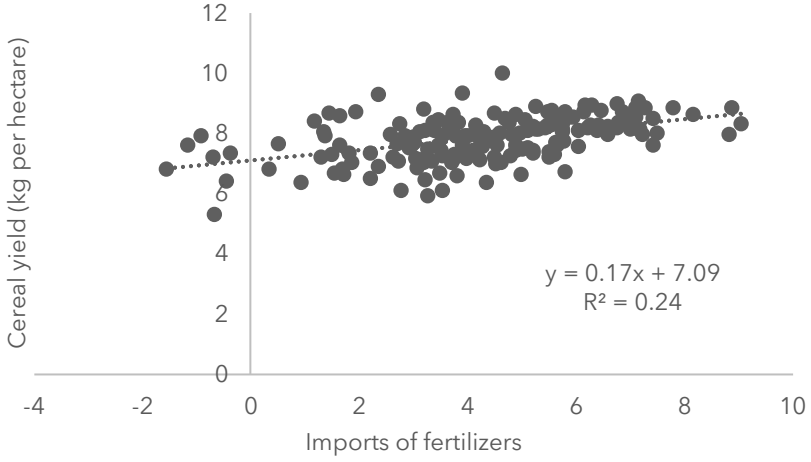
(a) Correlation between fertilizer consumption and cereal yield



(b) Correlation between fertilizer consumption and food insecurity



(c) Correlation between imports of fertilizers and cereal yield



Source: Authors' own elaboration using the World Development Indicators online dataset.
Note: All figures are averaged over 2000-2023 for all countries. Variables are in natural logarithm.

5. Conclusion

Fertilizers play a crucial role in agricultural production by enhancing productivity and therefore contributing to food availability, a key element of food security. Yet Africa's agricultural systems remain characterized by a low intake of fertilizers. While the continental average stands at 23 kg/ha, for two-thirds of countries, fertilizer-use intensity is less than 25 kg/ha, far below the 50 kg/ha target set in the African Union's 2006 Abuja Declaration. This situation hinders the development of African agriculture, where yields are among the lowest in the world, at only 40 percent of the world average for cereals and 8 percent for vegetables (FAO 20 2025a).

While characterized by a low fertilizer-use intensity, Africa is paradoxically becoming a more significant producer and exporter. As a result of their natural endowments, many African countries produce enough fertilizers to cover their domestic demand and export the surplus either to other African countries or to the rest of the world. Countries such as Morocco, Egypt, Algeria, and Nigeria are typical examples: Morocco has large reserves of phosphate, while the

other three countries are endowed with oil and natural gas. Given this natural advantage and the investments made in key countries, Africa has been an overall net exporter of fertilizers since 2016. However, given the heterogeneous nature of fertilizers and the specific requirements of crops, Africa still imports a large quantity of fertilizers, especially potash, the production of which has yet to expand on the continent. In addition, two-way trade occurs at the continental level, especially for nitrogen, because export prices are better than domestic market prices for some countries, such as Nigeria. Given this finding, one crucial part of the African fertilizer story relates to the fact that, overall, Africa is a net exporter of fertilizers to countries outside of the continent, meaning that it is more profitable for companies to export fertilizer off the continent than to try to sell it within Africa, where markets are underdeveloped.

Recent crises (COVID-19 and the Russia–Ukraine war) and their subsequent policy responses have highlighted the fragility of Africa given its dependence on world markets. First, global fertilizer markets are highly concentrated. So any restrictive policy in one country can destabilize world markets. Yet, in the wake of COVID-19 and the Russia–Ukraine crisis, several countries adopted restrictive measures such as export bans and quotas to favor their domestic markets and needs. Second, the disruption of supply routes and the explosion of insurance premiums due to the war added an additional layer of complexity, despite the availability of the product in some cases. Most African countries responded with (consumption) subsidies, resulting in mixed results. However, the growing trend of intra-African trade over the past decade constitutes a good risk-coping strategy to face abrupt external shocks and policy uncertainty.

Our results showed a positive correlation between fertilizer use and food security through improved agricultural yields. Increased yields induce higher food availability and lower prices, thus increasing the affordability of food and improving food access. These findings should be confirmed and extended, by developing a causal model and framework that goes beyond correlation analysis.

From a policy perspective, these findings reinforce the need for integrated and regionally coordinated approaches to agricultural input management. Strengthening domestic fertilizer production capacity, improving intra-African trade logistics, and investing in rural infrastructure can enhance both the availability and affordability of fertilizers. Equally important are complementary interventions, such as targeted and coordinated subsidies at the regional level to avoid leakages and cross-border smuggling; digital input delivery platforms; and credit access that improve smallholder farmers' ability to use fertilizers efficiently and sustainably.

