Major Changes in the Fertilizers Market in 2022-2023 and Their Impact on Global Food Security
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1 Appendix 4 was prepared by Lupicinio International Law Firm
In 2015, the UN General Assembly adopted 17 interrelated sustainable development goals (SDGs). It was expected that achieving these goals would ensure a better and more sustainable future for all by 2030. Unfortunately, we have to admit that today we are once again set back from achieving SDGs, including the goals of ending poverty and hunger as well as ensuring food security for all.

In 2016, I started the Andrey Melnichenko Foundation with the goal of nurturing the potential of children and youth. Over the past few years, the Foundation’s scope of work has significantly expanded to include special tracks that support projects on combating climate change and tackling other global issues.

The unfolding food crisis is a threat to the global community. According to expert estimates, if no urgent and effective measures are taken, a number of undernourished people will increase dramatically in the following years, especially in least developed countries, resulting in 416 thousand to 1 million additional deaths annually.

These figures are terrifying and challenge each of us to do what we can to prevent this forecast from becoming a reality. That is why Andrey Melnichenko Foundation is honored to support the discussion of the report that you are about to read.

This report, developed by a representative team of independent analysts with comprehensive support from various NGOs, is an attempt to answer truly challenging questions. What are the key causes of the current food crisis? How have sanctions and other unilateral restrictions made fertilizers unavailable to developing countries and pushed up the food prices? How will the current market situation affect production of agricultural goods in the coming years? And most importantly, how can the global community prevent a large-scale humanitarian catastrophe?

The Russia–Ukraine conflict and the following unprecedented sanctions exposed the extreme fragility of global food security, as well as its vulnerability to external shocks, inflicting the greatest damage upon the least developed countries. The observed fertilizer market changes are leaving the countries that are most in need with no affordable fertilizers, and thereby hindering domestic production of staple foods. This is happening at a time when the world has still not recovered from the pandemic.

It was critical for everyone involved in the making of this report to provide trustworthy data that is based on objective analysis, uses rigorous logic and takes into account all the aspects of the current food security crisis in a clear and comprehensive manner. I believe this is why the report provides so much value to the otherwise politicized and rather multifaceted issue.

I hope that this report will become an impetus for an open public deliberation on the causes of the food security crisis and will help policymakers embrace the extreme complexity of the problem. In addition, it sets the framework for a vital ethical discussion - what are the limits of the states’ power when trade and non-trade restrictions threaten the sustainable development of the most vulnerable countries and the lives of their citizens?

In order to prevent the worst scenario international community should massively increase urgent aid to the most crisis-affected countries, especially in Sub-Saharan Africa. This should not only include the direct emergency funding, but also long-term investment in agricultural infrastructure to promote domestic food and fertilizer production. Improving access to financing for local producers is also crucial to reduce the burden of food insecurity.

Today, the global community has all the necessary resources to ensure that the UN Sustainable Development Goals are achieved by 2030. However, it requires a clear-eyed, inclusive and depoliticized discussion, effective leadership and the efforts of governments.

We call for action to stakeholders, governments, business and civil society to take decisive actions to address the challenges and threats to global food security and the world’s sustainable future.
Over the past few years, the collective progress achieved by the global community in combating hunger and poverty has slowed dramatically. Today Africa is facing serious challenges that pose major threat to the continent’s sustainable development and, more importantly, threaten the lives of African people.

First, the COVID-19 pandemic, then the Russia-Ukraine conflict as well as the following sanctions and other restrictions inflicted severe damage to food security in Africa, especially in the Sub-Saharan region. However, this aspect remains largely absent from the public dialogue and mainstream media.

To address this issue, earlier in 2023, the Thabo Mbeki Foundation has spearheaded a multi-stakeholder report titled, “The Impact of the Ukraine War on the Fertilizer Market and Its Effect on Food Security in Africa.” It offered a valuable overview of the global mineral fertilizer market, outlining various challenges that have emerged over time and their consequences for the African continent.

Today it seems crucial to ask ourselves: what lessons can be learned, and what measures can be taken to ensure that Africa and other vulnerable regions do not suffer from a political crisis over which they have no control or influence? Failing to address this issue would mean missing a major opportunity to prevent a real humanitarian disaster.

On this account, the Thabo Mbeki Foundation was pleased to join the work on the presented report. The report in your hands offers a data-driven perspective amidst the numerous and often speculative discussions surrounding global food insecurity in the context of the Russia-Ukraine War. It presents an extensive data analysis on fertilizer production, trade, and transportation mechanisms.

The report meticulously measures the repercussions of recent changes in the fertilizer market, including the hindered trade in the Black Sea and the shutdown of the Togliatti-Odessa ammonia pipeline, the sanctions against Russia and Belarus, global logistics disruptions and the increased transportation legs, the impact of skyrocketing commodity prices in Europe on fertilizer production costs, as well as the introduction of various protectionist measures and export quotas by the governments of China and Russia.

The net effect of these developments is a staggering surge in fertilizer prices in Africa and other vulnerable regions of the world. This price hike directly translates into increased food costs. Faced with these challenges, farmers are left with two unpalatable options: either to reduce the amount of land they cultivate, thereby decreasing production volumes, or to increase the prices of their products. Both options increase household spending on food, making it unaffordable for some. As an example, in Sub-Saharan Africa a household already spends 30-60% of household budgets on food, compared to just 10-20% in developed countries like the USA and the EU. This drives the population of the least developed countries to extreme poverty and food insecurity, the hunger is spreading across the globe.

We believe that in order to overcome this crisis the focus should not merely be on extending charity and aid, however important these measures are. Instead, the global community should emphasize resource transfers and exchanges, enabling marginalized communities to forge their path towards sustainable development.

The report you are about to read serves as a complete toolkit for a diverse range of stakeholders, including policymakers, investors, manufacturers, multinational entities, financial institutions, and traders. While its primary focus might be the assessment of the fertilizer market, the depth and thoroughness of its analysis offer us a blueprint for envisaging a more harmonious world and more balanced international relations.

We strongly advocate for this piece of work to be recognized and utilized by everyone vested in the monumental task of eradicating hunger and starvation. This includes farmers, landowners and industry leaders, corporations involved in fertilizer trade, policymakers, and think-tanks.

In conclusion, we extend our profound appreciation to the dedicated team of researchers, data analysts, reviewers, and authors of this report. Their exemplary efforts in producing such a comprehensive study truly deserve commendation.
Major Changes in the Fertilizers Market in 2022–2023 Trends and Their Impact on Global Food Security

Executive summary

- In 2022, the world faced unprecedented challenges to global food security. Disruptions in global food and fertilizer supply chains caused by the Russia–Ukraine conflict and the following sanctions exacerbated market imbalances that were first observed in 2021. By 2023, an enormous number of various unilateral restrictions became the “new normal” for many markets. However, food and fertilizers are more than mere commodities. They are the backbone of global food security and the right of every human being to a decent standard of living.

- The number of undernourished people has been growing rapidly. According to FAOSTAT, in 2022 it reached a dramatic 735 mln, with the direst situation observed in several regions of Africa, where the share of undernourished people reached 23%. Food insecurity in Sub-Saharan Africa (SSA) is about to reach catastrophic levels – in 2022, the number of people facing acute hunger reached 262 mln, increasing by 9 mln compared to 2021.

- Although various reasons contributed to this, according to the UN World Food Programme (WFP), the fertilizer market crisis was the key factor contributing to lower yields and higher food prices, which finally led to the global food crisis. Thus, our review aims to quantify the input of various restrictions imposed between 2021 and 2022 on fertilizer supplies and determine the humanitarian and economic impact on the affected fertilizer-importing countries. We believe such an assessment is crucial for an objective discussion and development of international mechanisms to futureproof global food security.

- Major shifts in the balance of the global fertilizer market began back in 2021 with the introduction of export restrictions on Belarusian fertilizers. In 2022, those imbalances intensified due to the outbreak of the Russia–Ukraine conflict and sanctions against the Russian economy and Russian individuals, as well as other negative factors, altogether resulting in:
  - Direct reduction of fertilizer and ammonia supply caused by the sanctions against Russia in connection with the Russia–Ukraine conflict.
  - Direct reduction of potash supply from Belarus as a result of the sanctions against Belaruskali (the company accounted for around 19% of the global export of potash).
  - Decrease in ammonia exports from Russia due to the shutdown of the Toljatti–Odessa ammonia pipeline.
  - Increase in the volume of fertilizers “stuck” in the global trade due to the restructuring of logistics flows, which resulted in longer transportation legs and lead time.
  - Reduced production of nitrogen fertilizers (mainly in Europe) due to an increase in production costs driven by higher gas and ammonia prices.
Major Changes in the Fertilizers Market in 2022–2023 and Their Impact on Global Food Security

- Reduced production of phosphate fertilizers due to increase in production costs driven by higher feedstock prices (phosphate rock and ammonia).
- Protectionist measures taken by the Chinese government resulting in a ban on DAP/MAP exports and a huge increase in global ammonia prices.
- Protectionist measures by the Russian government resulting in a temporary ban on the exports of ammonium nitrate (AN) and export quotas for a number of other fertilizers.
- Global fertilizer and ammonia supply saw a total reduction of 40.8 mt as a result of all the negative factors since their inception until April 2023, including 16.3 mt as a direct result of various sanctions and trade restrictions against Russia and Belarus, and 24.5 mt as a result of all the other factors, including indirect consequences of those sanctions and trade restrictions.
- The decline in global fertilizer supply drove up the prices: at their peaks in the spring and summer of 2022, fertilizer prices were approximately 100–200% higher than their 2021 annual averages. For instance, quotes for nitrogen fertilizers reached 1,000 USD per tonne, which is 3–5 times higher than the 2017–2020 prices.
- In turn, the price hikes led to a redirection of trade flows in favour of the regions that are more willing to pay, leaving undersupplied the regions that are less capable to pay (including SSA). The net importers in developed countries “pulled” some of the output into their own markets, leaving the net importers with low purchasing power the most exposed to fertilizer shortages. All in all, the US and Europe pulled an estimated 2 mt of fertilizers away from SSA markets.
- High fertilizer prices and redirection of trade flows also led to a pronounced drop in consumption – in 2022, it went down by 23.7 mt (or 4%), from 500.3 mt in 2021 down to 476.6 mt in 2022. However, it affected each country in a different way. Although many regions in the world were faced with a significant reduction in fertilizer imports and consumption, in the EU or US, for instance, those challenges did not have an immediate negative impact. These countries had sufficient fertilizer stocks, which had been accumulated in the previous periods, and fertilizer application rates had been high as well, which allowed those countries to accumulate enough soil fertility to withstand a few years with slightly reduced fertilizer consumption. A drastically different situation was observed in countries where farmers are not export-oriented and the governments are not strong enough to protect their farmers, e.g. in African states. Those countries experienced a drop in consumption and a huge decline in the yield rates that were low in the first place because of depleted and undernourished soils.
- The share of domestic production in crop consumption by the SSA population stands at about 80%, which makes those countries highly dependent on local production and, consequently, on imported fertilizers. While many net importing countries with a low per capita GDP reduced fertilizer use due to the reasons mentioned above, it was only in SSA that reduced fertilizer application (down by 6%) immediately resulted in an increase in the number of people facing acute hunger (+9 mln). In 2022, fertilizer prices skyrocketed by 85% in SSA. Since fertilizers make up a significant portion of farmers’ production costs, it could potentially drive the prices of agricultural products in the region up by 53%.
- The SSA population spend most of their incomes on food. In 2022, this already high share increased even further – from 40% to 44%. At the same time, in some SSA countries (such as Nigeria, Kenya, Zambia, Uganda, Zimbabwe, etc.) domestic food prices are regulated. Basic staple grains are commonly subject to maximum price controls, so local farmers are limited in their ability to set the prices for their produce. Indeed, the prices for agricultural products in SSA were up by only 10–15%, which is significantly lower than the increase in production costs associated with fertilizer price hikes. As a result, SSA farmers were forced to reduce fertilizer consumption and still incurred high costs. That led to a decline in agricultural production as farmers have limited financial resources. That, in turn, created a food supply deficit: current grain deficit is estimated at 20 mt and is expected to grow even further.
- Between 2020 and 2022, the number of hungry people significantly increased in the five countries with the highest count, accounting for 45% of all those facing hunger in SSA in 2022. Thus, the share of the population experiencing acute hunger in the Democratic Republic of the Congo rose to about 26%, in Ethiopia to 21%, in Nigeria to 12%, in Kenya and Mozambique to 10% both.
Rising food prices affected household spending among the most vulnerable groups, pushing 28 mln people in SSA below the poverty threshold of USD 1.9 per day. Government support measures could partially compensate households for their increased costs, but these measures add to the external debt burden. In the coming years, SSA countries are expected to face high interest payments, in some cases exceeding 50% of government revenues.

Moreover, the events of 2022 changed the forecast for agricultural development in the region, according to which the agricultural sector of Sub-Saharan Africa could lose about USD 46 bn by 2030. In the absence of any support measures, and given the current population growth and pace of agricultural development, the number of hungry people in SSA could reach a catastrophic 418 mln by 2026.

The 2022 crisis clearly demonstrated the strong dependence of the world’s most vulnerable countries, including those in Africa, on the balance of the global fertilizer market. And one of the key reasons for the decline in fertilizer consumption and crop production were various unilateral and sanctions restrictions.

The initiators of the sanctions tried to prevent the adverse impact of the sanctions on fertilizer supplies, but employed manual management methods – licenses, permits to operate, subsidies – to do so. Such manual management practices also included the Grain Deal and donations of fertilizers to the most affected countries. However, the fertilizer market is large and interdependent, and manual management will always be much less effective than restoring normal market balance.

Implementation of the Grain Deal made it possible to secure the supply of food from Ukraine, but it did not contribute to overcoming the disruptions in the supply of Russia-originated fertilizers to global markets. If we compare the impact of the Ukrainian grain supply under the Grain Deal and that of the shortages of fertilizers and ammonia caused by the sanctions, an extreme disparity can be observed. Thus, the supply of grain under the Grain Deal allowed to provide about 95 mln people with food. If a similar calculation is made for fertilizers and ammonia that failed to reach the market due to various restrictions, those volumes could be used to produce enough agricultural products to feed about 199 mln people.

Although Russia withdrew from the Grain Deal in the summer of 2023 due to the continuous breach of covenants, it does not rule out rejoining the deal, providing both parts of the Grain Deal (supply of grain and fertilizers) are honoured. A speedy resumption of the Grain Deal is vital to maintain the progress achieved in lowering global food prices and to boost political discussion of measures to ensure unhindered access of Russia-originated fertilizers to the global market.

We believe that in order to restore the balance in the fertilizer market, it is necessary to initiate a public discussion involving all the stakeholders, assess the situation and the consequences of all relevant decisions (both restrictive ones and measures such as the Grain Deal) made at the international level, and take effective steps to lift the restrictions on fertilizer supply and prevent similar crises in the future:

1. Revision and tailoring of sanction policies are crucial for preventing any restrictions on the supply of fertilizers and agricultural products, including logistical, banking, and other disruptions, this might include the following:
   1. It appears necessary to adjust the EU’s supranational regulatory mechanisms in order to ensure strictly unified legislative approaches towards sanctions implementation and/or sanctions carve-outs in specific areas. Thus, EU member states should be limited in their power to interpret and handle the provisions of the EU sanctions regulation (EU Council Regulation), including derogation mechanisms, in cases when such regulations directly or indirectly affect operations with humanitarian goods and agricultural products.
   2. Considering the scale and impact of the EU, the US and the UK on global trade, it seems crucial to introduce specific proportionality tests in cases when sanction policies of these states directly or indirectly affect operations with humanitarian goods and agricultural products. Such proportionality tests should not only include the assessment of consequences of the imposed measures for the...
targeted state and/or entity, but also model the potential effects of sanctions on third parties – citizens of third states and third states themselves, especially the most vulnerable ones in Africa and Asia.

3. It is advisable to carry out an assessment of the existing sanctions cases and the adopted restrictive measures in relation to the supply of fertilizers using the framework of the proportionality tests described above. This would be an important step to further minimize the negative effects of these measures on food security in the most vulnerable countries.

4. It is necessary to review the existing sectoral sanctions and develop exemptions to ensure the supply of fertilizers to the global market in the required volumes. Such sectoral sanctions include bans on the import of potassium-containing fertilizers from Russia and Belarus, as well as the restrictions on the supplies of critical equipment and spare parts necessary for fault-free operation of fertilizer production facilities.

5. Anti-dumping measures should also be examined and revised in the cases where they severely disrupt normal fertilizer market balance and/or negatively affect fertilizer supplies to third countries, especially the most vulnerable ones.

- Formal investigations through multilateral international institutions to compensate the affected countries and, if necessary, to hold accountable key decision-makers who imposed sanctions and other unilateral restrictions.

- Efficient and workable mechanisms for emergency financial and humanitarian assistance are to be developed with participation of key international institutions:

1. It appears necessary to urgently establish special compensation mechanisms to repair the humanitarian and financial damage inflicted on the most affected countries by sanctions and other unilateral restrictions on fertilizer supplies. These compensation mechanisms should be developed with the participation and the engagement of countries that initiated restrictions and ultimately contributed to the global spread of hunger.

2. Development of multi-state financing formats and instruments to fund the restructuring of the global agro-industry in order to increase the availability and affordability of fertilizers and provide the growing global population with food, achieving Zero Hunger, one of the UN sustainable development goals (SDG 2).

- At the same time, systemic measures are required to improve the sustainability and self-reliance of African agribusinesses:

  - Given Africa’s population growth rates, local agricultural production should be sustainably boosted through increased domestic fertilizer production, improved technological literacy rates and awareness of fertilizer use among farmers, and the construction of irrigation schemes.

  - Access to financing for fertilizer purchases on the global market should be made available to African farmers, taking into account the specifics of fertilizer supply using letters of credit.
Introduction

In 2022, the world faced unprecedented challenges to global food security. Disruptions in global food and fertilizer supply chains resulting from the Russia–Ukraine conflict and subsequent sanctions exacerbated market imbalances already observed in 2021. By 2023, a myriad of different unilateral restrictions became the “new normal” for many markets and players. But food and fertilizers are not just commodities. They are the backbone of global food security and the right of every human to live in dignity.

The number of hungry people worldwide is growing rapidly. In 2022, it reached a dramatic 735 mln, which means 1 in 10–11 people on the planet face food insecurity. The situation is the direst in several regions of Africa, where the share of undernourished people reached 23% in 2022. For example, last year the number of hungry people in Sub-Saharan Africa increased by 9 mln, to 262 mln people, compared to 2021. It is in this region of Africa that food insecurity is the most acute today, with food consumption costs rising rapidly: as of 2022, in some countries those costs exceeded 80% of household incomes. Both the total number of hungry people and the proportion of the population experiencing severe food insecurity are on the rise (IPC/CH 3+ phases).3 This was mainly driven by the fact that between 2020 and 2022, Sub-Saharan Africa experienced a significant spike in food prices of 21%.4 This growth rate is three times higher than that of gross national income in SSA.5 Meanwhile, in Europe and the United States, price increases were much lower at 4–6%. The sharp price rise in Sub-Saharan Africa can be characterized as a “price shock” that eroded the affordability of food for the local population, which in turn exacerbated hunger and poverty in the region.

Changing balance in the fertilizer market

Major shifts in the balance of the global fertilizer market emerged in 2021 with the introduction of export restrictions on Belarusian fertilizers, and in 2022 the imbalances intensified.

In 2022, as a result of those imbalances, global exports fell from 230.8 to 210.5 mt, down 9% year-on-year.7 Phosphate and potash fertilizers accounted for the bulk of the decline in global exports in 2022, with phosphate supplies falling by 9.7 mt (to 59.6 mt), potash by 9.0 mt (to 52.4 mt) and nitrogen by 1.5 mt (to 98.5 mt).

Although price imbalances in the fertilizer market first emerged in mid-2021, the market situation deteriorated markedly in 2022 following the outbreak of the Russia–Ukraine conflict and the imposition of sanctions against Russia coupled with a number of other negative factors. The decline in global fertilizer supply led to significant price shifts (at their peaks in spring 2022, fertilizer prices of different products were approximately 100–200% higher than their 2021 annual averages).8 For instance, quotes for key fertilizer

The fertilizer market crisis was a key factor causing a decrease in yields and subsequent food price hikes, which finally led to the global food crisis.
types reached 1,000 USD/tonne (e.g. nitrogen fertilizers), which is 3–5 times higher than the 2017–2020 prices.

The key reasons for the decline in global market supply were restrictions on fertilizer exports from Russia and Belarus as a result of the sanctions.

Global fertilizer and ammonia supply saw a total accumulated reduction of 40.8 mt as a result of all the negative factors since their inception until their termination (or until April 2023 in case they still persist):

a. 16.3 mt – sanctions and trade restrictions against Belarus (8.3 mt) and Russia (8.0 mt);

b. 8.5 mt – increased transportation legs and lead time (3.3 mt of Russian and Belarus volumes);

c. 7.3 mt – fertilizer production cuts due to high feedstock prices (4.7 mt nitrogen; 2.6 mt phosphate);

d. 6 mt – national protectionist measures (including 5.4 mt due to phosphate fertilizer export quotas issued by China and 0.6 mt due to Russia’s ban on ammonium nitrate exports);

e. 2.7 mt – the shutdown of the Tolyatti–Odessa ammonia pipeline.

The restrictions on fertilizer exports and rising production costs made it impossible to maintain global trade volumes at the 2021 levels, forcing players to wage a price war for reduced supplies.

Below we will look at the imposed restrictions in more detail.

Sanctions against Russia and Belarus

Sanctions and other trade restrictions imposed against Russia and Belarus proved to be the most impactful in terms of the cumulative loss of global fertilizer trade.

We have decomposed the impact of each sanctions program on global fertilizer and ammonia supply. As the sanctions programs came into effect and impacted the market at different times, we have presented the cumulative impact, which is best illustrated by the total amount of fertilizer and ammonia supplies lost. The total loss over the period since the inception of such restrictions was 16.3 mt.

Throughout 2021, a series of sanctions and trade restrictions were imposed on the Belarusian potash industry, which significantly limited fertilizer supplies to the global market. In 2022, Western countries expanded the sanctions against Belarus. In March 2022, the European Union imposed a complete ban on the import of Belarusian potash fertilizers, as well as their transportation to the European Union and the engagement of EU service operators for these purposes. These restrictions closed a key route of Belarusian exports. All these factors led to an accumulated loss in Belarusian potash fertilizer exports of 8.3 mt since December 2021. To illustrate the scope of this decline, the loss of 6 mt of Belarusian exports in 2022 is equal to 10% of the global potash fertilizer trade volumes in 2021.

The impact of sanctions and trade restrictions against Russia on global fertilizer and ammonia supply includes the consequences of decisions taken by the authorities of the “sanctions coalition” countries against individuals and legal entities, as well as sectoral restrictions against the Russian transportation, banking, and insurance sectors. The direct consequences of those regulatory decisions include the suspension of fertilizer transit through the Baltic States and Poland, restriction or suspension of operations of those production and trading companies in Europe that regulators consider to be linked to sanctioned individuals, seizure of bank accounts, inability to deliver equipment, blocking of Russian fertilizers in European ports, and more. The cumulative impact of these restrictions on global fertilizer and ammonia supply since March 2022 was estimated at 8 mt.

Increased transportation legs and lead time

Due to the global trade shifts and logistics issues in the fertilizer market, producers had to find new, often longer, trade routes. For instance, Russian fertilizers, which were typically shipped to Europe, now head to countries like Brazil and India, increasing shipping durations.

In 2022, the average shipping time for fertilizers increased by a day, or 4%, compared to 2021. Consequently, more fertilizers remained “frozen” in transit, reducing immediate supply availability. Those “frozen” fertilizer volumes grew by 8.5 mt worldwide in 2022 compared to 2021 (including 2.8 mt of Russian and 0.5 mt of Belarus exports).
Rising costs of nitrogen and phosphate fertilizers

Reduction in nitrogen fertilizer production due to high gas prices

Rising gas prices are commonly cited as the most important factor in driving up the cost of nitrogen fertilizers. That was especially the case for plants operating on imported raw materials.

Galloping energy price growth since the end of 2021 and a spike in September 2022, including the prices for natural gas needed for ammonia production, as well as a reduction in European gas imports from Russia led to a significant cost increase. While in 2019 urea production costs for European plants ranged from USD 145 to 170 per tonne, in 2022 they rose to USD 800–900, making urea production no longer viable.

Moreover, the increase in natural gas prices, coupled with the restrictions on ammonia exports from Russia, led to skyrocketing ammonia prices in 2022 (80–160% higher than the 2021 annual averages), which were a damaging factor for plants that rely on imported ammonia.

As a result, almost 70% of the European fertilizer production capacity has been curtailed. The total drop of European nitrogen fertilizer production caused by rising natural gas prices was estimated at 4.7 mt.

Slump in phosphate fertilizer production due to rising costs

A number of factors drove phosphate price hikes in 2021–2022, including the introduction of protectionist measures, such as additional duties on Russian and Moroccan phosphate exports by the US, changes in production strategy, as well as higher prices for phosphate fertilizer feedstock (ammonia, sulfur, and phosphate rock).

High prices for phosphate rock and ammonia led to a significant increase in the phosphate fertilizer production costs, which became extremely high for plants operating on imported components. The cost for European producers increased by 128% in 2021–2022, to 899 USD/tonne.

In comparison, production costs in the Middle East grew by 27% over the same period, to 408 USD/tonne.

The increase in production costs made domestic phosphate production economically inefficient and led to a reduction in production capacities. Phosphate fertilizer production drop due to rising feedstock prices was observed in North America, Europe, and Africa, and accounted for 2.6 mt.

Reduction of transit through the ammonia pipeline

Before the outbreak of the military conflict in Ukraine, 2.4 mt of liquid ammonia was transported annually through the Tolyatti–Odessa ammonia pipeline, Russia’s main export route for commercial ammonia, which was subsequently exported to Morocco, Turkey, India, and Europe. Ammonia transit across the border was suspended on February 24, 2022. The total accumulated loss of ammonia supplies from Russia due to the suspension is estimated at 2.7 mt for the period from March 2022 to April 2023.

Restrictive measures implemented by exporting countries that affected fertilizer supply

Protectionist measures taken by the Chinese Government

In response to the rising prices and intensifying competition for reduced fertilizer supply in the global market, some exporting countries imposed restrictions to ensure the availability of fertilizers to domestic consumers.

A prime example is China, which introduced export quotas for phosphate fertilizers in November 2021. The quotas were set at 5.5 mt for H2 2021 and 3.5 mt for the same period in 2022. As a result of the quotas, phosphate exports from China decreased by 5.4 mt, or 40% (from 13.7 mt to 8.3 mt) over 2021–2022. The decline in exports from China primarily affected imports by Brazil (-1.9 mt), Pakistan (-1.0 mt), India (-0.4 mt), Australia (-0.4 mt), Argentina (-0.5 mt), and Indonesia (-0.2 mt), accounting for ~3% of global exports.
Protectionist measures taken by the Russian Government

To protect the domestic fertilizer market from potential risks associated with rising global fertilizer prices, Russia introduced the following measures in late 2021 and 2022: a) a ban on ammonium nitrate exports; b) quotas on fertilizer exports from Russia.

The ban on ammonium nitrate exports from February 2 to May 1, 2022 resulted in a 0.6 mt drop in Russia’s nitrogen fertilizer supplies.

The second measure – quotas for export of fertilizers from Russia – did not affect the ability of companies with Russian producing facilities to export fertilizers, since those quotas were set at the level of the historical export volumes.

Therefore, the measures implemented by Russia to protect its domestic fertilizer market were not material for the global fertilizer market.

Reallocation of supply to developed markets

As global fertilizer supply declined, net importers with low purchasing power were the most exposed. With production declining in the US and Europe, net importers in developed countries “pulled” some of the output over to their markets. Overall, the USA and Europe “pulled” about 1.8 mt of nitrogen fertilizers away from Sub-Saharan Africa, which partially offset the loss of supplies from Russia.

A similar pattern emerged in the phosphate fertilizer market, with European countries increasing net imports from China by 0.5 mt to offset the decline in domestic production, while also siphoning off some of the African volumes. Sub-Saharan Africa, for example, saw a 0.034 mt reduction in phosphate fertilizer exports from China to the Sub-Saharan region (3% of the region’s consumption in 2022). As a result, the loss of 0.2 mt of Sub-Sahara’s net imports of phosphate fertilizers can be attributed to the changes in Europe’s and USA’s imports.

Overall, the USA and Europe “siphoned off” 2 mt fertilizers from the SSA markets.

On the whole, the countries from North America, Europe, and Latin America, which faced a fall in fertilizer imports or “pulled” fertilizer supplies away from Sub-Saharan Africa, practically did not experience a significant reduction in fertilizer consumption. There are two reasons behind this: a) those countries had accumulated enough fertilizer stocks in the previous periods to rely on during a turbulent time on the market (USA, Europe, and Brazil generally keep their fertilizer stocks at the level of 30–35% of their annual fertilizer consumption, whereas Africa has historically had significantly lower stocks of around 15%); and b) fertilizer application rates were sufficiently high during previous periods, which, combined with leading agricultural practices, allowed those countries to accumulate enough nutrients in the soil to withstand a few years of slightly reduced fertilizer consumption.

However, when we turn our analysis to Sub-Saharan Africa, the impact of the crisis in the fertilizer market on this region is not that clear. We also note that the statistics regarding fertilizers in Africa (including data for stocks, application rates, etc.) is very limited, which explains the extensive usage of modelling and approximations in our work.

Impact of the fertilizer market crisis on agriculture in Sub-Saharan Africa

SSA’s average grain yield growth rate over the past 6 years has been as low as 1.5%, almost half that of South Asia (2.9%) and 1.7 p.p. behind the rate of population growth. Reducing fertilizer application to the already depleted soils poses the risk of further yield decline. Based on our economic model, we estimated that for each kilogram of fertilizer that was not applied there is a loss of about 7 kg in grain yield.

Moreover, low profits in the 2022–2023 season did not encourage farmers to purchase fertilizers this season, which will further reduce fertilizer application and seed quality and thus negatively affect yields in 2023–2024.

However, despite the critical importance of fertilization and the fact that the fertilizer application rates in Sub-Saharan Africa are already the lowest in the world, such factors as the inability to pass on costs to consumers, lack of government support for the local farmers, and the systemic problems...
of the agribusiness sector in the countries of Sub-Saharan Africa, prevented the region even from maintaining the previous fertilization levels. This will undoubtedly affect soil fertility.

### Inability to pass on costs to consumers

Food constitutes a much higher portion of the CPI basket in African countries as compared to the developed world, making SSA countries most vulnerable to soaring food prices. According to the IMF, consumers in Sub-Saharan Africa spend 30–60% of their income on food, compared to just 10–20% in developed countries (the USA, EU). As such, the rise in food prices could lead to an increased rate of growth in the number of people suffering from hunger, which makes it impossible to pass the cost increase on to customers.

Moreover, in some SSA countries (such as Nigeria, Kenya, Zambia, Uganda, Zimbabwe, etc.) domestic food prices are regulated. Basic staple grains are commonly subject to maximum price controls. Such non-free-market regulation measures were established with the aim of protecting the population, since grains form a major part of the diet for many people and are essential for food security.

These regulations help governments to partly control food prices, but on the other hand, they lead to a decline in farmers’ margins and eventually ruin farms’ economics.

### Lack of support measures from the government

Government subsidies and strong social protection of the population in developed countries allowed to mitigate the negative impact of price volatility and falling global trade volumes. However, SSA countries found themselves at an impasse as they did not have similar mechanisms for supporting the agro-industrial complex due to the high dependency on imported volumes and low purchasing power.

In Sub-Saharan Africa, where fertilizer production is almost non-existent and consumption is heavily dependent on imports, the countries faced the most urgent problems. The governments struggled to support farmers due to budget deficits. For example, in Malawi the list of subsidy recipients was reduced to include only the extremely poor farmers. The lack of subsidies resulted in additional costs for African farmers and declining agricultural production in Sub-Saharan Africa.

All these factors have a negative impact on the yields of key crops that play a significant role in the consumption structure of the SSA population (grain – 49% of total consumption, oilseeds – 19.1%). Any reduction in their domestic production will have an immediate negative knock-on effect on food security in the region.

### Impact of the fertilizer market crisis on the food security in Sub-Saharan countries

In 2022, global fertilizer supplies dropped to the 2018 levels. This might not seem like a huge problem, if one does not take into account the 300 mln people added to the global population in those four years, including 100 mln in Africa alone, and a 29% rise in food inflation. This sharp decline poses serious food security risks, especially in newly emerging African economies, as the 2018 fertilizer application rates are not enough to sustainably feed the growing population due to potentially lower crop yields.

In 2022, net-importing countries with a low per capita GDP, including countries in Sub-Saharan Africa, came under the most pressure following the shocks in the fertilizer market. Most countries reduced their fertilizer consumption due to extremely high prices driven up by the decline in global supply, but it was only in Africa that reduced fertilizer application immediately resulted in an increase of 9 mln in the number of hungry people. The situation was the most critical in Nigeria, Democratic Republic of the Congo, Ethiopia, and Kenya, where the proportion of hungry people in the most severe phases (IPC/CH Phase 3+) reached 12%, 26%, 21%, and 10%, respectively.

### Impossibility to replace domestic crop production by food imports

The share of domestic production in SSA’s crop consumption stands at about 80%, which makes the countries highly dependent on local production. Any decrease in yield
not accompanied by a change in the harvest area will immediately lead to an overall reduction in grain production.

The problem of falling domestic agribusiness production in Sub-Saharan Africa is exacerbated by the declining affordability of imports. The food market crisis caused by the COVID-19 pandemic triggered a surge in food inflation, and with the outbreak of the conflict in Ukraine, the problem escalated at an even faster rate. Current grain deficit is equal to 20 mt, and this figure will grow with the population increase.

If the resulting deficit is not compensated by imports (as was observed in 2021–2022), grain consumption per capita will decrease, which ultimately will lead to an increase in the number of undernourished people.

However, addressing the worsening humanitarian situation in Sub-Saharan Africa through external support alone will not halt the growth of hunger globally. Subsidies from developed countries in the long run, with unchanged fertilizer production volumes, will lead to a worldwide price increase due to heightened demand. Moreover, increased affordability in Africa due to external subsidies will exacerbate price growth and reduce fertilizer accessibility in other low-income importing countries (such as Asia and Latin America). Besides, a 20 mt boost in grain imports means that Sub-Saharan Africa will need to increase their current imports nearly by half, which itself is quite a sophisticated task. In the long term, the shortfall might only be covered by domestic production increase.

Possible consequences

In 2022, fertilizer prices skyrocketed by 85% in SSA. Since fertilizers account for a significant part of farmers’ production costs (for instance, 62% for maize in SSA), an 85% increase in fertilizer prices should have brought the prices of agricultural products in the region up by 53%. In theory, local farmers had two options to deal with the rising costs: decrease the volume of consumed fertilizers or, alternatively, increase the prices for their produce. However, the latter option was unviable due to at least two following reasons:

a. The SSA population already spend most of their income on food and cannot afford to spend much more: according to the IMF, consumers in Sub-Saharan Africa spend 30–60% of their income on food compared to just 10–20% in developed countries (the USA, the EU).

b. In some SSA countries, domestic food prices are regulated, as basic staple grains are commonly subject to maximum price controls.

Consequently, farmers had only limited opportunity to increase prices for their products. Overall, the prices for agricultural products were up by 10–15% in SSA, which is significantly lower than the increase in their production costs associated with growing fertilizer prices. Therefore, the entire increase in food prices in SSA in 2022 can be attributed to the soaring prices of imported fertilizers.

As a result, SSA farmers were forced to decrease consumption of fertilizers and still had to pay very high prices for the volume of fertilizers that they purchased.

The slight growth of grain consumption in SSA in 2022 should not mislead anyone, as 1) we expect the delayed effect of decreasing agricultural yields to manifest itself by 2024; and 2) the SSA population keeps rapidly growing every year, so even keeping the current levels of hunger from worsening requires that grain consumption keeps increasing in line with the population growth. That obviously was not achieved in 2022, which means that the average per capita grain consumption declined.

The government regulation of food prices was not able to prevent the spread of crisis. If governments of SSA countries continue to regulate food prices, the situation will translate into acute shortages and lower quality of food available to the population. But even without price regulation, people living in SSA cannot afford to buy food at higher prices, as was reasoned above.

Moreover, even though the increase in food prices was lower than the jump in production costs associated with the rising fertilizer prices, it was enough to greatly aggravate
the situation with poverty and hunger in the region. Below is a more detailed description of these humanitarian consequences, followed by a review of associated economic losses.

Humanitarian consequences

Rising hunger

High food inflation and declining farmer incomes drove up the number of hungry people in Sub-Saharan Africa in just one year – from 2021 to 2022 – by 9 mln, to a shocking 262 mln people, or 23% of the population.

As both the population and the number of hungry people in the region keep rapidly growing, immediate action is needed to ensure food security for the 262 mln people faced with food shortages. In 2022, the gap between actual grain consumption in Sub-Saharan Africa and the amount needed to ensure food security was estimated at 20 mt. In the short term, it is impossible to cover this shortfall, which is equal to 12.3% of the current production volumes, by increasing the yields of key crops.

In the absence of any support measures, and given the current paces of population growth and agricultural development, by 2026 the number of people suffering from hunger could grow by more than 50%, to 418 mln people, bringing the region closer to a humanitarian catastrophe.

Rising poverty

Rising food prices affected household spending for the most vulnerable groups, pushing large numbers of people below the poverty line.

UNDP estimates that due to the global food price hikes, the number of people living below the poverty line (less than USD 3.2 per day) increased by 72 mln worldwide. The most affected region was Sub-Saharan Africa, where the incomes of 28 mln people fell below the poverty threshold of USD 1.9 per day in 2022 due to inflation.

Economic losses

The humanitarian situation in the region worsened due to a series of economic problems, including falling farm profits and rising food costs. The states’ attempts to minimize the effects of the crisis in the food market led to an increase in foreign debts, restricting further development of the countries.

Rising consumer spending

The crisis in the food market resulted in Sub-Saharan Africans overpaying USD 78 bn for food in 2022.

The 2022 price growth caused food spending in Sub-Saharan Africa to increase by 24% in USD terms compared to 2020. In 2022, the already high share of food costs in the region increased further – from 40% to 44%.

Loss of farmers’ profits

The price escalation changed the cost structure for African farmers and eroded the profitability of their operations, resulting in losses. In 2021, about 36% of farmers’ income was spent on fertilizers, but in 2022 this share rose to nearly 56% due to an 85% price increase. Given the restrictions on maximum prices for staple foods, increased fertilizer costs could not be offset by buyers: grain prices rose by 11% on average, while input costs rose by almost 50%, and farmers’ profit margins fell from 42% to 22%. Translated to 2022 volumes and prices, this 20% reduction in profit margins corresponds to USD 17.9 bn in lost profits for Sub-Saharan African farmers. Moreover, during 2021–2022 farmers lost USD 2.2 bn due to underproduction caused by low yields. Overall losses of farmers are estimated at USD 20.1 bn. Additionally, a reduction in the long-term yield growth rate from 1.9% (2016–2020) to 0.4% (2021–2022) would result in a loss of about 113 mt of grain and oilseeds between 2023 and 2030, translating into further losses.

National debt increase

Rising prices for imported fertilizers and food cannot be fully passed on to Sub-Saharan consumers. Government support measures can partially compensate households for their increased costs, but these measures add to the external debt burden. In the coming years, the region will face high interest
payments (in some cases exceeding 50% of government revenues). If the countries face difficulties in paying their debts or extending their maturities, this could potentially have far-reaching consequences for the region’s economic growth and social development.

**Measures required to ensure food security**

The 2022 crisis clearly demonstrated the strong dependence of the world’s most vulnerable countries, including those in Africa, on the balance of the global fertilizer market. And one of the key reasons for the decline in fertilizer consumption and crop production were various sanctions restrictions.

We have come to an understanding that this impact may be avoided if sanctions policies and implementation process become more straightforward, transparent, commensurate to the goals which sanctions aim to achieve, and take into account the interests and concerns of third countries, which are not themselves subject to sanctions policies, but depend on the market and countries subject to the sanctions.

The initiators of the sanctions tried to prevent the adverse impact of the sanctions on fertilizer supplies, but employed manual management methods – licenses, permits to operate, subsidies – to do so. Such manual management practices also included the Grain Deal and donations of fertilizers to the most affected countries. However, the fertilizer market is large and interdependent, and manual management will always be less effective than restoring normal market balance. Nonetheless, the agreement of all parties and Russia in particular to continue with the Grain Deal (providing both parts of the deal – grain and fertilizers – are honored) as soon as possible is vital to maintain the progress achieved in lowering global food prices.

We believe that in order to restore this balance, it is necessary to initiate a public discussion involving all the stakeholders, assess the situation and the consequences of all the relevant decisions made at the international level (both restrictive ones and measures such as the Grain Deal), and take effective steps to lift the restrictions on fertilizer supplies and prevent similar crises in the future:

- Develop efficient and workable mechanisms for emergency financial and humanitarian assistance to affected countries, with participation of key international institutions, including support from countries that have contributed to the spread of hunger in the most vulnerable countries. I.e.:
  - Urgently establish special compensation mechanisms to repair the humanitarian and financial damage inflicted on the most affected countries by sanctions and other unilateral restrictions on fertilizer supplies. These compensation mechanisms should be developed with the participation and the engagement of countries that initiated restrictions, hence, contributing to the spread of hunger in the world. The ongoing and proposed assistance mechanisms and relevant initiatives should be publicly discussed, including an objective assessment of their effectiveness.
  - Develop multi-state financing formats and instruments to fund the restructuring of the global agroindustry in order to increase the availability and affordability of fertilizers and provide the growing global population with food, achieving Zero Hunger, one of the UN sustainable development goals (SDG 2).

- Review and tailor the policy of sanctions, as they have been a key factor in causing logistical, banking, and other disruptions to food and fertilizer supplies. Lifting the restrictions on fertilizer supplies would help increase global market availability and lower the prices, making fertilizer more affordable for smallholder farmers, including in vulnerable countries. The following actions may be considered:
  - Adjust the EU’s supranational regulatory mechanisms in order to ensure strictly unified legislative approaches towards sanctions implementation and/or sanctions carve-outs in specific areas. Thus, EU member states should be limited in their power to interpret and handle the provisions of the EU sanctions regulation (EU Council Regulation), including derogation mechanisms, in cases when such regulation directly or indirectly affects any operations with humanitarian goods and agricultural products. Such carve-outs should cover, inter alia, areas like banking, insurance, provision of industrial goods and technologies for the fertilizer production, transportation sector, and commodity trading facilities.
Introduce specific proportionality tests in cases when sanction policies of these states directly or indirectly affect operations with humanitarian goods and agricultural products. Such proportionality tests should not only include the assessment of consequences of the imposed measures for the targeted state and/or entity, but also model the potential effects of sanctions on third parties – citizens of third states and third states themselves, especially the most vulnerable ones in Africa and Asia.

Using the framework of the proportionality tests described above, carry out an assessment of the existing sanctions cases and the adopted restrictive measures in relation to the supply of fertilizers. This would be an important step to further minimize the negative effects of these measures on food security in the most vulnerable countries.

Review the existing sectoral sanctions and develop exemptions to ensure the supply of fertilizers to the global market in the required volumes. Such sectoral sanctions include bans on the import of potassium-containing fertilizers from Russia and Belarus, as well as the restrictions on the supplies of critical equipment and spare parts necessary for fault-free operation of fertilizer production facilities.

Examine and revise the anti-dumping measures in the cases where they severely disrupt the normal fertilizer market balance and/or negatively affect fertilizer supplies to third countries, especially the most vulnerable ones.

Initiate formal investigations through multilateral international institutions to compensate the affected countries and, if necessary, to hold accountable key decision-makers who imposed sanctions and other unilateral restrictions.

At the same time, systemic measures are required to improve the sustainability and self-reliance of African agribusinesses:

Given Africa’s population growth rates, local agricultural production should be sustainably boosted through increased domestic fertilizer production, improved technological literacy rates and awareness of fertilizer use among farmers, and the construction of irrigation schemes.