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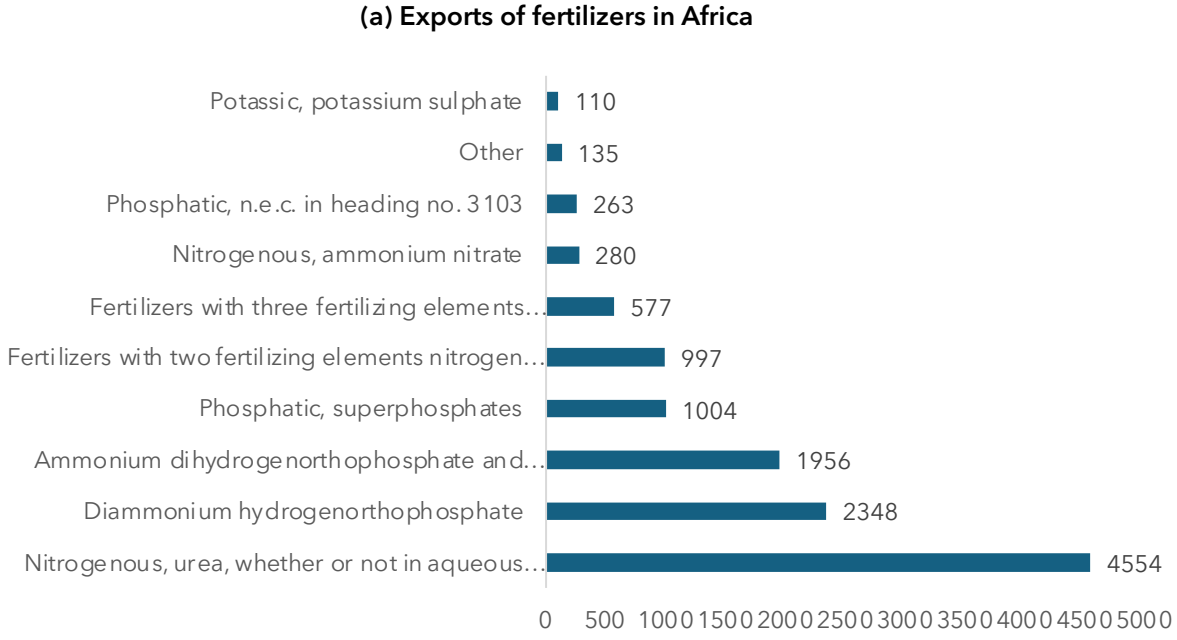
Appendix 4.1 Regional grouping of African countries

North Africa	Algeria, Egypt, Libya, Morocco, Sudan, Tunisia
West Africa	Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo
Central Africa	Angola, Cameroon, Central African Republic, Chad, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, São Tomé and Príncipe
East Africa	Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Seychelles, Somalia, South Sudan, Tanzania, Uganda, Zambia, Zimbabwe
Southern Africa	Botswana, Lesotho, Namibia, South Africa, Swaziland

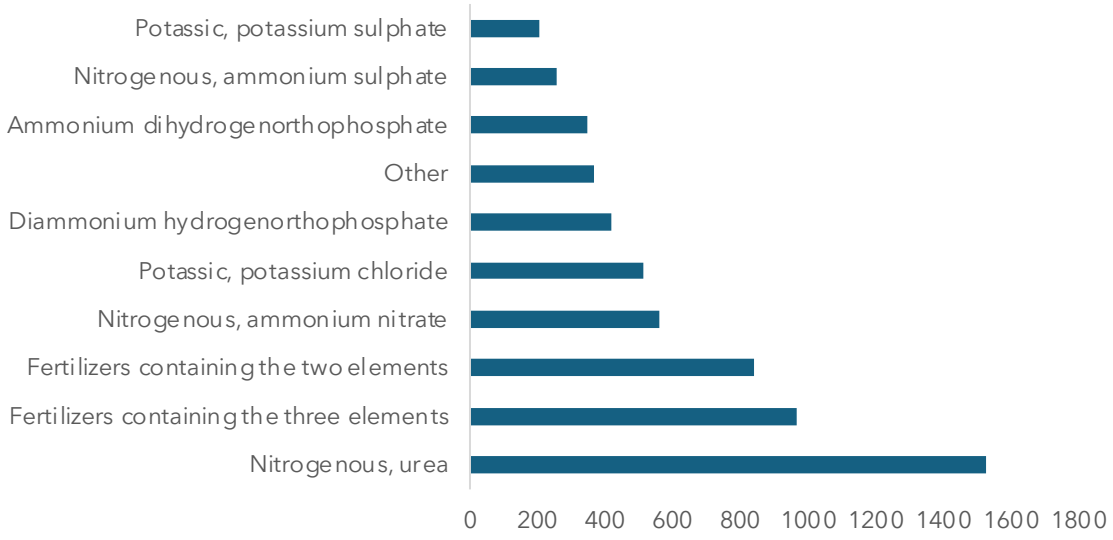
Source: United Nations geoscheme. https://en.wikipedia.org/wiki/United_Nations_geoscheme

Appendix 4.2 Sectoral Flows

Figure A4.2 Exports and imports of fertilizers, by type, 2019–2023 average



(b) Imports of fertilizers in Africa



Source: 2025 AATM database.