Access to financing for fertilizer purchases on the global market should be made available to African farmers, taking into account the specifics of fertilizer supply using letters of credit.
Overview of the Global Mineral Fertilizer Market
In 2020, the COVID-19 pandemic caused a global recession, labor shortages, and supply chain disruptions that affected the quantity and quality of food available to people. Triggered by the COVID-19 panic, market prices started to move up in response to the market panic caused by insufficient supplies. This increase did not last for long as many exporters maintained their activity. But next, an unpredictable increase in crop prices like corn and soybean took place, significantly boosting fertilizer prices starting from early 2021. Thus, the recovery from the pandemic came with exorbitant price increases for food, energy, and agricultural inputs such as seeds and fertilizers. Later in 2021, it was followed by a number of unexpected but important events that affected sales and distribution of the three main nutrients: an increase in gas prices in case of nitrogen, sanctions against Belaruskali for potash, and Chinese export quotas in case of phosphates.

The abovementioned factors made fertilizer availability in terms of production lower than usual, while the demand fundamentals were still healthy with Brazil and India, which also sent the prices soaring.

In addition, global conflicts significantly contributed to the abovementioned developments. Thus, starting from late February 2022, the situation got unpredictably worse due to the Russia–Ukraine conflict and related sanctions against Russia, and the panic level reached its maximum. The conflict further disrupted the access to energy, fertilizers and grain; that tripled the cost of fertilizers and triggered a more than 30% increase in the price of food in some parts of the world.

This sequence of events led to a significant increase in fertilizer prices, which heavily affected the willingness to pay of all regions and the ability to pay of certain regions and caused demand destruction. As a result, in 2022 global fertilizer production cuts amounted to 23.7 mt, global exports declined by 20.3 mt, leading to a subsequent equivalent drop in imports, which resulted in a 23.7 mt decline in global consumption and rising fertilizer prices. At their peaks in 2022, the prices of different fertilizers were approximately 100–200% higher than their 2021 annual averages.

In this report we will analyze all the fertilizer market indicators, such as trade, production, consumption, etc., in terms of physical weight, because this report involves the assessment of changes in fertilizer trade, where most of actual cross-border data comes only in physical weight (for example, this is the case for GTT, which is used as a primary source of fertilizer trade data in our report).
In the years leading up to 2021, global fertilizer production had been steadily increasing. In 2021, production was up by 4% compared to 2018. The most significant growth over that period was observed in Sub-Saharan Africa (20%) and CIS (13%). However, in 2022 the world experienced a pronounced fall in production of fertilizers, as it went down by 23.7 mt (or 5%), from 500.3 mt in 2021 down to 476.6 mt in 2022. The CIS decreased production by 25%, Europe by 13%. The only regions with substantial growth despite the overall fall were...
Sub-Saharan Africa and Latin America, as they increased production by 53% (1.9 mt) and by 11% (1.3 mt), respectively. However, this growth was not significant for the fertilizer market in absolute terms.

What is more, production kept changing well into 2021–2022. The increase in gas prices in many parts of the world, especially in Europe, pushed some producers of N fertilizers, e.g. Yara, to reduce production and raise their prices.

1.1.2. Fertilizer exports

Historically, the countries of Europe, Asia, and North America have been the main exporters of fertilizers, and over the past ten years they have been steadily increasing fertilizer supplies to the global market. Russia, Canada, China, the United States, Morocco, and Saudi Arabia are the leading fertilizer suppliers. Together, they account for up to ~70% of global exports and supplied a total of 441.2 mt of products in 2018–2021.

The recovery from the pandemic in 2021–2022 came with exorbitant prices for food, energy, and agricultural inputs, such as seeds and fertilizers, followed by a number of events that affected fertilizer trade around the world:

- The sanctions against Belaruskali which accounted for around 19% of the global export of potash.
- Sanctions against Russia due to the Russia–Ukraine conflict, which disrupted exports of nitrogen, phosphate, and potassium fertilizers, as well as non-sanction-related consequences of this conflict.
- The Chinese Government ban on export of DAP/MAP to protect their local market, coupled with the huge increase in international ammonia prices.
- The protectionist measures by the Russian Government.

In 2022, fertilizer exports experienced an even sharper fall than the production. Overall, exports decreased by 9%, down to 210.5 mt. The most significant declines were recorded for Belarus (61%), China (21%), Morocco (13%), and Russia (12%). At the same time, Sub-Saharan Africa’s exports increased by a striking 156% – from 1.1 mt in 2021 to 2.8 mt in 2022. However, this small-scale growth was unable to compensate for the overall decline in exports on a global scale. As a result, the availability of fertilizers decreased, which had an impact on prices and, finally, the consumption of many net-importing countries.

Source: Global Trade Tracker
I. Overview of the Global Mineral Fertilizer Market

1.1. Fertilizer consumption

4. Fertilizer consumption, physical mt

Over the past few years before 2021, global fertilizer consumption had been steadily increasing. The accumulated growth between 2012 and 2021 equaled 14%. The most significant growth over that period was observed in Russia (52%) and Brazil (84%), and even in the developing region of Sub-Saharan Africa, where consumption grew by 48%.

However, in 2022 the world experienced a pronounced drop in consumption, as it went down by 23.7 mt (or 5%), from 500.3 mt in 2021 down to 476.6 mt in 2022.

What were the underlying factors that produced such dynamics? As was already mentioned, the events of 2021–2022 made fertilizer availability in terms of production lower than usual. At the same time, the demand fundamentals were still healthy with Brazil, and India running at extremely low inventories, which consequently brought the prices for the three main nutrients to unprecedentedly high levels by the end of Q4 2021. This heavily affected the willingness to pay of all regions, leading to demand destruction. In this regard, it is quite important to distinguish the following types of fertilizer-consuming countries:

- Countries where farmers sell their products to export markets, thus the prices for their produce are correlated to international market prices (e.g. Brazil, the US, Western Europe): such countries will keep purchasing fertilizers as long as the impact from the decline in marginality is lower than that of loss of crops.
- Countries where farmers are not export-oriented, but the governments are heavily involved in fertilizer procurement. For instance, India cannot afford to have lower yields, so the government is heavily subsidizing fertilizer procurement and offsetting the fertilizer price increases to a considerable extent.
- Countries where farmers are not export-oriented, but the governments are not strong enough to protect the farmers, including most African countries. The result is the obvious huge loss of yields that were low from the beginning because of poor and non-nourished soils.

Therefore, Africa became the region where demand destruction, driven by high prices and undersupply of fertilizers, was felt the most because it has the lowest willingness and ability to pay.
The decrease in global fertilizer supply forced importers to adjust to the new reality. In the EU, imports fell by 2%, in the US by 24%. The only major market that actually increased its imports was India (26%). Sub-Saharan Africa’s imports went down by 4%, from 6.8 mt in 2021 down to 6.5 mt in 2022. The imports of fertilizers also significantly decreased in case of Ukraine (2.7 mt), Thailand (1.5 mt), Argentina (1.4 mt), Spain (0.7 mt), and Malaysia (0.6 mt).
1.1.5. Fertilizer net imports

6. Net fertilizer import distribution, physical mt

The chart above illustrates the evolution in net imports of macro-regions over the last five years. The key fertilizer net-importing regions are Latin America, Oceania, Sub-Saharan Africa, and Europe. Net exporting regions include the CIS, North Africa, and North America. Asia turned from being a net importer in 2018 into a net exporter in 2021–2022.

Now it is worth taking a closer look at each region to understand the key underlying factors.

**North America**

Mainly thanks to Canada, which is one of the key fertilizer producers and exporters and has a relatively low domestic consumption, North America is generally known to be a net exporting region. Over the past five years North America increased its net exports by 74%, from 5.4 mt in 2018 up to 9.4 mt in 2022. The main reason behind this is the fact that the USA lowered its imports during this period from 26 mt to 22 mt, while its exports grew from 9 mt to 10 mt.

**Europe**

Europe on the whole is a net-importing region. It has sufficient production capacities, but still its level of consumption cannot be met solely through domestic production, so the region requires imported fertilizers. During 2018–2021, its net import was relatively stable at 1-2 mt; however, in 2022 it sharply increased by 323%, from 1.3 mt in 2021 up to 5.5 mt in 2022. This occurred largely due to partial shutdown of some production capacities in Europe because of falling fertilizer production margins as a result of high gas prices. Another important reason was sanctions and other restrictions against Russia, which, among other things, led to the cessation of ammonia supplies through the Baltic States and via the Tolyatti–Odessa ammonia pipeline (the reasons will be examined in the next chapter).

**The CIS**

The CIS region, where such major fertilizer-producing countries as Russia and Belarus are located, is the leading net exporter of fertilizers. The region has abundant resources of natural gas (Russia), potash (Belarus) and also has sufficient materials for production of phosphate fertilizers (Russia, Kazakhstan), meaning that all the three key nutrients are covered. In the three years leading up to the crisis in the fertilizer market, net exports of the region kept growing.
In 2020, it increased by 8% compared to 2018 (43.4 mt) and amounted to 46.8 mt. In 2021, it increased even further, to 49.0 mt. However, in 2022, net exports dropped by 31%, to 33.7 mt. The key factors behind this were sanctions and trade restrictions imposed on Russia and Belarus (Belarus was first hit in 2021, and after the outbreak of the conflict in 2022 Ukraine western countries started imposing sanctions against Russia and expanding the existing sanctions against Belarus). They both directly and indirectly hindered supplies from Russia and Belarus to the world market.

Asia
Over the last five years, Asia turned from being a net importer in 2018 (net imports of 5.3 mt) to being a net exporter in 2022 (net exports of 1.2 mt). The classification of Asian countries as a separate region is conditional, and despite being categorized as overall net importers, they are also characterized by significant import volumes into individual countries. This happened despite the fact that Asia as a region includes such countries as India, China, and Indonesia, which are known for their high volumes of imports. Over this period, India even expanded its imports, from 18 mt in 2018 up to 23 mt in 2022. But overall, over the past five years, Asian countries increased domestic fertilizer production by almost 10 mt, thus ensuring its capabilities to meet local demand and even expand the exports.

Latin America
Brazil is one of the key food-producing regions in the world, but does not have sufficient fertilizer production capacities, so the country is the largest importer of fertilizers in the world. Mainly thanks to Brazil, but also to some other countries, Latin America is the world’s leading fertilizer net-importing region. In the past few years before 2022, the region had been steadily increasing its net imports, from 42 mt in 2018 up to 57.1 mt in 2021 (36% growth). This trend was largely in line with the increasing imports into Brazil, which grew from 29.5 mt in 2018 to 41.6 mt in 2021. However, in 2022 Latin America’s net import declined by 12%, down to 50.2 mt. Once again, one of the main drivers of this change was Brazil, which decreased its imports by 3.4 mt in 2022.

North Africa
North Africa has abundant resources for production of phosphate fertilizers (Morocco is a leading producer of phosphates with the largest resource base in the world) and natural gas deposits (Algeria, Egypt) needed for production of nitrogen fertilizers. At the same time, fertilizer consumption in this region is relatively low. This explains why North Africa became a net exporter of fertilizers. Over the past few years, net export of the region steadily grew up. In 2022, it equaled 18 mt, a 14% growth from 15.8 mt recorded in 2018. Increasing demand for imported fertilizers from Latin America, Asia, and Europe ensures the sales markets for fertilizers from North Africa.

Sub-Saharan Africa
Sub-Saharan Africa, lacking own fertilizer production capacities, is a net importer of fertilizers. From 2018 till 2020, its net import increased by 41%, from 5.1 mln up to 7.2 mt. However, in 2021 and 2022, its net import subsequently decreased and was down to 3.8 mt in 2022.
Over the recent years before 2021, Sub-Saharan Africa’s fertilizer consumption kept increasing. However, in 2021 and 2022, there was a substantial drop in the volume of fertilizers consumed by SSA countries: in 2022, consumption in the region was down by 0.6 mt (6%) compared to 2021 levels.
Sub-Saharan Africa turned out to be a region where demand destruction, driven by high prices and undersupply of fertilizers, was the most pronounced because this region had the lowest willingness and ability to pay the exorbitant prices for fertilizers.

Oceania
Oceania is a net importer and its balance remained relatively stable with a surge in fertilizer purchases in 2021.
### 1.2. Fertilizer market price dynamics

The turmoil in the global fertilizer market in 2021–2022, including sanctions and trade restrictions, logistical problems and local shortages, created price shocks. They affected all the key nutrients – nitrogen, phosphorus, and potassium.

#### Nitrogen fertilizers

**7. Dynamics of UAN, urea, AN, and TTF prices, USD/physical tonne**

Dynamics of UAN, Urea, AN and TTF prices, $/t

- **Termination of Nord Stream 1**
- **Sanctions against Russia due to the conflict in Ukraine**
- **Cold winter in Asia (record since 1996)**

Source: working group analysis

Natural gas is the most widely used raw material and fuel for nitrogen fertilizer production. About 70% of global supply of ammonia, which is the key intermediate for all nitrogen fertilizer derivatives, is produced from natural gas. Typically, natural gas accounts for approximately 70% of the cost of ammonia, which assumes quite a strong correlation between natural gas and nitrogen fertilizer prices. However, during the period of high volatility, we observe the decreasing correlation between natural gas prices and fertilizer prices. Among other things, it also means that other factors came into play.

In 2008–2021, the UAN price was steady at about USD 200 per tonne. But in May–June 2021, nitrogen fertilizer prices soared, and in March 2022 UAN FOB Baltic price peaked at USD 933 per tonne (160% higher than the 2021 annual average price). Similarly, Urea FOB Baltic peaked at USD 825 per tonne (109% higher than the 2021 annual average price).

In Sub-Saharan Africa, prices also substantially increased. Urea FOB Nigeria reached USD 904 per tonne in spring 2022 (90% higher than the 2021 annual average).

A downward trend emerged later, and in 2023 nitrogen fertilizer prices began to stabilize along with the decline in natural gas prices and the partial recovery of fertilizer supplies to the global market.

#### Phosphate fertilizers

The price of diammonium phosphate (DAP) and monoammonium phosphate (MAP) fertilizers hovered around USD 300–500/tonne from 2010 to 2020. Rising feedstock prices (including ammonia prices), as well as a number of other factors, led to an increase in phosphate fertilizer prices in 2021–2022.

At the same time, FOB Morocco price indices, which reflect the cost of fertilizers in Sub-Saharan Africa, reached their peaks in 2022: in the spring–summer of that year, DAP/MAP FOB Morocco prices came close to USD 1,300/tonne, which was nearly 100% higher than the 2021 average annual prices. In the same period triple superphosphate (TSP) FOB Morocco almost reached USD 1,100/tonne, which was also around 100% higher than the 2021 annual average.

Prices in West Africa also significantly increased. For instance, NPK Bulk CFR West Africa spots almost doubled (from USD 430 to 788 per tonne), peaking at USD 870/tonne. In the middle of that year, a downtrend emerged.
8. Dynamics of MAP, DAP, TSP, and NPK prices, USD/physical tonne

Potash fertilizers

Potash fertilizer prices had historically stayed at the level of USD 200–300/tonne. However, in 2021–2022 the sanctions against Belaruskali followed by the sanctions and trade restrictions against Russia dramatically changed the market landscape, triggering a price hike.

At the same time, it is important to note that potash prices started to rise even before the sanctions formally came into effect. Supply disruptions amid the problems with potash exports from Belarus spurred prices as early as the summer of 2021. Also, the devaluation of the Brazilian real against the dollar in 2021 led to an increase in the profitability and export revenues of Brazilian soybean and corn producers, boosting their purchasing power. As a result, the demand for fertilizers in Brazil increased, and their prices rose as well. Finally, by early 2022, FOB Vancouver (Canada) KCl prices exceeded USD 600/tonne, and at their peak in the summer of 2022 after the outbreak of hostilities in Ukraine, potash prices reached USD 1,000/tonne (a 100–150% increase compared to the annual average prices of 2021). The price hike in Sub-Saharan Africa was even more pronounced, as MOP CFR West Coast Africa reached USD 1,325/tonne (212% higher than the 2021 annual average price).

After the price shock in the spring-summer of 2022, potash fertilizer prices gradually declined, and by mid-2023 they went back to the levels of early 2021. This was facilitated, in particular, by production ramp-up at Canadian plants and increased supplies by Belaruskali, which had partially adapted to operating under sanctions.

Dumping by Belaruskali on the back of discounts on their products restored supply in the market, and potash prices returned to their previous values. In addition, Canadian producers, anticipating a long-term decline in potash supply, reactivated their mothballed capacities and increased production. This also contributed to market rebalancing and lower prices.
Major Changes in the Fertilizers Market in 2022–2023 and Their Impact on Global Food Security

Assessment of the Impact of Various Factors on the Fertilizer Market in 2021–2022
A number of unexpected yet important events affected the sales and distribution of the three main nutrients in 2021–2022, i.e.:

- Direct reduction of fertilizer and ammonia supply as a result of sanctions against Russia in connection with the Russia–Ukraine conflict.
- Direct reduction of potash supply from Belarus as a result of the sanctions against Belaruskali which represented around 19% of the global export of potash.
- Decrease in ammonia supply from Russia due to the shutdown of the Tolyatti–Odessa ammonia pipeline.
- Increase in the volume of fertilizers “stuck” in the global trade due to the restructuring of logistics flows, which resulted in increased transportation legs and lead times.
- Reduced production of nitrogen fertilizers (mainly in Europe) due to a jump in production costs driven by the increase in gas and ammonia prices.
- Reduced production of phosphate fertilizers due to an increase in production costs driven by the rising feedstock prices (phosphate rock and ammonia).
- The protectionist measures taken by the Chinese Government (resulted in the ban on export of DAP/MAP to protect their local market coupled with a huge increase in global ammonia prices).
- The protectionist measures taken by the Russian Government (resulted in a temporary ban on the export of AN and the introduction of export quotas for a number of fertilizers in order to protect the domestic market from the increase in global prices).

A combination of those factors led to a decline in global supply, which, in turn, triggered a considerable growth of fertilizer prices in the international market. In turn, the price growth led to the redirection of trade flows in favor of the regions that were more willing to pay, leaving undersupplied the regions that were less capable to pay (including Sub-Saharan Africa).
2.1. The assessment of fertilizer supply decline and underlying factors

Different data sources were used to assess the effects of each of those factors. For instance, the analysis of Russian fertilizer and ammonia export reduction was based not only on Global Trade Tracker (GTT) data, but also on some other sources for the following reasons:

- Since February 2022, Russia and Belarus, two large exporters of fertilizers, stopped publishing data on their exports, which means that now the analysis of export volumes in GTT can be done only through the thorough analysis of imports by country and the sources of trade flows (so-called “mirror” data on export).
- GTT covers only a limited list of countries, and for some countries data appears with delays.
- For Russia, sources with more accurate export data are available. Therefore, in this section we base our estimates for Russian fertilizer export volumes on these sources instead of GTT, which is used in all other cases as a source of trade data. For Belarus and other countries GTT data is used.

Below is a breakdown of eight factors which contributed to the decline in global supply of fertilizers and ammonia.

2.1.1. Direct reduction of fertilizer supply as a result of sanctions against Russia

The major factor that had both a direct and indirect impact on Russian fertilizer and ammonia exports was sanctions and associated restrictions related to banking services, logistics, equipment supplies, etc. Following the start of the Russia–Ukraine conflict on February 24, 2022, Russia-opposing states (the European Union, the USA, the UK, Switzerland, Canada, Japan, Australia, New Zealand, etc.) imposed a number of restrictions against the Russian economy and Russian businesses. Some of those sanctions were directly related to the fertilizer sector.

- In March and June 2022, the EU, the UK, and Switzerland imposed sanctions on seven people associated with the Russian fertilizer industry. The sanctions were imposed against managers, founders, and owners of all five major Russian-based fertilizer companies – Acron, EuroChem, Uralchem, Uralkali, and PhosAgro, which in total account for 85% of Russia’s fertilizer production.14 Most of the shareholders have divested their stakes in the companies and are effectively no longer affiliated with them in any way. Nevertheless, decisions to block assets and operations were still made by regulators based on the assumption that these companies were associated with sanctioned persons. Moreover, some counterparties are wary of cooperating with these companies due to the risk of secondary sanctions.
- In the summer of 2022, the US imposed sanctions against three people, associated with the Russian fertilizer industry.
- In April 2022, the EU approved the fifth package of sanctions against Russia, which included a complete ban on importing Russian fertilizers, containing potash, to the EU. Additionally, the supplies of materials and equipment for the Russian chemical industry (including fertilizer production) were restricted.
- The EU, the UK, and Switzerland prohibited imports of potash and complex fertilizers of Russian origin (in the EU and Switzerland – subject to annual quotas).15
- The UK, Canada, and Australia imposed additional tariffs on Russian goods, including fertilizers (all types of fertilizers in Canada16 and Australia,17 and phosphorus, complex and potash fertilizers in the UK).18

Additionally, the supply of fertilizers was affected by other sanctions not directly related to fertilizers. Such restrictions include de-SWIFTING of major Russian banks, restrictions on access to international markets for Russian financial institutions, prohibitions for Russian vessels to enter EU ports, as well as restrictions on exports of certain goods to Russia and imports of certain goods from Russia.19

The abovementioned restrictive measures hindered the supplies of Russian fertilizers to global markets and created obstacles for the consumers of Russia-originated fertilizers from third countries. It resulted in the accumulated loss of fertilizer and ammonia supply to global markets of 8 mt for the period since March 2022 till April 2023.
Even though it is impossible to assess the impact of each effect separately, as these effects are complex and usually overlap one another, at least on a qualitative level these consequences may be distinguished as (1) the effects from personal sanctions against individuals associated with fertilizer producers and (2) the effects of non-personal sectoral sanctions and general restrictions against the Russian economy. Further, we will highlight these specific consequences of sanctions, which directly or indirectly contributed to the reduction in the supply of Russian (and even non-Russian) fertilizers to global markets.

Personal sanctions against individuals associated with the Russian fertilizer industry

As has already been mentioned, Russia-opposing countries imposed individual sanctions against persons connected with the Russian fertilizer industry and all five major fertilizer producers – Acron, EuroChem, Uralchem, Uralkali, and PhosAgro, accounting for 85% of Russia's fertilizer production. For example, as per the EU's sanctions, in each case it was explicitly stated in legislative documents that the person [Name] owns or controls the fertilizer company [Name]. So, owning or controlling an entity associated with the Russian fertilizer sector was used as a ground for listing.

According to the EU law, if sanctions are adopted against an individual, all their funds and economic resources must be frozen. In this logic, if a fertilizer company belongs to or is controlled by a sanctioned individual, this asset must also be frozen. Such listing ground directly targets fertilizer companies, hence affecting their operation as some regulators treat such companies as an entity owned or controlled by a sanctioned individual.

At the same time, it was clearly declared by high-level officials that food and fertilizers originating in Russia are not subject to sanctions.

This controversy was highlighted when the Russian fertilizer company Uralchem donated a consignment of fertilizers to African countries. The UN brokered a transportation of 20,000 tonnes of charitable fertilizers from the port of Rotterdam (Netherlands) to Africa, which required negotiations between the Dutch government and the UN.

The Dutch Ministry of Foreign Affairs published a statement: "Although grain and fertilizers do not fall under European Union sanctions, the fertilizer in question was frozen because a sanctioned individual is involved with the Russian company that owns it."20

The personal sanctions served as the basis for the introduction of a number of additional restrictions on fertilizer companies, which also significantly affected the ability of those companies to supply fertilizers to the world market.

Production and distribution disruption

One of the direct consequences of implemented personal sanctions, which contributed to the reduction in the supply of fertilizers to world markets, are the disruptions in production and distribution of fertilizers in Europe.

A striking example of such production disruptions is the Lithuania-based fertilizer plant Lifosa AB, owned by EuroChem. Prior to the sanctions, this entity supplied more than 1 mt of fertilizers to the world markets. However, the plant’s operations were severely impacted due to the fact that the Government of Lithuania treats AB Lifosa as a sanctioned entity, since it believes that Lifosa is associated with the individuals listed in the EU sanctions lists. The plant is constantly faced with disruptions in the supply chain and a shortage of raw materials, which leads to reduced capacity and unplanned shutdowns.21

The work of distribution networks focused on meeting the demand from farmers was effectively blocked (and remains blocked) in many countries, even when those networks sell fertilizers of non-Russian origin. Particular difficulties are observed in Italy, Poland, Hungary, and a number of other countries.

It should be mentioned that the sanctions also affected European fertilizer producers, since they were deprived of Russian raw material and input base. For example, Yara International from Norway terminated its relationship with several suppliers from Russia on the grounds of sanctions. The company’s spokesperson stated that "as a result of the sanctions imposed by the EU on persons linked to certain Russian fertilizer producers, Yara is stopping sourcing from EuroChem, Uralkali, Uralchem, and PhosAgro effective immediately while we carry out a detailed review of the scope and implications of the sanctions".22
The Baltic bottleneck

The main commercial routes for the supplies of Russian fertilizers and ammonia, including those to the third countries, went through the territories of the Baltic States – Lithuania, Estonia, and Latvia. Transportation facility terminals and warehouses in the ports of Sillamäe (Estonia), Klaipeda (Lithuania), and Ventspils (Latvia) suspended their operations as per the decisions of national authorities since February 2022.23 Those decisions were introduced based on the alleged connection of the terminals and warehouses with individuals included in the EU sanctions lists.

Acron reported that it faced termination of the company’s bulk and liquid fertilizer terminal (AS DBT) in Estonia, including a ban on the transportation of fertilizers stored in in Muuga Harbour.24 The deal on the sale of the terminal for transshipment of fertilizers in the port of Riga, owned by Uralchem, another Russian fertilizer company, to a Swiss trader was cancelled as per the decision of Latvian authorities.25 The operations of EuroChem’s ammonia terminal in Sillamäe, Estonia, were also terminated following the decision of Estonian authorities.

In addition to pan-European sanctions, several European countries imposed restrictions on rail shipments from Russia. Estonia and Latvia banned rail freight transit through their territories, and national rail operators Operail and LDZ refused to cooperate with Russian companies. Lithuania is considering similar measures. Due to the imposition of sanctions, Operail and LDZ freight transportation fell by 48% and 25% year-on-year, respectively. All these factors led to a dramatic reduction in ammonia and bulk fertilizer shipments from Russia through those facilities: 8.6 mt shipped in 2021 and January–March 2022 vs. 79,000 tonnes shipped between April and June 2022 and zero tonnes shipped starting from June 2022.

The inability to access Baltic ports forced Russian fertilizer producers to redirect their logistics flows to Russian ports, and these measures increased logistics costs and lead times for Russian companies. It is also worth noting that Russia itself lacks domestic port capacities to re-shape its transits without the Baltic states. Thus, Maxim Kuznetsov, executive director of Russian Association of Fertilizer Producers, explained, “It is impossible to load liquid ammonia in our (Russian) ports, just as in general there are no capacities for transshipment of dangerous goods such as some types of other mineral fertilizers.”26

Zero tonnes of ammonia and bulk fertilizer shipments shipped starting from June 2022.

Banking disruptions

The sanctions led to the freezing of bank accounts and the refusal of most EU and UK banks to provide financial services to Russian fertilizer producers. The decisions to suspend bank account services for Russian fertilizer producers were based on the alleged connection of the companies – owners of those accounts with the individuals included in the EU sanctions lists upon the decision of the EU Council. Those measures hindered payments to customers and suppliers, jeopardizing continued financing of operations and maintenance of production facilities.

Both fertilizer suppliers with Russian production assets and African and Asian consumers report problems with settlements through European Banks. Companies report that more than USD 800 mn has been frozen on their accounts. For instance, fertilizer giant EuroChem Group had around USD 113 mn frozen on its accounts at Deutsche bank as of August 2023.

For example, one of the main financial instruments for African fertilizer consumers are letters of credit that are used for delayed payments for the supplies of fertilizers. Since European banks prefer to suspend or terminate their services to Russian fertilizer companies, African consumers are deprived of this crucially important financial instrument.

The absence of payment options for consumers of Russian fertilizers was also noted by Mr. Macky Sall, President of the Republic of Senegal (in 2022 – Chairperson of the African Union). Calling on the European Union to provide some scope for African countries to pay for imported grain and fertilizers from Russia, he stated, “We want to pay, but it is becoming impossible.”27

International settlements with customers and suppliers have also been made more difficult by the disconnection of 10 Russian banks from the SWIFT system. Foreign banks have closed Russian banks’ correspondent accounts, making international payments impossible. Russian fertilizer producers used Rosselkhozbank for international payments, which was among the banks cut off from SWIFT. The United States allowed JP Morgan to process payments for agricultural exports through Rosselkhozbank, but so far only one payment is known to have been made.

A ban on Russian companies issuing international bonds was also introduced, which, together with the closure of correspondent accounts, shut down the possibility for Russian fertilizer producers to raise foreign debt capital.
Other sanctions against Russia affecting fertilizer supply

Additionally, fertilizer supply was affected by other sanctions not directly related to the fertilizer sector.

1. Restrictions on the entry of Russian vessels into EU ports

The European Union banned Russian ships from entering its ports from April 16, 2022 as part of a package of sanctions against Russia. Exceptions to the ban are possible only with prior authorization from the competent national authority and under strictly defined conditions.

Since April 8, 2023, the ban applies to any vessel that is certified by the Russian Maritime Register of Shipping, regardless of the flag. This ban has caused Europe–Russia sea transportation routes to be diverted to transit through countries that do not restrict transportation to Russia, such as Turkey, China, India and the UAE. The cost of Russian logistics on all routes has risen by an average of 40–60%.

2. Equipment export ban

Restrictions on the supply of equipment, including units critically necessary to ensure the fault-free operation of fertilizer-producing assets, were introduced by the fifth and sixth EU sanctions packages. The sanctions restricted the ability of foreign companies to supply Russian fertilizer producers with equipment (e.g., pressure reducers, jet turbines, pipes, automatic control tools, etc.), as well as contracting and engineering services. Foreign licensors (KBR, Haldor Topsoe, Casale, Toyo, etc.), contractors (Renaissance, Methanol Casale, Thyssenkrupp, Technimont), equipment manufacturers (Mitsubishi Heavy Industries, Air Liquide, etc.) have left the market, cutting off the supply of necessary technologies.

Supplies of equipment and services from these companies are required to support the operation of existing and construction of new gas chemical production facilities and, in particular, fertilizer production. Due to these decisions, it will be hard to maintain the production of fertilizers at the necessary levels. The projects under EPC contracts concluded before March 1, 2022 that are necessary to meet the growing global demand for fertilizers will also be affected. Facilities planned for 2023–2030 and those under construction with a total annual capacity of up to 13.2 mt of ammonia and 16.2 mt of urea are now at risk.

3. Ban on insurance and reinsurance

Sanctions have resulted in major reinsurance companies no longer being able to provide services for Russian entities, including ships carrying grain or fertilizers. Insurance companies are not willing to take the risk of issuing a policy without reinsurance because the risks are too high. The problem is that by the end of 2021, 72% of the risks had been ceded to foreign reinsurance companies, while the remaining 28% were mainly held by the state-owned RNRC. Even though the Central Bank (the sole RNRC shareholder) has increased the company’s charter capital 15 times, to RUB 300 bn, since the end of 2021, it will still not be able to restore the reinsurance market in Russia to the previous levels through RNRC alone. Besides, such a situation leads to risk concentration in one country.

4. Australian, Canadian, and UK import duties

Australia, Canada, and the United Kingdom have imposed duties on Russian fertilizer imports. In February 2023, as part of the economic sanctions imposed on Russia, Canada introduced an immediate 35% tariff on all Russian imports, including nitrogen fertilizers already ordered for the 2022 crop season. The UK followed Canada’s lead and also imposed duties on Russian goods, which include fertilizers.

Nitrogen fertilizer exports from Russia decreased by 62% (0.4 mt) in case of Canada, by 66% (0.2 mt) in case of Australia, and by 78% (0.1 mt) in case of the UK.
2.1.2. Sanctions and trade restrictions against Belarus and its potash fertilizer industry

During 2021, a number of sanctions and trade restrictions were imposed against the Belarus economy, including the Belarus potash industry as one of the key sources of government revenues.

- **June 2021:** the EU adopted a package of targeted economic sanctions, which included trade restrictions on Belarusian potash. The regulation prohibited to import, purchase or transfer, directly or indirectly, potash fertilizers from Belarus, whether or not originating in Belarus.

- **August 2021:** the UK adopted a sanctions package that included a series of trade restrictions applying to Belarusian potash. The regulation prohibited importing, supplying or delivering potash originating in Belarus (including to third countries), as well as technical assistance or brokering services regarding such supplies.

- **August 2021:** the US also imposed sanctions targeting the Belarus potash industry. The US Office of Foreign Assets Control (OFAC) designated Belaruskali, a state-owned Belarusian potash producer, meaning that no US counterparties could be involved in any economic operations with Belaruskali or any entity in which Belaruskali owns, directly or indirectly, a 50 percent or greater interest. Later, in December 2021, the OFAC also designated Belarusian Potash Company, which handled trading and export operations on behalf of Belaruskali.

Some of the sanctions and trade restriction outlined above came into full force later that year (primarily, in December 2021), as international companies were given time to wind down their activities with Belarusian counterparties. As a result of the imposed trade restrictions the supplies of Belarusian potash to the world market were severely affected as the key commercial routes were strictly limited.

In 2022, after the outbreak of the hostilities on February 24, 2022, western countries expanded their sanctions against Belarus. Some of them were directly related to the fertilizer sector. In March 2022, the European Union imposed a complete ban on potash fertilizers from Belarus, as well as on its transportation to the European Union and the engagement of EU service operators for these purposes. These restrictions shut down the key route of Belarus export.

The sanctions generally included a ban on any cooperation of European and American companies with Belaruskali and restrictions on imports of the company’s products. Moreover, they also largely affected logistics. Fertilizers from Belarus were previously exported through Lithuanian ports. In compliance with the European sanctions, Lithuania banned the transit of Belarusian fertilizers through the port of Klaipeda, which previously handled about 11 mt of Belarusian potash fertilizers per year. In response to the sanctions, Belaruskali began redirecting export shipments through Russian ports and started considering building new port infrastructure in the Murmansk and Leningrad regions. The company has entered into contracts for the transshipment of potash through the Russian terminals Petrolesport and Neva-Metal in St. Petersburg, and through the Rybny Port in Vladivostok.

Since March 2022 the US and the EU have completely stopped purchasing potash fertilizers from Belarus. Some of the trade volumes were redirected to China, as it was the only major country that actually increased its supplies from Belarus. However, this increase in supplies to China was really insignificant in comparison with the overall drop in Belarusian export.

The total accumulated loss in Belarusian potash fertilizer supply to global markets amounted to 8.3 mt for the period since the first sanctions against Belarusian potash industry came into full force.

The total accumulated loss in Belarusian potash fertilizer supply to global markets amounted to 8.3 mt for the period since the first sanctions against Belarusian potash industry came into full force (December 2021) through April 2023. As there were no major additional factors in place, this drop in export can be fully attributed to the impact of sanctions and trade restrictions.
2.1.3. Shutdown of the Togliatti–Odessa ammonia pipeline

Before the outbreak of the military conflict in Ukraine, 2.4 mt of liquid ammonia flowed across the border annually through the Tolyatti–Odessa ammonia pipeline, Russia’s main ammonia export route, which was subsequently exported to the United States and Europe. Transit of ammonia across the border was suspended on February 24, 2022, and on June 5, 2023, a section of the ammonia pipeline was blown up in Kharkov Oblast. Togliattiazot announced that it was looking into railroad routes for ammonia transportation.

The total accumulated loss of ammonia supply from Russia is estimated at 2.7 mt for the period from March 2022 till April 2023.

2.1.4. Increased transportation legs and lead time

As a result of the global redirection of trade flows in the fertilizer market and logistical bottlenecks, fertilizer producers throughout the world had to adjust and establish new trading routes which previously were not used due to their longer distances. For example, part of Russian fertilizers which previously used to head to Europe, is now sold to Brazil, India, and other countries, and shipping to these destinations from Russian ports takes much longer. Another example is Canada, which in 2022 increased its supplies to China and India by 0.6 mt (20%) and at the same time decreased its supplies to its closest neighbor, the USA, by 1.9 mt (11%), on the back of total export decline of 1 mt (4%).

According to our estimates, the average lead time of fertilizer shipping to customers (time at sea) in 2022 increased worldwide by 1 day (or 4%) compared to 2021. This means that the volume of fertilizers “frozen” during the shipping (fertilizers that are aboard a vessel that has not yet arrived at the destination port) grew up. All else being equal, in the short term it results in the decline of supply effectively available for potential customers.

The increase in the volume of fertilizers “frozen” in shipping is estimated at 8.5 mt worldwide in 2022 compared to 2021 (2.8 mt and 0.5 mt are Russian and Belarus volumes, respectively).

2.1.5. Slump in European nitrogen fertilizer production due to high gas prices

Traditionally, nitrogen fertilizer and by-product prices have been heavily dependent on the price of natural gas, which accounts for approximately 70% of the cost of ammonia. Accordingly, changes in the gas market directly affect pricing in the nitrogen fertilizer market.

The rise in gas prices in the summer of 2021 was triggered by a very cold heating season of 2020–2021, coupled with low inventories in European gas storage facilities (30%). Phase two of the energy crisis in Europe started with the outbreak of hostilities in Ukraine (late February – early March 2022). The termination of gas supplies from Russia through the Nord Stream 1 pipeline in September 2022, as well as the transit of gas through Nord Stream 2, which never went into operation, provoked another round of gas price hikes.

Another adverse factor for the gas market was the decline in gas flow through other gas export pipelines from Russia, including through Ukraine. After a period of shock, when gas prices briefly soared to USD 3,900 per 1,000 cubic meters, Europe was able to adapt to the changes and by 2023 made up for the loss of more than 49 mt of Russian gas with LNG supplies from other countries.

As a result, Europe experienced a great surge in natural gas prices. The peak was reached in August 2022, when prices hit USD 70 /mmbtu on TTF basis (compared to USD 5 /mmbtu in 2019). This spike in energy prices in 2022, including natural gas needed for ammonia production, as well as a reduction in European gas imports from Russia led to a significant reduction in fertilizer production in Europe.

According to the Financial Times, many of Europe’s chemical companies – including sector behemoths Grupa Azoty, Achema, and CF Industries – responded to the turmoil with shutdowns and cutbacks.33
Rising natural gas prices strongly affected all nitrogen fertilizer production costs. This was especially the case for plants operating on imported raw materials. While in 2019, urea production costs for European plants ranged from USD 145 to 170 per tonne, in 2022 they rose to USD 800–900.

11. Urea production costs, EXW 2022, USD/physical tonne

Source: working group analysis

12. Urea production costs, EXW 2021–2022, %

Source: working group analysis

Urea production is no longer viable at this level of cost. As a result, almost 70% of the European fertilizer production capacity has been curtailed.34

The increase in natural gas prices, coupled with the restrictions on the supply of ammonia from Russia, led to skyrocketing ammonia prices in 2022, which at their peaks were 80–160% higher than the 2021 annual averages. That obviously contributed to the soaring prices of nitrogen fertilizers that use ammonia as an input in their production: their prices peaked in 2022, increasing by 100–160% compared to the 2021 annual averages.

13. Dynamics of ammonia prices, USD/physical tonne

Source: working group analysis

The drop in nitrogen fertilizer production in Europe recorded in 2022 compared to 2021 totaled 5.6 mt. Only two factors could have such a significant impact on production:

a) shortages of ammonia supply at plants that rely on imported ammonia, and

b) high natural gas prices for those capacities that have integrated ammonia supply.
Compared to the previous year, in 2022 the total ammonia imports to Europe decreased in absolute terms by 0.3 mt, which was much less than the huge decline in Russian ammonia supplies to Europe (1.0 mt). The fact that Europe was able to replace a significant part of ammonia imports from Russia by increasing supplies from other countries means that the increase in ammonia prices did not influence the production of fertilizers at plants that work on imported ammonia. We therefore conclude that the drop in European nitrogen fertilizer production at plants that rely on imported ammonia can be fully attributed to the impact of the Tolyatti–Odessa ammonia pipeline shutdown, cessation of transit through the Baltics, and other trade restrictions imposed on Russia that hindered Russian ammonia supplies.

As for the second factor – the impact of high gas prices – according to our estimates, out of the total drop of 5.6 mt in European nitrogen fertilizer production, around 4.7 mt can be attributed to the direct impact of rising natural gas prices. This figure is based on the overall drop of 5.6 mt and the country-specific shares of nitrates and urea fertilizer production capacities that have integrated ammonia supply in Europe (on average around 83% across Europe).

This further increased the pressure on the global fertilizer market, contributing to the redirection of trade flows to Europe.

### 2.1.6. Reduced production of phosphate fertilizers due to an increase in production costs

A number of other factors drove phosphate price hikes in 2021–2022, including the introduction of protectionist measures, such as additional duties on Russian and Moroccan phosphate exports by the US, changes in production strategy, as well as higher prices for phosphate fertilizer feedstock (ammonia, sulfur, and phosphate rock).

It should be noted that protectionist measures intended to keep phosphate prices low within the US and China only had a short-term positive effect. In the long term, phosphate prices continued to rise due to the increasing costs of components used in the production of this type of fertilizers.

The upward trend in phosphate fertilizer costs, which started as early as 2021, continued in 2022. For European producers, the costs soared by as much as 128% in 2022, to USD 899 per tonne. This compares to a 25% increase in China and a 27% increase in the Middle East. The extreme cost increase in Europe was triggered by higher ammonia prices and phosphate shortages. Production costs for African producers increased by 57%, mainly due to higher ammonia costs. Rising ammonia costs pushed African phosphate production costs to the level of North America and China, even though Africa was among the cost leaders in 2021 at USD 319. Rising phosphate rock and ammonia prices also led to a significant increase in the phosphate fertilizer production costs in North America (37%). For Russia, the increase in production costs was the least significant – phosphate costs rose by 12%, lower than in almost all other regions, and ammonia prices barely rose at all due to the low cost of domestic gas.

### 14. DAP production costs, EXW 2022, USD/physical tonne

![DAP production costs chart](chart.png)

Source: working group analysis
Such an increase in phosphate fertilizer production costs in the EU, Africa, and North America forced domestic producers to curtail their production.

The drop in phosphate fertilizer production totaled 10.9 mt in 2022 compared to 2021.

As was demonstrated on the cost curve chart, the biggest impact of rising ammonia costs on phosphate fertilizer production was registered in three regions – North America, Africa, and Europe. As for North America and Africa, they recorded production declines of 0.9 mt and 0.8 mt, respectively. European production contracted by 1.8 mt, including 1 mt for Belgium and Lithuania, where major problems were connected to other factors, mainly raw material shortages due to sanctions against the former and current beneficiaries of the company which operates two major plants in these countries (AB Lifosa in Lithuania and EuroChem Antwerp plant in Belgium) and is controlled by EuroChem Group.

Therefore, the total contribution of North America, Africa, and Europe to the overall phosphate fertilizer drop driven by rising ammonia prices in 2022 vs. 2021 is estimated at 2.6 mt.

Despite only a moderate rise in production costs, Asia also experienced a pronounced decline in phosphate fertilizer production – in 2022 it was down by 7.3 mt. The major reason behind this fall was contracting production in China largely driven by the closure of six export-oriented plants with an annual capacity of 2.75 mt.

### 2.1.7. Protectionist measures taken by the Chinese Government

In November 2021, China introduced export quotas for phosphate fertilizers in response to the unbalancing of the market, aiming to curb domestic prices in an already growing market. The quotas were set at 5.5 mt for H2 2021 and 3.5 mt for the same period in 2022. As a result of the quotas, China’s phosphate exports fell by 5.4 mt (from 13.7 to 8.3 mt) over 2021–2022. China’s quotas reduced market supply, primarily affecting supplies to India, Pakistan and Bangladesh, as China is a major exporter to South Asia, accounting for about 30% of imported fertilizers.

### 2.1.8. Protectionist measures taken by the Russian Government

In order to protect the domestic fertilizer market from possible risks associated with the increasing global fertilizer prices, Russia implemented the following measures in late 2021 and in 2022: a) ban on the export of ammonium nitrate; b) quotas for exports of fertilizers from Russia.

The introduction by the Russian Federation of a ban on the export of ammonium nitrate from February 2 until May 1, 2022 resulted in a 0.6 mt decrease in Russian fertilizer supplies.

The second measure – quotas for fertilizer exports from Russia – did not affect the ability of companies with Russian producing facilities to export fertilizers, since those quotas were set at the level of the historical export volumes. Thus, though the limitations did not allow to increase export volumes, they had no significant impact on the fertilizer export decrease.

Therefore, the measures implemented by Russia to protect its domestic market were not material for the global fertilizer market.
2.2. The impact of rising fertilizer prices and lower supply on fertilizer trade redirection

We identified what factors led to the reduction in the supply of fertilizers and quantified that reduction. The loss of such a significant volume of fertilizers with low production costs, coupled with the increase in production costs for a number of manufacturers led to an increase in global fertilizer prices. Solvent countries with a high demand for nitrogen and phosphate fertilizers started to actively search the market in pursuit of available fertilizers produced by suppliers that were less affected by the circumstances. Countries in Europe reduced their exports and boosted their imports, thus triggering one of the most wide-scale redirection of fertilizer trade flows that the market had ever seen. At the same time, the catastrophic rise in fertilizer prices was not offset by the inclusion of additional low-cost capacities in global production, which led to an outflow of volumes from the least solvent countries, including those in Sub-Saharan Africa.

Overall, the reduced production of nitrogen fertilizers in Europe, as well as the reduced supply of phosphate fertilizers in the USA, Morocco, and Europe resulted in the solvent countries (Europe and the USA) "pulling away" 2 mt from countries that traditionally supplied their fertilizers to the least solvent countries, including Sub-Saharan Africa (1.8 mt of nitrogen and 0.2 mt of phosphate fertilizers).

2.2.1. Redirection of nitrogen fertilizer trade flows

The greatest increase in the cost of nitrogen fertilizers globally was seen in Europe. In this region, production costs increased so significantly that it led to a closure of fertilizer-producing plants, a drop in production volumes, and hence, a reduction in export volumes. This led to an increase in demand for imported fertilizers from Europe. As a result, nitrogen imports to Europe increased from 28.7 to 32.8 mt, while exports fell from 27.1 to 25.4 mt.
17. Net imports of nitrogen fertilizers, 2021–2022, physical mt

Due to the reduction in domestic production, Europe started to actively attract the available fertilizer volumes from other parts of the world, increasing its net imports from 1.6 to 7.4 mt. This rise in net imports stems both from a sharp reduction of net imports to Latin America (-1 mt) and growth of imports from all over the world (+4.3 mt). The greatest increase in exports to Europe was observed in the following regions: North Africa (+1.4 mt), China (+0.5 mt), the Middle East (+0.7 mt), the USA (+1 mt).

18. Net imports of nitrogen fertilizers in Europe, the USA, and Sub-Saharan Africa, 2021–2022, physical mt

Regions where the EU and USA obtained additional volumes to the detriment of SSA

Europe

USA

Sub-Saharan Africa
As can be seen, Europe was able to attract an additional 1.4 mt of net import from Latin America, 0.8 mt from the Middle East, and 1.2 mt from North America. As a result, Europe managed to significantly increase its net import volumes – from 1.6 to 7.4 mt. At the same time, the USA and Sub-Saharan Africa decreased their net imports in 2022. As net exports from the United States increased, it helped to partially ease the fertilizer availability crisis in Europe. The increase in exports from the US occurred due to a growth in domestic production of 8% (2 mt), with exports also rising by the same volume. The expansion of production volumes was partially facilitated by the efficiency enhancement project at the Koch Beatrice plant, as well as production intensification at other facilities due to favorable market conditions.

The most noticeable decline in Sub-Saharan net imports (-0.8 mt) occurred after Nigeria increased exports to Latin America. The net exports from North America to Latin America also increased by 1.1 mt. Thus, the loss of 0.8 mt in SSA’s net imports can be attributed to Latin America.

Besides, Europe attracted an additional 0.8 mt in net imports from the Middle East, while the net import of SSA from that region decreased by 0.4 mt. Thus, the loss of 0.4 mt in SSA’s net imports can be attributed to the Middle East.

What is more, the growth of exports from Sub-Saharan Africa to North America and Europe by more than 0.6 mt diverted fertilizers from the domestic market in favor of North America and Europe. Thus, the loss of 0.6 mt in SSA’s net imports can be attributed to Europe and North America.

Overall, the USA and Europe “pulled” about 1.8 mt of nitrogen fertilizers away from the SSA market.

Also, we can conclude that the fall in nitrogen fertilizer production in some regions was not fully compensated by production growth in other regions, as production costs eventually rose in all the regions. Thus, the 10.8 mt drop in nitrogen fertilizer production in Europe and the CIS in 2022 was only partially offset by the growth in production in Asia (+3.6 mt), Sub-Saharan Africa (+2.0 mt), North America (+1.6 mt), and Latin America (+1.2 mt).
First, China’s export quotas reduced market supply, primarily affecting supplies to India, Pakistan, and Bangladesh, as China is a major exporter to South Asia, accounting for about 30% of the region’s imported fertilizers. Between 2020 and 2022, China’s phosphate supplies to South Asia fell by more than 0.8 mt (13% of all phosphate exports from China). Although total global phosphate consumption declined by 5% between 2020 and 2022, South Asian countries increased consumption by 10%. Increasing demand from the countries of this macro-region and phosphate export quotas were among the factors driving up the prices in 2021–2022.

Second, the growing production costs in Morocco resulted in a decrease in supply of phosphate fertilizers from this region to global markets. Morocco, a leading supplier of phosphate fertilizers, decreased its exports by 1.3 mt in 2022. It is important to note that this reduction occurred unevenly. Exports to developed countries (the EU, North America, Australia, and New Zealand) decreased by 42% in 2022 (1.6 mt), whereas to other countries (Africa, Asia, Latin America), exports decreased by a mere 2% (7.8 mt).
Third, the increased production costs in Europe and North America additionally squeezed the global supply, resulting in the need for Europe and the USA to attract imports from other fertilizer suppliers.

The global fertilizer and ammonia market was cumulatively deprived of 40.8 mt. The main reason were foreign trade restrictions resulting from the sanctions against Russia and Belarus. Overall, a 0.2 mt reduction in SSA's net imports of phosphate fertilizers can be attributed to Europe and the USA.

Additionally, wealthy countries, e.g. Europe and the USA attracted about 2.0 mt of fertilizers from the producers that typically supplied the least solvent regions. Combined, these factors resulted in a pronounced slump in fertilizer availability.

Net imports to Sub-Saharan Africa almost did not change and stayed at the level of 2.7 mt in 2022. Morocco offset the fall of imports to Sub-Sahara from the Middle East and China. The net imports of Sub-Saharan Africa from China were redirected to Europe, which created a loss of 34,000 tonnes of phosphate fertilizers in Sub-Saharan Africa. Additionally, net imports from the Middle East also declined, partly due to the redirection to the more solvent European consumers (164,000 tonnes).

21. Net imports of phosphate fertilizers in Europe, the USA, and Sub-Saharan Africa, 2021–2022, physical mt

| Regions where the EU and USA obtained additional volumes to the detriment of SSA |
|---------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Europe                          | -0.9              | 0.1               | 0.0               | 0.5               | 0.1               | 0.0               |
| USA                             | -1.0              | -0.4              | 1.0               | 0.0               | -0.9              | 1.0               |
| Sub-Saharan Africa              | 2.7               | 0.0               | 0.1               | 0.0               | 0.0               | 0.2               |

Source: Global Trade Tracker, working group analysis
Analysis of the Consequences of the 2022 Fertilizer Availability Crisis on the Food Security of SSA
The year 2022 witnessed unprecedented events in the fertilizer market, when global supplies slid back to the 2018 levels. This might not seem like a huge problem, if one does not take into account the 300 mln people added to the world's population over those four years (including 100 mln people in African countries), and the 29% increase in food inflation over the same period. Taking into account these factors, the sharp decrease in the availability of fertilizers carries significant risks for the food security of all countries, especially for the newly emerging economies of Africa. Limited availability of fertilizers leads to a decrease in crop yields, and this cannot be quickly compensated. It is physically impossible to ensure a stable and sufficient level of food production for an additional 300 mln people, using the 2018 fertilizer volumes.

The most affected region in terms of food availability is Sub-Saharan Africa, where the share of undernourished people as a proportion of the region’s population stands at 23%, and the problem of food insecurity is becoming increasingly more acute. Thus, the SSA region will be the main region of interest in this study. The second worst-off region globally in terms of food security is Asia, with 9% of its population being undernourished. While the problem of hunger in Asia in relative terms is not as acute as in Sub-Saharan Africa, this problem persists and should be definitely taken into consideration. In order to analyze the effects of the fertilizer market crisis in 2021–2022 on a global scale, we have also studied, though in less detail, the situation with hunger in Asia.

In 2022, fertilizer prices skyrocketed by 85% in SSA. Since fertilizers account for a significant part of farmers' production costs (for instance, 62% for maize in SSA), an 85% increase in fertilizer prices should have brought the price of agricultural products in the region up by 53%. In theory, farmers in the region had two options to deal with the rising costs: decrease the volume of consumed fertilizers or, alternatively, increase the prices for their produce. However, the latter option was unviable due to at least two following reasons:

a) The SSA population already spend most of their incomes on food and cannot significantly increase that share any further: according to the IMF, consumers in Sub-Saharan Africa spend 30–60% of their incomes on food compared to just 10–20% in developed countries (the USA, the EU).

b) In some SSA countries (such as Nigeria, Kenya, Zambia, Uganda, Zimbabwe, etc.) domestic food prices are regulated, as basic staple grains are commonly subject to maximum price controls.

Consequently, farmers had only limited opportunity to increase the prices for their products. Overall, the prices for agricultural products were up by 10–15% in SSA, which is significantly lower than the increase in their production costs associated with growing fertilizer prices. Therefore, the entire increase in food prices in SSA in 2022 can be attributed to the soaring prices of imported fertilizers.

As a result, SSA farmers were forced to decrease consumption of fertilizers and still paid very high prices for the volume of fertilizers that they still purchased. Inflation in financial resources available to farmers. This, in turn, created a food supply deficit and exacerbated hunger in the region. And we should also keep in mind that the SSA population is constantly growing by around 3% annually, and 2022 was no exception.

In this chapter, we explore the state of food security in the countries with the highest numbers of undernourished people. We thoroughly examined the chain of events and the main factors that led to the deterioration of food security in those countries. Further, we analyzed how the acute fertilizer deficit in 2022 led to a deterioration in the price and physical accessibility (affordability & availability) of fertilizers in those countries. In the following chapters, we will analyze how the decrease in fertilizer accessibility results in falling crop yields and agricultural product deliveries, and, ultimately, the exacerbation of humanitarian problems in the region.

The overall situation with SSA food security is presented in Figures 22 and 23. The detailed cases for the most undernourished countries (Nigeria, DRC, Ethiopia, Kenya, Mozambique) are given in Appendix 2. Additionally, we have analyzed the situation in South Africa – one of the most developed countries in the region, which is also suffering from deteriorating food security. The details on South Africa are also given in Appendix 2.
### 22. Summary table of food security and fertilizer consumption changes

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of undernourished people, mln</th>
<th>Undernourished people increase, 2020–2022</th>
<th>Fertilizer consumption dynamics, 2020–2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nigeria</td>
<td>33 33 39</td>
<td>+19% -7%</td>
<td></td>
</tr>
<tr>
<td>Congo-DRC</td>
<td>51 68 71</td>
<td>+40% -3%</td>
<td></td>
</tr>
<tr>
<td>Ethiopia</td>
<td>24 26 26</td>
<td>+11% -13%</td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>8 8 9</td>
<td>+13% -21%</td>
<td></td>
</tr>
<tr>
<td>Mozambique</td>
<td>8 9 10</td>
<td>+20% -20%</td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>13 14 15</td>
<td>+9% +51%</td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>14 14 15</td>
<td>+5% -100</td>
<td></td>
</tr>
<tr>
<td>Madagascar</td>
<td>13 14 15</td>
<td>+14% &gt;100</td>
<td></td>
</tr>
<tr>
<td>Somalia</td>
<td>8 8 8</td>
<td>0 &gt;100</td>
<td></td>
</tr>
<tr>
<td>Zambia</td>
<td>5 6 6</td>
<td>+7% -7%</td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>4 4 5</td>
<td>+31% +6%</td>
<td></td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>3 3 4</td>
<td>+16% -40%</td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td>2 2 2</td>
<td>-11% -65%</td>
<td></td>
</tr>
<tr>
<td>Lesotho</td>
<td>1 1 1</td>
<td>+25% -46%</td>
<td></td>
</tr>
<tr>
<td>Botswana</td>
<td>1 1 1</td>
<td>-14% -40%</td>
<td></td>
</tr>
<tr>
<td>Benin</td>
<td>1 1 1</td>
<td>0 -14%</td>
<td></td>
</tr>
<tr>
<td>Gambia</td>
<td>1 1 1</td>
<td>0 -92%</td>
<td></td>
</tr>
<tr>
<td>Gabon</td>
<td>1 1 1</td>
<td>0 +53%</td>
<td></td>
</tr>
<tr>
<td>Namibia</td>
<td>0 0 0</td>
<td>0 -70%</td>
<td></td>
</tr>
<tr>
<td>Djibouti</td>
<td>0 0 0</td>
<td>0 +40%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Global Trade Tracker, working group analysis

### 23. Summary of cases of changing food security

#### Nigeria

- **Nigeria**
- **2020**: 1.42
- **2021**: 1.86
- **2022**: 2.30
- **Changes of fertilizer consumption, %**: -30%
- **Phase IPC/CH**: +6.1

#### Ethiopia

- **Ethiopia**
- **2020**: 1.54
- **2021**: 1.66
- **2022**: 1.44
- **Changes of fertilizer consumption, %**: -12%
- **Phase IPC/CH**: +0.2

#### Mozambique

- **Mozambique**
- **2020**: 0.75
- **2021**: 0.68
- **2022**: 0.55
- **Changes of fertilizer consumption, %**: -20%
- **Phase IPC/CH**: +0.6

#### Democratic Republic of the Congo

- **Democratic Republic of the Congo**
- **2020**: 8.2
- **2021**: 9.2
- **2022**: 9.8
- **Changes of fertilizer consumption, %**: 26%
- **Phase IPC/CH**: +0.8

#### Kenya

- **Kenya**
- **2020**: 8.2
- **2021**: 7.6
- **2022**: 9.4
- **Changes of fertilizer consumption, %**: -21%
- **Phase IPC/CH**: +1.8

Source: working group analysis, FAOSTAT

## III. Analysis of the Consequences of the 2022 Fertilizer Availability Crisis on the Food Security of Sub-Saharan Countries

### 23. Summary of cases of changing food security

Source: Global Trade Tracker, working group analysis
3.1. Hunger and food production: deepening problems in SSA

The situation with hunger

Nearly 10% of the world’s population is starving. The UN has developed a classification system for various stages of food deficit, from malnutrition to full-scale famine. In total, about a third of the global population faces various degrees of food shortages. The number of people starving worldwide has reached a dramatic 735 mln. The problem is relentlessly worsening, and in the past 5 years, the number of those starving has increased by an additional 148 mln people.

Behind these figures lie significant regional differences: in percentage terms, Africa is the most affected region, and the problem is becoming increasingly worse. Currently, in the Sub-Saharan region, one in every five inhabitants is considered to be starving, and the proportion of people starving accounts for 23% of the population. This is more than twice as high as in Asia (9%) and in Latin America and the Caribbean region (6%).

Nowadays, Sub-Saharan Africa is the region where the problem of food security is the most acute: between 2018 and 2022, the number of starving people increased by 61 mln over the five years’ period to reach 262 mln people (a figure comparable to the population of France, Germany, the UK, and Italy combined).

24. The number of undernourished people in the world, mln

Source: FAOSTAT

25. Distribution of the undernourished population by stage in the worst hit countries of Sub-Saharan Africa, mln

Source: FAOSTAT, FSIN
The problem of malnutrition, which is faced by 262 mln people in SSA, could be solved by increasing grain consumption in Africa. Taking into account the 3,400 kcal/kg calorific value of wheat and ~800 kcal/person/day gap between the current and target food consumption among the undernourished people, we estimate that consumption of ~20 mt of grain is required to adequately nourish the 262 mln hungry people in SSA. This gap in grain consumption correlates with an almost 12.3% gap between the current production volumes and target grain consumption. And, as can be seen in the figure below, this deficit in consumption keeps increasing each year.

The problems with food production in SSA

In Sub-Saharan Africa, 80% of grain consumption is sustained by domestic production, which determines the importance of high yields for providing the population with a harvest. Even the slightest drop in yield rates can lead to a significant reduction in consumption. Any decrease in yields will immediately lead to an overall reduction in grain production. If the resulting deficit is not compensated by imports (as was observed in 2021–2022), grain consumption per capita will decrease, which ultimately will lead to an increase in the number of undernourished people. For instance, a relatively small 12.3% reduction in yield will lead to a twofold increase in grain deficit and an even greater aggravation of hunger in the region. Therefore, it is vital to sustain domestic production in order to ensure food security in Sub-Saharan Africa. Moreover, since the population in SSA is growing by 3% annually, it is extremely important that the growth rate of food production outmatches that of the population growth.

Addressing the issue of low production volumes through crop imports is a viable option, but it is applicable primarily to developed markets. In Sub-Saharan Africa, the population needs to rely on domestically sourced food due to the limited possibility of importing large volumes of food to offset missing local production. High interest rates and rising prices in the global market make it impossible for newly emerging economies in Africa to replace domestic food production with imported volumes. Thus, Sub-Saharan Africa cannot rely on food imports as a way of solving the problem of hunger. Bridging the consumption gap would require boosting grain imports by 20 mt, nearly half of the current import of 46 mt. The only solution to this problem is to improve domestic production of agricultural products.

Achieving the rate of production growth that would be on a par with the pace of population growth is a sophisticated task. To put this in a context, a 10% increase in global grain production took over 12 years. Over the same period, the population of Sub-Saharan Africa grew by 39%. In this regard, all efforts to prevent hunger must be focused on increasing agricultural yields in Africa. Over the same period, the population of Sub-Saharan Africa grew by 39%. In this regard, all efforts to prevent hunger must be focused on increasing agricultural yields in Africa, which will allow to increase food production to satisfy the demand of the growing population.

However, even before the crisis of 2022, yield rates in SSA countries were extremely low, as shown below.
The main reason for the low yields is the insufficient use of crop enhancement tools by local farmers. The agricultural production market in Sub-Saharan Africa is 80-90% represented by small farms that do not have access to the global food market. Their work is focused on domestic consumption, often on food for their own households. About 80% of farms have a sown area not exceeding 2 ha. Farms are low mechanized, and the added value of products per worker is 3.7 times lower than in China and 5 times lower than in Egypt. Poor technological literacy negatively affects agricultural productivity and does not allow the region to increase the production of key agricultural crops by intensive methods, as was done in South Asia.

Thus, in order to increase agricultural yields, local farmers should adopt best farming practices and intensify the implementation of crop-enhancing measures, including an increase in the intensity of fertilizer use.

To sum up, the increase in the number of people suffering from hunger in Africa in the past few years was due to the fact that the population growth rate in Africa exceeds the growth in consumption of agricultural products. Consumption of agricultural products is partially sustained through imports (20% of total consumption), which are difficult to increase, and is highly dependent on domestic production (80% of total consumption).

However, the growth in domestic production in 2022 was limited due to the catastrophic situation in the fertilizer market, which experienced a shortage of supply and record high prices at the same time. The causes of the fall in fertilizer consumption in Sub-Saharan Africa, as well as the consequences for African farmers, will be analyzed in the following chapters.

### 3.2. Analysis of the dynamics of fertilizer consumption in 2022

The exacerbation of food insecurity in newly emerging economies as a result of rising fertilizer prices is an internationally recognized problem. According to the World Food Programme (WFP), the fertilizer market crisis is the most significant factor that influenced the global food crisis in 2022. The ruin of farms and the decline in the availability of food imports exacerbated the already difficult situation with food security in SSA.

In 2022, what is referred to as the "perfect storm" occurred in the mineral fertilizer market, when a combination of strong shocks, such as disruptions of supply chains, raw material price spikes, restrictions on exports from Russia and Belarus, decreased profitability of production, and others, led to a sharp drop in global fertilizer supplies. The global fertilizer and ammonia market saw an accumulated loss of 40.8 mt.
resulting from the impact of all existing negative factors since their inception. Besides the physical deficit (availability) in 2022, we also note a deterioration in the affordability of fertilizers – these factors are interconnected, yet they have different degrees of impact on countries with varying income levels and self-sufficiency in key raw resources.

In 2022, apparent global fertilizer consumption slid back to the 2018 levels. The growth of wealth in newly emerging economies, the development of the agricultural sector, and increased accessibility all contributed to the steady growth in fertilizer consumption worldwide over the past 10 years. However, this stable trend was disrupted in 2022 when fertilizer consumption decreased by 4.6%. This was the sharpest correction in the last ten years, reducing global consumption of mineral fertilizers by 23.7 mt, bringing it back to the 2018 levels.

Source: working group analysis

In 2022, apparent global fertilizer consumption slid back to the 2018 levels.

This was especially felt in newly emerging economies on the African continent, where the difficult situation with fertilizer availability was further exacerbated by local humanitarian and weather crises such as wars (the conflict in the Tigray region of Ethiopia, terrorist attacks in Mozambique), droughts (in Ethiopia, Kenya, Somalia), epidemics (bubonic plague and Ebola in the Democratic Republic of the Congo, COVID-19).

On the whole, the countries from North America, Europe, and Latin America, which faced a fall in fertilizer imports or “pulled” some volumes away from Sub-Saharan Africa, did not experience a significant reduction in fertilizer consumption. There are two reasons behind this: a) those countries had sufficient fertilizer stocks, which had been accumulated in the previous periods, to rely on during a turbulent time in the market (the USA, Europe, and Brazil generally keep their fertilizer stocks at the level of 30–35% of their annual consumption, whereas Africa has historically had significantly lower stocks of around 15%); and b) fertilizer application rates were high during the previous periods, which, combined with leading agricultural practices, allowed those countries to accumulate enough nutrients in the soil to withstand a few years of slightly reduced fertilizer consumption.

However, when we turn our analysis to Sub-Saharan Africa, the impact on the region is not that clear. We should also mention that the statistics regarding fertilizers in Africa (including data for stocks, application rates, etc.) are very limited, which explains the extensive usage of modelling and approximations in our work.
III. Analysis of the Consequences of the 2022 Fertilizer Availability Crisis on the Food Security of Sub-Saharan Countries

29. Changes in fertilizer consumption in Sub-Saharan Africa, physical mt

In 2022, with a reduction in the volume of cross-border trade in fertilizers, consumption decreased in almost all countries. In Sub-Saharan Africa fertilizer consumption fell by 6%. However, this fall goes hand in hand with the fact that the countries in the region (Kenya, Gambia, Mozambique, Uganda, Niger, Sudan, etc.) are the most dependent on fertilizer imports and have the lowest purchasing power (please refer to Figure 30 below).

The declining supply of low-cost fertilizers and intensifying competition for the limited quantity of fertilizers, which decreased due to the sanctions and export restrictions, further reduced fertilizer consumption in these countries. The low social protection of the population, combined with the lack of reserves, led to an immediate rise in agricultural inflation.

There are two main reasons for fertilizer demand decrease in SSA countries:

- Inability to shift costs to the end customer
- Lack of support measures from the governments

Each is extremely important and will be further analyzed in detail.

Source: working group analysis
III. Analysis of the Consequences of the 2022 Fertilizer Availability Crisis on the Food Security of Sub-Saharan Countries

30. Changes in fertilizer consumption by country, 2021–2022

3.2.1. The inability to pass costs on to the end customer

Food constitutes a much higher portion of the CPI basket in African countries as compared to the developed world, making SSA countries the most vulnerable to soaring food prices. According to the IMF, consumers in countries with lower incomes spend more on food and are affected the most when those prices rise. Food makes up 30–60% of the CPI baskets in the low-income countries of SSA (according to the IMF data) compared to just 10–20% in developed countries (the USA, the EU). The differences in diet are also significant: a deep dive into the makeup of those food baskets reveals that low-income countries rely more on basic staple products as opposed to a wider product offering available to consumers in developed countries (as reflected in the higher share of proteins, for example). As such, the rise in food prices could lead to an increased rate of growth in the number of people suffering from hunger.
31. Correlation between the share of food in consumer spending and GDP per capita

In some SSA countries domestic food prices are regulated. Basic staple grains such as rice, wheat, maize (corn), and millet are commonly subject to maximum price controls. Such non-free-market regulation measures were introduced to protect the population, since grains form a major part of the diet for many people and are essential for food security. For instance, Nigeria, Kenya, Zambia, and Uganda have implemented maximum price regulations for staple grains such as rice and maize to ensure food affordability for their people and manage the inflation.

At the same time, such regulation is detrimental for the farmers. Smallholder farmers are the backbone of the agricultural sector in SSA. Crop production in Africa is not a business, but a vital necessity. Under such circumstances, farmers lack a safety margin to cushion economic shocks, and any crisis immediately leads to food shortages in SSA. Smallholder farmers do not have access to mechanisms that could smooth the shocks to the means of production: they lack economies of scale, access to financing, warehouses, logistics, and have fewer technological resources, as opposed to commercial-scale farmers that operate in developed markets (DM). As a result, farmers in the SSA countries have less financial and economic flexibility than their colleagues in DM countries and are much more sensitive to any increase in production costs.

The disproportionate rise in global fertilizer prices led to a record low in their affordability index. Fertilizer availability decreased more than twofold from the beginning of 2020 until mid-2022. This reduction in availability negatively impacted the economy of farming households worldwide, with the most vulnerable countries feeling the pressure of high prices to the greatest extent. Lower-income countries rely on upstream fertilizer products (urea – 51% of apparent nitrogen consumption, MOP – 75% of apparent potash fertilizer consumption), which, ironically, are the most sensitive to cost push, with prices already close to marginal cost support levels.

At the same time, the margin of agricultural products in Africa is 20–40%, which is 1.5–2 times lower than in North America. Due to the inability to pass costs on to the end consumer and low margins, small farms in Africa are forced to minimize the cost of production. While fertilizers do not exceed 10% of production costs for farms in North America, this share stands at 60% of the costs borne by an African farmer, so any increase in fertilizer prices becomes an acute problem and forces farmers to reduce fertilizer application.

The factor of high dependence of marginality of African farmers on fertilizer prices makes their demand for fertilizers more volatile than in other newly emerging economies. Minor changes in price may force farmers to significantly reduce demand.
32. The effect of urea availability on consumption in Sub-Saharan Africa and Brazil

After the fertilizer market recovered from the 2008 crisis, from 2013 to 2020, the level of accessibility of mineral fertilizers in the Sub-Saharan region was relatively stable (fertilizer affordability index stood at 0.53–0.64). In 2022, against the backdrop of an almost twofold increase in prices for all types of fertilizers, the accessibility index dropped to record lows, which was immediately reflected in the consumption rates of all types of mineral fertilizers. Figure 32 demonstrates that the global market crisis impacted fertilizer affordability in SSA more than in other newly emerging economies (i.e. Brazil), and due to the greater price elasticity of demand significantly decreased fertilizer consumption (by 8% vs. 4%).

3.2.2. Lack of support measures from the government

In this context of low fertilizer availability and high prices in the global market, the net importing countries faced challenges to secure access to fertilizers for their farmers and, most importantly, at affordable prices.

Regions with high incomes managed to cushion the shocks to their agricultural sectors and offset the deficit volumes by attracting fertilizers from other countries, even at higher prices, as well as by using fertilizer reserves or switching from their own food production to food imports. Government subsidies and high social protection of the population in developed countries allowed to mitigate the negative impact of price volatility and decreasing global trade volumes. For instance, as shown previously, the EU countries successfully replaced the lost volumes of nitrogen fertilizers from Russia by increasing the imports from other suppliers. Furthermore, during this period, the EU countries increased grain imports by 11% (9 mt) and reduced their exports to external markets by 7% (6 mt).

Newly emerging economies do not have such mechanisms for supporting their agro-industrial complexes due to high dependency on imported volumes and low purchasing power. Certain countries, like India, managed to minimize the negative effects of reduced fertilizer availability through significant state subsidies for fertilizer procurement. The fertilizer subsidy budget in India increased from USD 14.1 bn in 2021 to USD 26.2 bn in 2022 in order to level out the impact of price increases and attract imports.

In Sub-Saharan Africa, where fertilizer production is almost non-existent and consumption is mainly dependent on imports, the countries faced the most urgent problems. The governments struggled to support farmers due to budget deficits. In Malawi, for example, the list of subsidy
recipients was trimmed down to include only the extremely poor farmers. In Tanzania, the government decided to stop the tender system of aggregated fertilizer procurement. In Ghana, where subsidies used to cover 50% of fertilizer costs in 2017–2020, this proportion was slashed to 38% in 2021, and during the 2022 crop season, the government reduced the subsidies even further – to 15% of total fertilizer costs.

To sum up, due to the lack of effective government support measures, African farmers were lacking the compensatory mechanisms to smooth shocks in the global fertilizer market. This resulted in additional costs for African farmers, as well as a slump in agricultural production in Sub-Saharan Africa. The following chapters will address these issues in more detail.
IV

The Crisis in the Agro-Industrial Sector of the SSA Countries Caused by Shocks in the Fertilizer Market
The agro-industrial complex of SSA is facing a number of problems, each of which negatively affects the economics of crop production.

First, as a result of the reduction of global fertilizer supply in 2022, SSA faced a 4% decline in fertilizer imports in 2022 compared to 2021. Second, the average price for imported fertilizers was 85% higher in 2022 compared to 2021. Since the share of imports in the consumption of fertilizers in SSA is extremely large (~70%), it makes consumers of fertilizers in this region extremely vulnerable to the global fertilizer market fluctuations.

The developments of 2022 significantly impaired the availability of fertilizers for end users. That led to SSA’s fertilizer consumption decline of 0.6 mt (6%) in 2022. We should also keep in mind that the application rates of those fertilizers in SSA are suboptimal, and further underfertilization can have far-reaching consequences for crop yields.

4.1. The effects on the agricultural yields

Currently observed effects

The fertilizer crisis slowed down the rate of grain production growth, which decreased from 2.8% (2016–2020) to 0% (2021–2022). That, in turn, led to a shortfall of 16.5 mt of grain over 2 years.

Furthermore, inadequate fertilization in depleted soils can have far-reaching consequences in terms of crop yields. Soils across a significant portion of Sub-Saharan Africa are heavily eroded and naturally deficient in organic content. Due to growing demand for land, the natural replenishment of nutrients during fallow periods is no longer adequate to sustain soil productivity over extended periods. Inadequate nutrient restoration in agricultural practices on land with limited to moderate potential leads to the deterioration of soil quality. In this context, the utilization of fertilizers becomes particularly crucial.

Industry analysts calculated nutrient balances for arable soils in 38 Sub-Saharan countries and for 35 crops. The study reported alarming average nutrient losses for SSA as follows: 26 kg of N, 3 kg of P and 19 kg of K as of 2022. This indicated persistent nutrient mining over time. Other estimations claim that 4 mt of nutrients are harvested annually in SSA and less than 0.25 mt return to the soils in the form of fertilizers.

Effects of the fertilizer market crisis in the Sub-Saharan agricultural market are double-sided, but at the same time those effects are also interconnected:

- Reduced fertilizer supply leads to lower application of fertilizers, which, in turn, eventually results in lower agricultural yields
- The higher fertilizer prices coupled with the impossibility to increase the output prices lead to deterioration of farmers’ economics and the refusal to purchase fertilizers
The shortage is compensated for by the existing mineral and organic nutrient reservoirs within the soil. However, if not adequately replenished, these reservoirs gradually diminish in size. As the soil nutrient content diminishes for crops, it becomes evident that this reduction directly affects crop yields.

Those already suppressed application rates further decreased in 2022 as farmers had to trade down and turn to more old-fashioned crop-enhancing practices like using decomposing tree leaves. African crop yields would disproportionately suffer from the degrading of farming practices. African crop yields are much more vulnerable to swings in fertilizer application as compared to DM countries as they fall from a very low base. Decreasing economies of scale imply that reduced fertilizer use in countries with high application rates like Malaysia, New Zealand, or Ireland (>150 kg of fertilizers/ha of arable land) could have a smaller effect on crop yields in those regions than an even smaller decline in use in SSA countries like Kenya (65 kg/ha), Ethiopia (36 kg/ha), or Nigeria (19 kg/ha).

### Potential effects

The problems caused by the crisis in the fertilizer market are further aggravated by the systemic issues in the agricultural industry of the Sub-Saharan Africa, i.e. low application rates and weak economic systems.

Small farms are often poorly informed about the role of fertilizers in increasing yields (according to industry researchers). For example, in the Democratic Republic of the Congo, the share of nitrogen fertilizer consumption in the total consumption structure is 81%, and in Nigeria – 87%; meanwhile in more agriculturally developed countries, for instance, Brazil, the shares of fertilizers (N, P, K) are nearly equal. Increasing awareness of the basics of plant nutrition, the proper use of mineral fertilizers for achieving food security and for producing crops with required qualities could contribute to smoothing the volatility of fertilizer use.

The insufficient development of the economy as a whole poorly reflects on the agro-industrial complex. Farmers often do not have access to the banking system, which significantly limits their ability to get credit financing for fertilizers to ensure high yields in the upcoming season. The liquidity trap also negatively affects the quality of the seed fund. Due to the lack of savings because of low profits in the previous periods, farmers will be forced to buy lower quality seeds, which will lead to a further reduction in yields. Insufficient government subsidies did not allow African farmers to maintain fertilizer consumption at the achieved level, as was done in India, primarily due to the low GDPs.

We anticipate a prolonged effect of lower application rates in African countries as even after the recent retreat prices still bite. The International Fertilizer Industry Association (IFA) expects reductions in the use of all three main nutrients in 2022/23. According to the World Bank data, fertilizer affordability remains well below historical rates. We believe that persistently high prices coupled with strained savings leave SSA farmers unable to tolerate higher costs as their financial resources have been drained following several consecutive years of shocks (elevated production costs coupled with multiple other socio-economic challenges over the past three years).
34. Long-term effect of falling grain and oilseed yields

The reduction in the pre-crisis annual average growth rates of grain and oilseed yields from 1.9% (in 2016–2020) to 0.43% (in 2020–2022) could further increase the production gap. By 2030, the gap is projected to reach 11%, which is critical given the high share of domestic production in consumption.

Even before the influence of negative factors in the recent years, fertilizers made up a significant share of the cost structure of African farmers. Moreover, farmers are extremely dependent on the changes in the global fertilizer prices.
Firstly, the share of imports in the consumption of fertilizers in Sub-Saharan Africa stands at ~70%, which means that the local prices for fertilizers in Africa are changing in the same direction as the global prices. Secondly, complicated logistics, especially in landlocked countries (like Ethiopia, the Democratic Republic of the Congo, and Zambia), add further pressure on the prices, since under such geographic conditions, any increase in fertilizer prices for Sub-Saharan farmers is further exacerbated by high transportation costs from the port to the farm.

Under such conditions, price increases become an unbearable burden. According to GTT, the increase in prices of imported fertilizers reached 85% for African farmers, which forced them to completely abandon the use of fertilizers or to reduce the application to a minimum.

The rising prices changed the cost structure and undermined the profitability of operations, resulting in loss of profits among African farmers. In 2021, approximately 35% of their income was spent on fertilizers, but in 2022, due to the 85% price increase, this share rose to nearly 56%. Given the existing limits on maximum prices for essential food products, the increase in fertilizer spending could not be shifted onto consumers: for example, the price of maize increased on average by 11%, while fertilizer prices surged by 85%. Due to the increased costs of grain production, 49%, farmers’ profitability dropped from 42% to 22%.

Moreover, there is an FX mismatch as food and fertilizer imports are FX-denominated, while disposable incomes of local consumers are all LCU-denominated. As a result, higher input prices cannot be fully downstreamed into prices set for locally-produced food; at the same time imported food products are becoming unaffordable. In 2021–2022, LCUs in the three largest SSA economies devalued by 6.6% on average against the USD, effectively meaning that not only fertilizer prices jumped by 150%, but in LCU terms the increase was actually higher (160–300% depending on the inflation rate in each country). This factor does not affect, for example, farmers in Brazil, where FX-denominated imported crop inputs are well matched by FX-linked revenue streams from soya exports. In DM countries, farmers had the opportunity to pass on the cost increase to consumers thanks to the high purchasing power of the population. The situation for African farmers developed in the most extreme way: there was no access to the global trade market and maximum selling prices were set within the countries, which did not allow to pass on costs to domestic consumers.
Major Changes in the Fertilizers Market in 2022–2023 and Their Impact on Global Food Security

Possible Consequences
The crisis of 2022 affected all players of the Sub-Saharan market, which led to a number of humanitarian consequences, as well as economic losses.

As for the humanitarian aspect, the diminished food supply caused a significant increase in food prices, which pushed approximately 46 mln people in SSA below the poverty line (less than USD 3.2 per day). The decline in incomes led to a 9 mln increase in the number of undernourished people in 2021–2022. The situation is likely to worsen further unless measures are taken to stabilize the fertilizer and food markets.

Economic losses include:

- increased household spending on food (+USD 78 bn in 2022);
- higher regional debt burden (+USD 1 bn, up to USD 22 bn); and
- lower farm profits (-USD 20.1 bn) and a long-term decrease in yields.

According to our estimates, total reduction in the GDP due to slow growth rate of the agriculture sector may reach USD 46 bn.

### 5.1. Humanitarian damage

Rising food prices, declining incomes of farmers and galloping inflation in the Sub-Saharan countries have led to a decline in the overall standard of living and an increase in the number of undernourished people. Given the continued pressure on the agricultural sector in SSA and lack of external support, the consequences of this crisis could lead to a humanitarian catastrophe in Africa.

The FAO predicts that the number of hungry people (IPC Phase 3 and above) will increase in some countries. It was estimated that in the absence of aid, 3 mln people in South Africa would face severe food insecurity (IPC Phase 3 and above) between April and August 2023, including 0.8 mln people in emergency situations (IPC Phase 4).

The most food-insecure people (IPC Phase 3 and above) are conflict-affected and displaced populations, and poor households in urban and peri-urban areas with limited access to food. The number of acutely malnourished children was projected to rise to 0.3 mln between October 2022 and August 2023, a 39% increase from the same period last year.

The global economic slowdown is expected to continue into the second half of 2023 due to ongoing disruptions related to the disruption of global trade in the fertilizer and food markets, as well as rising borrowing costs and persistently high prices for key commodities, such as energy, fertilizers, and food. Small and undiversified economies that are highly dependent on trade and external financing are particularly vulnerable to these turbulences in agribusiness.

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5.1. Rising hunger

[36. Projected number of undernourished people in Sub-Saharan countries, mln people and % of the population]

Source: working group analysis, FAOSTAT, IMF
5.1.2. Rising poverty

As a result of the 2022 crisis, the increase in prices for agricultural products and resources affected the budgets of end consumers, whose food spending accounts for a significant part of all expenses. The share of food in the spending structure of vulnerable segments of the population has increased, pushing some of them below the poverty line.

37. Increase in poverty due to the inflation burden, mln people

According to UNDP estimates, as a result of the inflation caused by the conflict, 72 mln people worldwide fell below the poverty line of less than USD 3.2 per day. Sub-Saharan Africa was hit the worst, with sharp increases in poverty affecting Sudan, Nigeria, Ghana, Kenya, Rwanda, and Burkina Faso. In this region, inflation caused 46 mln people to fall into poverty during 2022, meaning their incomes fell below the poverty median threshold in low-income countries – USD 3.2 per day.

Supporting poor people’s livelihoods becomes an unaffordable burden. The situation calls for substantial and immediate assistance to impoverished and vulnerable households at a time when most newly emerging economies are facing reduced financial capacities and growing debt service obligations. The situation is further exacerbated by the issue of political instability in Sub-Saharan countries, military conflicts, destruction of households, and violence, which forces people to migrate.

5.2. Economic damage

The contribution of agriculture to the GDP of Sub-Saharan Africa has averaged around 18% over last 5 years. The pivotal role of the agricultural sector in Sub-Saharan countries is attributed to the high agriculture employment rates, with some countries seeing 60~70% of their entire population engaged in this sector.

38. Contribution of agriculture to the GDP of Sub-Saharan Africa, USD bn

Source: working group analysis, World Bank
In the four years leading up to 2022, the contribution of agriculture to the GDP of Sub-Saharan Africa had been increasing at an average annual rate of 2.8%. According to forecasts, at this average annual growth rate, the agricultural sector could reach an output worth USD 433 bn by 2030. However, in 2022, agricultural production suffered due to lower yields, which are associated with problems in the supply of resources, such as fertilizers and high-quality seeds, and the rising prices for those resources. In 2022, the annual growth rate of the agricultural sector output in Sub-Saharan Africa decreased to 2.5%, altering the development scenarios: the agricultural sector of Sub-Saharan Africa could lose about USD 46 bn by 2030. This decline will be critical for the farmers and will make the food situation in the region even more precarious, significantly increasing dependence on food imports and the number of people facing hunger. The impact on each player of the economy will be revealed further.

The agricultural sector of Sub-Saharan Africa could lose about USD 46 bn by 2030.

5.2.1. Consumer spending

39. Food inflation in the USA, Europe, and Sub-Saharan Africa (basis = 2018)

The jump in food prices was triggered by the problems with the supply of food and resources and lower fertilizer application rates, which led to reduced crop production. All those factors forced Sub-Saharan residents to spend an additional USD 78 bn on food in 2022 compared to 2021, which only exacerbated poverty in Sub-Saharan Africa and decreased real food consumption per person. As the share of food exceeded 50% of household spending in Sub-Saharan countries, spending on other necessities, e.g. healthcare, has significantly decreased, which is critical for SSA residents, whose standards of living and quality of life were already low.53

40. Annual food spending in Sub-Saharan Africa, 2021–2022, %

Sub-Saharan residents spent an additional USD 78 bn on food in 2022 compared to 2021, which only exacerbated poverty in Sub-Saharan Africa. Due to the rising prices, food spending in Sub-Saharan countries increased to USD 736 in 2022. African households have historically spent most of their incomes on food. While food accounted for about 17% of total expenses of residents of developed countries in 2020, for residents of Sub-Saharan countries this share was as high as 40%.52 In 2022, the already high share of food spending in the Sub-Saharan region increased even more, from 40% to 44%. This share is even higher in individual countries, e.g. Nigeria (85%), Congo (68%), CAR (67%), Malawi (60%), Kenya (60%), which are facing a serious food crisis.

The agricultural sector of Sub-Saharan Africa could lose about USD 46 bn by 2030.

As demonstrated in the figure above, SSA experienced the highest food inflation over the past five years, which was especially pronounced in 2022, when the trend for SSA started to substantially diverge from those of the USA and Europe. By 2023, the food inflation index in SSA was equal to 1.57 – much higher than for the USA (1.25) and Europe (1.31). In USD terms, this was partly compensated for by the depreciation of local currencies – which, according to the IMF, stood at ~10% in 2022 vs. 2020 – but was still much lower than the food inflation.

Source: working group analysis, World Bank

40. Annual food spending in Sub-Saharan Africa, 2021–2022, %

Source: FRED

Sub-Saharan residents spent an additional USD 78 bn on food in 2022 compared to 2021, which only exacerbated poverty in Sub-Saharan Africa.
5.2.2. Increasing national debts

The increases in prices of imported fertilizers and food products cannot be fully passed on to consumers in Sub-Saharan Africa. Government support measures enable partial cost compensation for households but add to the external debt, which becomes a burden for countries during crisis periods and hampers economic development.

In Sub-Saharan Africa, policymakers are confronted with the need to adapt to a more stringent financing landscape, which carries two significant implications for the fiscal policy. Firstly, the already elevated debt vulnerabilities are likely to exacerbate. As borrowing costs rise, countries may encounter difficulties in refinancing their existing liabilities and extending longer-term maturities. This could give rise to liquidity challenges, which might, over time, lead to questions about solvency in certain cases. Secondly, policymakers will grapple with the challenge of covering essential expenditures for fundamental services, let alone acquiring funding for advancing progress towards the Sustainable Development Goals.

Looking forward, the challenging funding environment in the region is anticipated to persist and emerge as a prominent aspect of the new normal. In the upcoming years, countries in the region are projected to experience some of the highest interest payment burdens globally, exceeding 50 percent in some cases. Within just the next two years, a substantial portion of outstanding Eurobond debt is set to mature, so Sub-Saharan Africa has to pay approximately USD 6 bn in 2024 and an additional USD 7 bn in 2025.\textsuperscript{54} If countries face difficulties in meeting repayments or rolling over debt, it could potentially have far-reaching consequences for the region’s economic growth and social development.

According to the Fitch, in 2023 the region’s debt burden will reach USD 22.3 bn, which will further limit the ability of newly emerging African economies to import food.

5.2.3. Farmers’ profit losses

As was demonstrated in the previous chapter (see section 4.2), the economics of SSA farmers have significantly deteriorated due to the fertilizer crisis in the region. According to the estimates, from the beginning of the fertilizer crisis in the Sub-Saharan region in 2021 farmers missed out on USD 20.1 bn in profits:

- USD 2.2 bn due to grain production losses in 2021–2022, derived from 16.5 mt production losses due to declining yields in 2021–2022 (detailed in 4.1), with an average margin of USD 134 per tonne in 2021 (detailed in 4.2).\textsuperscript{55}
- USD 17.9 bn due to gross margin reduction from 42% to 22% (an average loss of USD 56 per tonne of grain and production of 321 mt in 2021–2022) (detailed in 4.2).
Measures Required to Ensure Food Security
A wide range of interventions have been implemented towards food security in Sub-Saharan Africa. Although some of them may have fallen short, both domestic and external efforts to support the population and the agro-industrial complex of SSA should continue in order to ultimately reduce the share of hungry people.

### 6.1. Retrospective evaluation of external support measures

There have also been actions on the part of developed countries to ensure food security. A strategy to reduce hunger was developed in 2000, which identified 4 key areas of development:

- maximizing sustainable agricultural production;
- improving the quality of functioning of markets and trade;
- improving access to nutrition through diversification of employment and income sources; and
- protection of natural resources.

Sustainable agricultural production was given the highest priority, not least as a means of ensuring the achievement of other goals.

A host of measures aimed at rebalancing the global food and fertilizer markets (are affecting) were developed for African countries where the food crisis is the most acute.

For example, the Fund for Supporting Agriculture (FSA) was established in 2008. The purpose of the fund is to support agro-industrial production and fisheries and to promote commercialization, storage, and processing of all relevant products. The program supported by the fund includes institutional strengthening, research for the development of relevant sectors, and improving technology literacy of African agrarians. One of the organization's priorities is to allocate more funds to cultivating short-cycle crops, such as vegetables, maize, and rice, as well as to developing the poultry and pork segments.

One of the successes of the fund, whose budget in 2011 amounted to EUR 6.7 mln and supported hundreds of projects, was the involvement of banks, which facilitated loans to farmers, especially those who wanted to buy heavy machinery.

In 2010, following a call by the President of the Democratic Republic of the Congo to help newly emerging economies achieve food security, a number of incentive programs, such as the National Program for Food Security (NPSA), were developed with support from the World Bank. The 29 mln euro project was implemented in partnership with the FAO and aimed at boosting food crop production in each village with the assistance of foreign experts, rehabilitating rural roads, and setting up commercialization and resource allocation bodies.

Another development instrument was the Agricultural Development and Rural Road Rehabilitation Project, for which EUR 14.5 mln was allocated. The project was designed to enable poor rural people to generate more income from their production by supplying technological tools, purchasing equipment and inputs at lower prices, and building market infrastructure.

Despite the undeniable necessity of the aforementioned external support measures, the volume of allocated subsidies is negligible compared to the annual food spending of the local population. Just compensating for the estimated deficit of 20 mt of wheat at 2021 prices requires around USD 11 bn; given the 2022 price increase, this amount grows by 9%, to USD 12 bn.

However, not all actions by developed countries contribute to the normalization of the food security situation. High import duties on cash crop imports to developed countries encourage African countries to minimize production costs. According to a report by the The French Agricultural Research Centre for International Development, this primarily affects the wage bill, leading to an impoverished population and, consequently, an increase in the number of hungry people.
6.2. Retrospective evaluation of internal support measures

Realizing the gravity of the food security problem and the importance of fertilization as a factor for crop yields, the 2006 African Union Summit in Abuja, Nigeria took a number of decisions aimed at increasing fertilizer application:

- increase fertilizer use to an average of 50 kg per ha by 2011;
- develop local fertilizer markets;
- implement state support measures, including subsidies for fertilizers to increase their use by farmers;
- improve infrastructure for transportation and distribution of fertilizers to remote and hard-to-reach areas; and
- implement educational programs to increase farmers’ awareness of the benefits of fertilizer use and their proper application to maximize yields.

However, these goals and solutions have not been fully realized. By 2011, the set target for soil fertilizer application rate was not achieved. Only in North Africa did the fertilizer application rate approach the 50 kg of nutrients per hectare of arable land, which is still low compared to other regions of the world. More critical is the application rate for SSA, which is below the average rate for the continent. Soil fertilizer application in Africa remains insufficient to ensure food security and optimize nutrient use efficiency.

For example, in 2007, the Kenyan government introduced NAAIAP (National Accelerated Agricultural Inputs Access Programme) for farmers who still could not afford inorganic fertilizers. The Kilimo Plus program offered vouchers for fertilizers and improved maize seeds that targeted smallholder farmers could redeem from private agro-dealers. In 2008, the country established a national fertilizer subsidy program in response to a spike in oil prices that tripled retail fertilizer prices. The program provided all verified farmers with fertilizer rebates from the National Cereals and Produce Board (NCPB). As of 2018, the program had procured and distributed 1.3 mt of fertilizers worth KSh 31 bn (USD 307 mln).

41. Fertilizer application in African regions, kg of nutrients per ha

![Graph showing fertilizer application in African regions](image)
Both programs may have increased fertilizer use but created problems for commercial fertilizer markets. While NAAIAP increased maize yields by 30% and reduced poverty by 11%, a World Bank evaluation found that government reimbursement payments to agro-dealers were regularly delayed, undermining confidence in the program and preventing timely resupply.

In Mozambique, temporary subsidy programs were introduced as a way of overcoming the lack of information among farmers who had limited experience with improved inputs in 2010–2011. The programs were supposed to address farmers’ ignorance and mistrust of fertilizers. During the subsidy year, farmers increased fertilizer use by 33 kg/ha and achieved a 58% increase in maize yields. The program also impacted nearby farmers who did not receive subsidies. During the campaign period, farmers were able to purchase more fertilizers, which had a positive impact on fertilizer application and, consequently, yields in the following two seasons.

However, fertilizer subsidy programs in Africa are differentiated by region and are often dependent on government budgets, which are not always sufficient to sustain long-term financial support to farmers. For example, the 2018–2021 subsidy programme in Ghana significantly increased the country’s crop yields, leading to better food availability, but was discontinued due to the strain caused by the COVID-19 crisis, which, in turn, further reduced fertilizer availability.

Increasing domestic fertilizer production in Africa and SSA in particular could be an important step towards developing the continent’s agricultural sector. However, most of the growth in production has been concentrated in North African countries.

Domestic fertilizer production in Africa has increased by 90% over the last 10 years, but most of the continent’s fertilizers are produced in North Africa (80–90%). Sub-Sahara, despite a 5-fold increase in production capacity since 2012, accounts for about 1% of total global fertilizer production. The growth in SSA’s fertilizer production in 2022 is attributed to the strong growth in global fertilizer prices, which encouraged the development of domestic production. However, so far, the lack of adequate logistics infrastructure and scientific knowledge in fertilizer production and application have hindered the development of SSA’s agribusiness sector.

42. Fertilizer production in Africa, physical mt

<table>
<thead>
<tr>
<th>Year</th>
<th>Sub-Sahara</th>
<th>North Africa</th>
</tr>
</thead>
<tbody>
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<td>2012</td>
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</tr>
<tr>
<td>2019</td>
<td>11.6</td>
<td>1.0</td>
</tr>
<tr>
<td>2020</td>
<td>12.9</td>
<td>1.0</td>
</tr>
<tr>
<td>2021</td>
<td>12.6</td>
<td>1.4</td>
</tr>
<tr>
<td>2022</td>
<td>12.5</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Source: working group analysis

6.3. Ongoing support measures

Efforts and statements of international organizations

In April 2022, the World Bank developed a global response to the fertilizer and food market challenges, affecting such areas as agriculture, access to nutrition and water, social protection, and irrigation.

To implement global measures to support producers and households, the Bank committed about USD 30 bn for short- and long-term food security measures in 69 countries, including active measures in 22 of the 24 pockets of hunger identified.

For example, the USD 2.3 bn Food Systems Sustainability Programme for Eastern and Southern Africa is helping countries improve the resilience of the region’s food systems and the ability to address growing food shortages. The programme will strengthen the inter-ministerial response to the food crisis, as well as intensify medium- and long-term efforts to ensure the sustainability of agricultural production, sustainable development of natural resources, improved access to markets, and greater attention to food systems resilience in policy development.
Efforts and mechanisms introduced by countries

The issues of rebalancing the food and fertilizer markets were mainly raised at the G20 Summit in November 2022. The G20 countries advocate open, transparent and equal trade in agricultural products, and oppose the imposition of bans and restrictions on exports of food and fertilizers in a manner inconsistent with the norms of the World Trade Organization. G20 members called on all countries to assist the nations most affected by the food crisis, urging those in a position to do so to donate food and fertilizers, and pledged to facilitate humanitarian supplies to ensure access to food in emergencies. In this regard, the G20 advocated exemption of humanitarian assistance from sanctions, including through efforts of the UN. The World Trade Organization (WTO) CEO Ngozi Okonjo-Iweala urged G20 countries to move towards reducing export restrictions, especially in trade in food, feed, and fertilizers, as this would help reduce price volatility.

At the international level, the European Commission is making its own efforts to improve global food security by means of:

- cooperation with selected partner countries, including through the Global Fertilizers Challenge, to reduce their dependence on and consumption of imported fertilizers;
- enhancing transparency of the global fertilizer market by participating in relevant international fertilizer initiatives, in particular the G20 Agricultural Market Information System (AMIS);
- initiating discussions on the removal of export restrictions on fertilizer trade within the framework of the WTO, with a view to meeting commitments made under the declaration of food security;
- continued work with member states to ensure smooth development of global trade in agrifood products and fertilizers; and
- further strengthening the EU humanitarian food aid, which already exceeded EUR 900 mln in 2022, an increase of 55% over 2021.

The USA has also taken steps to stabilize the fertilizer and food markets. In July 2022, the US Treasury Department’s Office of Foreign Assets Control (OFAC) authorized transactions with Russia related to food, fertilizer, and seed supplies. The USA removed some of the goods, such as inorganic fertilizers, seeds and reproductive materials, foodstuffs, vitamins and minerals, food supplements and vitamins, bottled water, live animals, and animal feed from the anti-Russian list.

However, a month later, the agency updated the general license and clarified the rules for importing a number of Russian goods into the United States, as well as the conditions for exporting U.S. goods to Russia. In particular, it stated that transactions involving goods from the list would be prohibited if the Russian Central Bank, the National Welfare Fund (NWF), the Russian Ministry of Finance or any of the sanctions-listed banks were in any way involved in processing the transactions.

Charity efforts

In 2022–2023, charitable organizations actively worked on expanding nutrition programs in the Sub-Saharan region. These programs aim to provide balanced food rations to children and adults suffering from hunger, especially in remote and most vulnerable areas.

Charitable organizations also focused their efforts on educating local communities in sustainable farming and agriculture practices. The goal is not only to provide food in the short term but also to ensure long-term sustainability of food systems.

Nevertheless, despite the efforts of international organizations, developed countries, and charitable companies, their results are insufficient even to stabilize the growing hunger issue in Sub-Saharan Africa.
6.4. African consumers’ adaptation

During 2022, when the supply of fertilizers was limited and prices went up, the most vulnerable consumers, including the countries of Sub-Saharan Africa, had to devise and implement various adaptation strategies, which involved the following efforts from the Governments and market participants:

- Asking for support from big exporters, using political tools to obtain special offers, non-commercial ones, big discounts and secured availability in exchange for long-term contracts. As a result of such efforts, in 2023 Russia decided to ship its fertilizers, blocked in the Baltic states, to Kenya, Nigeria, and to other countries that need them most, free of charge. The total Russian donation to poor countries may reach 0.262 mt of fertilizers blocked in the ports of Latvia, Estonia, Belgium, and the Netherlands.

- Allocating or expanding subsidy budgets in order to enable farmers to buy fertilizers at higher prices. E.g. in 2023 the Government of Malawi awarded fertilizer contracts to 13 companies to supply fertilizers under the 2023–2024 Affordable Inputs Programme (AIP). Also, Ghana has adopted the Planting for Food and Jobs (PFJ) inputs subsidy programme which also covers fertilizer access and fertilizer systems development, with USD 98 mln spent in 2022 to fund the Programme and with a total budget of >USD 400 mln for 4 years.

- Promoting the use of alternatives to mineral and chemical fertilizers, such as organic fertilizers. For instance, the FAO and the WFP support Ghana towards agriculture resilience and food security under the Joint SDG Fund Development Emergency Modality project, aiming at the promotion of organic fertilizers in Ghana to fight the food crisis and enhance farmers’ livelihoods.

- Promoting the use of local resources, e.g. direct application of rock phosphate in the countries where they have some, which is less efficient, but cheap and readily available. This is practiced in Tanzania and Mali.

- In the past few years, more and more countries in Africa have been pushing to have their own local fertilizer production. For them, this is the only way to ensure the availability and affordability of fertilizers during the periods of high prices. E.g. Nigeria has gone from just three blending plants operating at 40% capacity in 2016 to 44 fertilizer blending plants today, most of which are operating at full capacity. Besides a new USD 2.5 bn, 3 mt urea plant was commissioned in Nigeria in late March 2022. In June 2023, Egypt announced the construction of a new 270 ktpa fertilizer-grade granulated ammonium nitrate plant with a total estimated investment cost of USD 270 mln, which will also supply fertilizers to the local and Sub-Saharan markets.

- Although not widely practiced in African countries so far, pushing for lighter (and thus cheaper) formulae instead of the usual ones offered by the blenders/distributors has huge potential, as this helps to maintain the level of prices that farmers can afford.

The abovementioned measures for the improvement of agricultural and food production are also in line with the actions undertaken in accordance with the climate change adaptation strategies of African countries, covered by Africa Adaptation Acceleration Program (AAAP). The goal of AAAP is to raise at least USD 10 bn in investments by 2025 to build climate-smart agriculture and resilient food systems to support food security for at least 38 mln farmers in 26 African countries.

Required support measures

The issue of hunger in Sub-Saharan Africa requires a more robust effort. The rapid population growth (averaging 2% annually over the last 15 years) coupled with slow agricultural sector growth led to worsening food security. This situation is further exacerbated by internal instability due to external and internal conflicts, pandemics, and weather-related disasters.
VI. Measures Required to Ensure Food Security

43. Base case scenario of food security normalization in Sub-Saharan Africa

The grain deficit in Sub-Saharan Africa amounted to 20 mt in 2022. In the short term, it is not possible to bridge the 12.3% gap in required production volumes at the current production level through increased crop yields in key agricultural sectors. By 2026, the number of people suffering from hunger could increase by 59%, to 418 mln people. The rapid increase in the number of hungry individuals must be halted, which can potentially be achieved through subsidies that promote higher fertilizer use and food imports, particularly grains.

Removing all restrictions on fertilizer exporters in compliance with the United Nations Conference on Trade and Development (UNCTAD) Convention would increase fertilizer availability on the global market and help bring down the prices, making fertilizers more affordable for smallholder farms. A reevaluation of sanction policies by political leaders is necessary, as sanctions have been a key factor behind logistical, banking, and other disruptions in food and fertilizer supplies. It is imperative to swiftly reduce sanction pressure on the sectors that impact food security in Sub-Saharan Africa.

44. Ambitious scenario of food security normalization in Sub-Saharan Africa

The international community should establish a comprehensive mechanism to protect humanity from repeating mistakes related to food security threats arising from sanctions.

However, addressing the worsening humanitarian situation in Sub-Saharan Africa through external support alone will not halt the rise of global hunger. Should fertilizer production volumes remain unchanged, subsidies from developed countries will in the long run lead to a worldwide price increase due to heightened demand. Moreover, increased affordability in Africa due to external subsidies will exacerbate price growth and reduce fertilizer accessibility in other low-income importing countries (such as Asia and Latin America). Therefore, developing the agro-industrial complex of SSA countries is necessary to create a self-sustaining market with steady growth rates for both grain crops and mineral fertilizers.
Considering the population growth in Sub-Saharan Africa, achieving a hunger rate equivalent to the global average (9%) by 2026 necessitates a sustainable rate of grain consumption growth of 5%. The ambitious scenario considers an increase in production through higher fertilizer consumption. By 2026, fertilizer consumption in Sub-Saharan Africa should grow by 23%, to 12.3 mt, consequently, grain consumption would also increase by 22.5%. As a result, the number of people suffering from hunger should decrease from 262 mln in 2022 to 115 mln in 2026.

The required rate of growth should be achieved through larger arable land areas and improved crop yields.

To enhance crop yields, a comprehensive approach is required:

- increase domestic fertilizer production;
- enhance farmers’ technological skills and their trust in fertilizers;
- construct irrigation systems.

In the absence of these measures and given the current population growth and trends in the agricultural industry, the number of hungry people in Sub-Saharan Africa could reach 418 mln by 2026, bringing the region closer to a humanitarian catastrophe.
Hunger in Asia: Key Hotspots at a Glance
This report mainly focuses on the situation in Africa, where food insecurity (measured as a share of undernourished people as a proportion of the region’s population) is the most acute. However, in order to analyze the effects of the fertilizer market crisis in 2021–2022 on a global scale, we have also studied, though in less detail, the situation with hunger in Asia.

The overall number of undernourished people in Asia in 2022 amounted to ~402 mln, which accounts for 55% of the total number of undernourished people around the world and 9% of the total population of Asia. Though in relative terms the problem with hunger in Asia is not as acute as in Sub-Saharan Africa (where, as it has been mentioned in Chapter 3, in 2022 there were 262 mln undernourished people, or 23% of the regional population), this problem persists and should be definitely taken into consideration.

The overall situation with food security in Asia is provided in figure 45 below. From this figure the following categories of countries can be of certain interest for our analysis:

- Countries where the numbers of undernourished people are high in both relative and absolute terms, along with high increase of this number in the past 3 years and no visible growth in fertilizer consumption. This primarily refers to India with an estimated 234 mln undernourished people (or more than 30% of the global total and more than 50% of the total number of undernourished people in Asia), and Pakistan, where the highest rate of growth in the number of undernourished people among all Asian countries was registered. These two countries will be further studied in detail in Appendix 3.

- Countries with a moderate to high increase in the number of undernourished people and a decline in fertilizer consumption, where due to the relatively low share of undernourished people in the total population, the effects of the fertilizer market crisis on the hunger problem were not very pronounced. In particular, this refers to the Philippines and Myanmar, which will be further studied in detail in Appendix 3.

- The remaining countries where a) there is positive dynamics towards a decline in the number of undernourished people and a growth in fertilizer consumption, or b) their population and the number of undernourished people are relatively low and negligible in global terms. However, we will look at Sri Lanka in detail in the next chapters for the following reasons:
  - The highest inflation rates in Asia, reaching a record high 94.5% in September 2022, which may result in a surge in the number of undernourished people in the country.
  - A ban on chemical fertilizers introduced in 2021, which makes it a unique case warranting further analysis.
### India

India is home to 234 mln undernourished people (a 17% increase from 2020). This is the highest absolute number of undernourished people globally, representing 17% of the country’s population and 32% of the total global number of undernourished people.

Millions of people are resorting to negative coping strategies that, if prolonged, are likely to set back their social and economic development much longer than the current crisis. The problem of malnutrition in India could have been solved by increasing grain consumption in Asia by ~20 mt of grain.

Grain consumption in India is almost completely covered by domestic production. This determines the importance of high yields for providing the population with a harvest. Food import (or reducing food export) is not a viable option for India, since the high volatility of global food prices makes it impossible for newly emerging economies to purchase products at global prices (or to abandon the substantial revenues from crop exports). That is why domestic production of affordable crops is absolutely essential for India. And the production of crops is largely dependent on fertilizer availability, which is driven by price fluctuations in the fertilizer market.

India has historically met most of its fertilizer demand through own domestic production (the share of imported fertilizers in consumption stands at around 35%). The growth of fertilizer consumption in 2012–2020 (+13.1 mt, or 26%) was achieved both through own production development (+16% over the same period) and, even more significantly in relative terms, through increased imports (+57% over the same period). Fertilizer exports from India have historically been insignificant.

In 2022, India managed to minimize the negative effects of reduced fertilizer availability drawing on significant state subsidies.

In 2022, India managed to minimize the negative effects of reduced fertilizer availability drawing on significant state subsidies. The government provides financial support to companies that sell fertilizers to farmers, a key vote bank, at below-market rates. India is a top importer of urea and a major buyer of diammonium phosphate (DAP) needed to

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### Summary table of food security and fertilizer consumption dynamics in Asia

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of undernourished people, mln</th>
<th>Undernourished people increase, 2020-2022</th>
<th>Fertilizer consumption dynamics, 2020–2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>200 222 234</td>
<td>+17%</td>
<td>0</td>
</tr>
<tr>
<td>Pakistan</td>
<td>29 36 43</td>
<td>+47%</td>
<td>0</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>20 20 19</td>
<td>-4%</td>
<td>+10%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>16 17 16</td>
<td>-1%</td>
<td>-3%</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>10 11 12</td>
<td>+18%</td>
<td>+127%</td>
</tr>
<tr>
<td>Philippines</td>
<td>6 6 6</td>
<td>+7%</td>
<td>-20%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>5 5 5</td>
<td>-8%</td>
<td>+5%</td>
</tr>
<tr>
<td>Thailand</td>
<td>4 4 4</td>
<td>-14%</td>
<td>-20%</td>
</tr>
<tr>
<td>Myanmar</td>
<td>2 2 2</td>
<td>+40%</td>
<td>-62%</td>
</tr>
<tr>
<td>Nepal</td>
<td>1 2 2</td>
<td>+14%</td>
<td>+125%</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>1 1 1</td>
<td>-21%</td>
<td>-53%</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1 1 1</td>
<td>-25%</td>
<td>+14%</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>1 1 1</td>
<td>0</td>
<td>-20%</td>
</tr>
<tr>
<td>Taiwan</td>
<td>1 1 1</td>
<td>-22%</td>
<td>+7%</td>
</tr>
<tr>
<td>Cambodia</td>
<td>1 1 1</td>
<td>+14%</td>
<td>+3%</td>
</tr>
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<td>+22%</td>
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<td>Turkmenistan</td>
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<td>0</td>
<td>-10%</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>0 0 0</td>
<td>0</td>
<td>-21%</td>
</tr>
</tbody>
</table>

Source: Global Trade Tracker, working group analysis

The situation with hunger in the countries from the abovementioned categories can be summarized as follows. More details can be found in Appendix 3.
stimulate its huge agriculture sector which employs about 60% of the country’s workforce. The fertilizer subsidy budget in India was increased from USD 14.1 bn in 2021 to USD 26.2 bn in 2022 in order to offset the increase in prices and enable the importers to attract required volumes. However, India’s estimated losses from the increased fertilizer prices exceed the amount of subsidies. Moreover, officials are considering slashing the fertilizer subsidy bill to 1.75 tn rupees (USD 21.4 bn) for the 2023/24 fiscal year as global prices fall, but it is still above the seven-year-average.

The total economic damage for India resulting from the food and fertilizer crisis is estimated at USD 45.1 bn, which includes farmers’ losses and rising consumer spending. In 2022, the number of undernourished people in India increased by 12 mln (or 5%) compared to 2021 and by 34 mln (or 17%) compared to 2020. However, the overall situation in Asia is expected to normalize in the coming years, which will help bring the number of undernourished people in India down to the 2020 levels of around 192 mln by 2025 (down by 42 mln compared to 2022).

Pakistan

Pakistan has 43 mln undernourished people – up an astonishing 47% from the 2020 figures. This is the second highest absolute number of hungry people in Asia and represents 18% of the country’s total population.

Historically, Pakistan has met most of its fertilizer demand through own domestic production: the share of imported fertilizers in consumption is around 15–20%. Millions of people are resorting to negative coping strategies that, if prolonged, are likely to set back their social and economic development much longer than the current crisis.

Grain consumption in Pakistan is almost completely covered by the domestic production. The problem of malnutrition in Pakistan could have been solved by increasing grain consumption by ~4 mt of grain. Domestic production of affordable crops is absolutely vital for Pakistan, since no other viable options to ensure appropriate levels of consumption are available for the people in this country. And the production of crops is largely dependent on fertilizer availability, which, in turn, depends on price fluctuations in the fertilizer market.

Historically, Pakistan has met most of its fertilizer demand through own domestic production: the share of imported fertilizers in consumption is around 15–20%. Fertilizer consumption increased by 2.7 mt (37%) in 2012–2020 mainly due to a ramp-up in domestic production (+51% over the same period), while imports decreased by 25% over the same period. Pakistan’s fertilizer exports have historically been rather insignificant.

The total economic damage stemming from the food and fertilizer crisis is estimated at USD 18.3 bn and comes from the farmers’ losses and increased consumers’ food spending. In 2022, the number of undernourished people in Pakistan increased by 7 mln (or 18%) compared to 2021 and by 14 mln (or 47%) compared to 2020. However, the overall situation in Asia is expected to normalize in the foreseeable future, which by 2025 will help bring the number of undernourished people in Pakistan down to the 2021 levels of around 35 mln (down by 8 mln compared to 2022).

The Philippines

The problem of malnutrition, which is faced by 5.9 mln people in the Philippines (5.1% of the total population of the country; +7% in 2021–2022), is less acute than in India and Pakistan and could have been solved by increasing grain consumption in the country by up to ~0.5 mt of grain, which equals 0.2 mt of additional fertilizer supply. Overall consumption of fertilizers in the country currently stands at 2.3 mt (~20% in 2021–2022). Although lower consumption levels are not likely to be the primary reason for certain persistence of malnutrition in the Philippines, they definitely add to the problem.

Myanmar

The combination of a political and economic crisis persisting since the February 1, 2021 military takeover, rising intensity of the ongoing conflict in many parts of the country, the impact of the COVID-19 pandemic, the outbreak of hostilities in 2022,
In case no further actions are undertaken, the number of undernourished people in Myanmar may keep growing by 0.3 mln per annum, reaching 3 mln people.

Sri Lanka

The number of undernourished people in Sri Lanka decreased by 21% (5% of the population) in 2021–2022 and stood at around 1.1 mln in 2022.

However, Sri Lanka is undergoing the worst economic crisis since its independence, which is severely impacting local markets and income sources and has compounding effects on food security, resulting in record high inflation (84.9% as of September 2022). Reduced foreign reserves, increased international prices and the devaluation of the Sri Lankan rupee led the country to default on its debt in May 2022 for the first time in its history. The decision to ban chemical fertilizers adopted in 2021 caused a 40% drop in rice and maize yields, which in turn triggered the food inflation crisis. Although the ban was reversed by the end of 2021, elevated international prices, cancelation of government subsidies, and the lack of foreign reserves impeded the imports of required agricultural inputs. The economic downturn, shortages of imported goods, including fuel and gas, reduced agricultural production, and high prices disrupted livelihoods, forcing households to resort to consumption-based coping strategies and hampering their abilities to meet other essential needs.

Even despite the decline in fertilizer (-53%) and grain (-19%) consumption in 2021–2022, the statistics indicates that the food security situation in Sri Lanka is not dramatic, as the number of undernourished people declined by 21%. However, the extremely high food inflation driven by the ban on fertilizers might worsen the situation and increase the number of undernourished people in the country in the upcoming years.

The extremely high food inflation might worsen the situation in Sri Lanka and increase the number of undernourished people in the country in the upcoming years.

In case no further actions are undertaken, the number of undernourished people in Myanmar may keep growing by 0.3 mln per annum, reaching 3 mln people.
Major Changes in the Fertilizers Market in 2022–2023 and Their Impact on Global Food Security

Policy Initiatives of Western Countries and International Organizations Aimed at Rebalancing the Food and Fertilizer Markets
8.1. Policy statements and assessment of the situation

As the situation in the food and fertilizer market deteriorated in 2022, global food security issues re-emerged on the international political agenda.

In March–April 2022, Russia and Western countries began to exchange mutual recriminations with regard to the worsening global food insecurity. For instance, in April 2022 the Russian president Vladimir Putin claimed that sanctions would inevitably worsen food shortages in the world’s poorest regions, spurring waves of migration and food prices. He also emphasized that “in these current conditions, a shortage of fertilizers on the global market is inevitable”.

In response to those statements in April 2022, High Representative of the EU for Foreign Affairs and Security Policy Josep Borrell noted that “our sanctions against Russia do not bear any responsibility for the growing food insecurity: the agricultural sector in Russia is not targeted. Our sanctions do not prohibit the import and transportation of Russian agricultural goods”. At the same time, he also stressed that the Russian–Ukrainian conflict had significantly increased the risks of disruptions in global fertilizer trade.

A similar position was expressed by the U.S. Secretary of State Antony Blinken in May 2022: “Sanctions aren’t preventing Russia from exporting food and fertilizer; the sanctions imposed by the United States and many other countries deliberately include carveouts for food, for fertilizer, and seeds from Russia, and we’re working with countries every day to ensure that they understand that sanctions do not prevent the flow of these items.”

Thus, none of the confronting parties denied the worsening global food security, as well as problems with the supply of fertilizers to global markets. However, the assessment of the causes of those problems differed dramatically from the very beginning.

None of the confronting parties denied the worsening global food security, as well as problems with the supply of fertilizers to global markets. However, the assessment of the causes of those problems differed dramatically from the very beginning.

It is also worth noting that the EU statements specifically emphasized that sanctions did not prevent fertilizer supplies to third-country markets, including Africa. Mr. Borrell noted that the EU would send letters to African counterparts to explain that sanctions were decisions that affected only the EU member states and not third countries. In addition, he separately emphasized, “Our sanctions do not forbid them [financial and economic actors] to participate in the trade of food and fertilizers with Russia and third countries.”

At the same time, the UN Secretary-General António Guterres did recognize the negative impact of the sanctions on fertilizer supplies. According to him, “[Russian food and fertilizers] are not subject to sanctions, but suffer indirect impacts”. He also noted that fertilizer prices had tripled compared to the pre-pandemic period and that it was impossible to deal with the global food crisis without full access to Ukrainian and Russian food and Russian fertilizers.

It is also important to note that at the UN level, the discrepancy between the statements of Western countries and the real situation was partially admitted. For example, it can be seen from Mr. Guterres’ statement made in September 2022: “We are working with the US, working with the EU, working with other partners to make sure that what has been said time and time again, that sanctions do not apply to food and fertilizers, translates itself into reality, and we badly need the Russian fertilizers at a moment in which we are seeing a fertilizer market crunch.”

In November 2022, the USA, the UK, and the EU issued a joint statement reiterating that their sanctions did not apply to food and fertilizer supplies from Russia, calling on global partners to adopt a similar approach, as well as to take into account special exemptions from their sanctions regimes for Russian fertilizers and food (these mechanisms will be described in detail in the next section): “We have always been clear that the target of our sanctions is Russia’s war machine and not the food or fertilizer sectors. To that end, we have provided clarity to industry and partners. […] These provisions make clear that banks, insurers, shippers, and other actors can continue to bring Russian food and fertilizer to the world. We call on our global partners, and on the actors, industries and services involved in agricultural trade, […] to bring Ukrainian and Russian food and fertilizer to meet acute demand.”

Similar statements on the importance of the free trade regime for food and fertilizers have also been released at the level of the G7 countries. For example, the statement made
by the G7 leaders following the June 2022 Elmau Summit asserted that the G7 countries would continue to ensure that sanctions regimes did not target food and did not impede free trade in agricultural products, including Russian products.67

However, despite all those statements, market conditions remained challenging in 2022–2023, especially for low-income countries, including Africa.

According to the resolution of the Bureau of the Pan-African Parliament, fertilizer prices on the continent had risen by more than 300% and there was a shortage of about 2 mt due to logistical, banking, and other constraints.68 As a result of those restrictions, food production in Africa was expected to fall by at least 20%. At the same time, “individual countries that impose direct or indirect sanctions and related decisions to restrict the flow of fertilizer inputs to the global market bear the primary responsibility for this risk”.69

Another example of the concerns expressed by African leaders regarding food security issues is a communication from Jane Toroitich, Political Coordinator of the Permanent Mission of Kenya to the UN, stating that “food security in Africa has deteriorated and may get worse if fertilizer costs remain high [...] the transit and transshipment in ports of Russian fertilizers and raw materials through nearby countries have fallen by almost 90%. Overall, Russian fertilizer supplies to global markets have decreased sharply leading to the rise in prices".70 She also called on the UN Security Council to pass a resolution for all countries to lift any restrictions on the export and transportation of food and fertilizers.

The difficult situation with food and fertilizer availability was also the focus of attention of key international organizations. According to a joint statement issued in February 2023 by the heads of the Food and Agriculture Organization, the International Monetary Fund, the World Bank Group (World Bank), the World Food Programme (WFP) and the World Trade Organization (WTO), 349 mln people in 79 countries were food insecure. Furthermore, “fertilizer affordability [...] is also the lowest since the 2007/2008 food crisis, which is leading to lower food production and impacting smallholder farmers the hardest, worsening the already high local food prices”.71

Unreasonable barriers to trade in food and fertilizers, as well as the continued high risks to global food security, were also mentioned in the statement of the G7 leaders following the Hiroshima Summit in May 2023:

“We remain deeply concerned with the ongoing and worsening global food security and nutrition situation, with the world facing the highest risk of famine in a generation. We reiterate the importance of ensuring rules-based, open, fair, transparent, predictable, and non-discriminatory trade and avoiding unjustified restrictive trade measures to keep the food and agricultural markets open and call on our G20 partners to do the same.”72

Thus, from the very beginning, Russia and Western countries have matched the Russian–Ukrainian crisis and the accompanying Western sanctions to the risks to global food security, while pointing to different causes.

• According to Russian officials, it was the sanctions imposed by Western countries and other states that significantly hindered the access of Russian food and fertilizers to global markets, pushing prices up and leaving the newly emerging economies with no access to those goods.

• Western countries (primarily the US, the EU, and the UK) insisted in their statements (and continue to do so) that sanctions do not affect fertilizer and food supplies due to special carveouts from the sanctions regimes. The rise in food and fertilizer prices, as well as their declining availability, is attributed to the disruption of supply chains, logistical difficulties due to the conflict, and the refusal of Western contractors to work with Russian companies.

The deteriorating global food security situation is a key focus of the international agenda for leaders of both developed and newly emerging economies, as well as international institutions. Disruptions in food and fertilizer supply chains pose significant risks in terms of the spread of hunger and poverty, uncontrolled migration, and social unrest. In this regard, it is important to assess the effectiveness of measures and tools used by Western countries to exclude Russian food and fertilizers from sanction regimes.
8.2. Political actions of Western countries: license regimes and derogations and their effectiveness

The US, the UK and the European Union have introduced various tools and mechanisms aimed at exempting food and fertilizers from the sanctions regimes of these countries. Each of the approaches requires separate consideration because of differences in the scope of targeted products and transactions, as well as the specifics of its legal application.

The US: the General License regime

The U.S., which has considerable experience in implementing sanctions, was the first among Western countries to adopt a special general license in March 2022 – General License No 6A “Transactions Related to the Export or Reexport of Agricultural Commodities, Medicine, Medical Devices, Replacement Parts and Components, or Software Updates, the Coronavirus Disease 2019 (COVID-19) Pandemic, or Clinical Trials”. The license was issued by the Office of Foreign Assets Control on March 24, 2022.

The first version of the license provided for authorization of all economic transactions necessary for the export or re-export of agricultural products to, from, or in transit through Russia. Agricultural products for the purposes of this license were defined as: food for humans or animals; seeds for food crops; mineral and organic fertilizers; reproductive materials for the production of food animals.

The text of the license was reviewed several times. According to the current version of the license (No 6C dated 17/01/2023), operations related to the production, manufacturing, sale, transport or provision of agricultural commodities and machinery are permitted.

In addition, according to James O’Brien, head of the U.S. State Department’s Office of Sanctions Coordination, in September 2022, the U.S. State Department collected reports on problems with food and fertilizer supplies through U.S. embassies, with a special focus on African countries. A special food security help desk was also set up for entities experiencing difficulties with purchasing food or fertilizers from Russia.

Additionally, in August 2022, the OFAC published clarifications on the non-sanctioned status of fertilizer companies PhosAgro and EuroChem in the FAQ section of its website.

Effectiveness of the tool

The effectiveness of the US approach is assessed as high. It has a wide coverage by product type (all types of mineral and organic fertilizers fall under the scope of the license), as well as by types of permitted operations. In addition to the prompt implementation, the license was timely updated according to the feedback received from market players.
The UK: the General License regime

In November 2022, the UK Treasury’s Office of Financial Sanctions Implementation (OFSI) issued a general license – General License INT/2022/234.9952.78. This license, subject to certain conditions, authorizes operations related to agricultural commodities, including the provision of insurance and other services.

Specifically, it authorizes: (1) receiving and transferring funds and economic resources, including from designated persons, for transactions related to the export, sale, production, and transport of agricultural commodities; (2) providing insurance, reinsurance, and underwriting services and any other financial services regarding transactions involving agricultural commodities.

Agricultural commodities for the purposes of this license were defined as: food, fertilizers, feed, seeds, and reproductive materials for the production of food for animals. However, fertilizer for the purposes of the license were defined specifically as:

- ammonium nitrate, including fertilizers and fertilizer blends containing more than 15% by weight ammonium nitrate, except liquid fertilizers (containing any amount of ammonium nitrate) or dry fertilizers containing less than 15% by weight ammonium nitrate; and
- ammonia in aqueous solution (commodity code 2814 20, “ammonia water”).

Thus, the license covers only a small part of Russian fertilizer exports (namely, ammonium nitrate, CAN, dry fertilizers based on ammonium nitrate, and ammonia water). These exports accounted for only 12% of total fertilizer exports from Russia and 8% of fertilizer exports from Russia to the UK in 2021.

Effectiveness of the tool

The effectiveness of the UK’s approaches is assessed as low, primarily due to the small coverage by product type. Given the small share of products covered by the license, as well as the small share of these products in the overall structure of Russian exports, the adoption of the UK’s general license contributed little to easing the restrictions on fertilizer supplies from Russia.

The European Union: the regime of derogations

The first step towards easing the EU sanctions regime on food and fertilizer supplies from Russia was to adopt amendments to the FAQ (Frequently Asked Questions) on the application of the EU sanctions legislation in September–October 2022.

In particular, it was stated that European operators are allowed to supply (transfer) Russian fertilizers (potash and complex fertilizers containing the three main nutrients) to third countries, as well as to provide services necessary for such supplies (brokerage, financial, insurance, and other services). At the same time, the FAQ is not a legally binding document and the main regulation containing a ban on the transport, supply through the EU of potash and complex fertilizers to third countries, as well as a ban on the provision of services necessary for such supplies (described earlier in section 2), remains in force to date (Regulation (EU) No 833/2014).

On December 16, 2022, the EU approved the 9th package of sanctions against Russia, which included special amendments to address problems with exports of Russian food and fertilizers to global markets arising from the EU sanctions on individuals related to the Russian fertilizer industry.

In particular, Council Regulation No 269/2014 was amended with the following paragraph added:

“By way of derogation from Article 2, the competent authorities of a Member State, based on a specific and case-by-case assessment, may authorize, for each relevant transaction separately, the release of certain frozen funds or economic resources belonging to natural persons listed in Annex I who held a significant role in international trade in agricultural and food products, including wheat and fertilizers, prior to their listing, or the making available of certain funds or economic resources to those persons, under such conditions as the competent authorities deem appropriate and after having determined that such funds or resources are necessary for the sale, supply, transfer or export of agricultural and food products, including wheat and fertilizers, to third countries in order to address food security.”
VIII. Policy Initiatives of Western Countries and International Organizations Aimed at Rebalancing the Food and Fertilizer Markets

Thus, the EU allowed sanctioned individuals who, prior to being sanctioned, played a "significant role" in international trade in food and fertilizers to use their funds or assets on an exceptional basis if such resources are necessary to ensure the supply of Russian agricultural products and fertilizers to third countries for food security purposes.

Such unfreezing of funds and assets is possible on a case-by-case basis, for each individual fertilizer or food supply transaction, and only upon the decision of the competent authorities of the EU country that introduced asset-freezing measures and under such conditions as they deem necessary. The member state is obliged to inform the other EU members of the decision within two weeks. It should be noted that even prior to these amendments the EU member states were able to give special permissions for certain transactions. The adopted amendments institutionalized this process, making it way more bureaucratic.

Importantly, the adoption of these amendments at the end of 2022 can be interpreted as the EU's first indirect recognition of the negative impact of personal sanctions on Russian food and fertilizer supplies. At the same time, the applied approach has many disadvantages.

a. The power to unfreeze assets and/or authorize transactions was transferred to national authorities of the EU member states, which determine the conditions of such unfreezing or authorizations upon their own. What is more, the competent national authority of the EU state has the power not to give any authorizations at all. This is due to the fact that the adopted mechanism gave the EU countries the right, but not the obligation, to issue relevant permits. As a result, countries promoting especially harsh anti-Russian rhetoric (Poland, Lithuania, Latvia, Estonia, etc.) continued to block supplies of Russian fertilizers to global markets. Thus, for example, on the day when the derogation mechanism was adopted, the President of Lithuania stated that food security should not be used as a cover for easing anti-Russian sanctions;81 Poland also shared this position.

Below are some of the quotes of Lithuanian and Polish politicians:

- The Lithuanian Foreign Minister Gabrielius Landsbergis: "Lithuania […] will not grant any exemptions to hundreds of oligarchs or at least those who are definitely in Lithuania or have assets or businesses in Lithuania."82

- The Lithuanian President Gitanas Nauseda: "We are a little bit concerned about the attempts to relax the mechanism of sanctions with the cover of food security. Food security is important, but it should not be used as an excuse for a relaxation of sanctions and for some Russian oligarchs."

- Polish Prime Minister Mateusz Morawiecki: "Unfortunately, some countries suggested removing several Russian oligarchs from the list, including Viatcheslav Kantor. We strongly oppose this."85

b. The frozen funds of the companies do not belong to designated individuals. The regulation provides for the unfreezing of funds and assets specifically for the sanctioned person. At the same time, the fertilizer supply transactions are carried out by companies that are not sanctioned by the EU, and thus it is not clear whether the companies can apply for derogations.

c. Derogations are issued in a case-by-case mode, meaning that each transaction requires a separate authorization, which creates significant administrative costs, is time-demanding and incompatible with business as usual. The regulation does not provide for the possibility of obtaining a general license (permission) to unfreeze funds and carry out transactions (similar to the OFAC and OFSI licenses).

d. The regulation implies that all provisions of the EU Regulation automatically apply to the company, i.e. the company is subject to the EU sanctions (as an asset owned or controlled by a person on the EU sanctions list). Thus, the use of the mechanism by a company may be interpreted as its consent with the fact that it is controlled or owned by a sanctioned person.

It should be especially noted that the EU sanctions legislation is being fully copied and implemented by Switzerland, including all the drawbacks listed above. This has a significant negative impact on trading and banking operations of the affected fertilizer companies since many of them used Switzerland as a trading hub.

In May 2023, further clarifications were issued by EU officials to fine-tune the mechanism adopted as part of the 9th sanctions package. Once again, it should be mentioned that the guidance or FAQ's published by the EU are non-regulatory and may be applied (or not) by the national regulators of the EU countries at their discretion.
• A Guidance Note was published to ensure food security through the implementation of firewalls in cases of EU entities trading in agricultural and food products and controlled by a designated person or entity.86 A firewall implies changes to the corporate governance of the entity to prevent any participation of a designated individual in the operations and any business decisions of the company, as well as to prevent such person from obtaining resources or other benefits. The above mechanism involves the implementation of a firewall by the company itself in order to obtain sanctions clearance from the national regulator.

• The FAQ section was updated, in particular, for the case of requesting regulatory approval for fertilizer trading by a non-sanctioned company that does not consider itself to be owned or controlled by a sanctioned person.87 The EU clarifies that a company’s subjective position regarding its ownership and/or control of a sanctioned person over the company does not prevent it from applying for authorization under the mechanism adopted within the 9th sanctions package. The regulation does not draw any conclusions from such application as to whether the company is indeed owned and/or controlled by the sanctioned individual.

Effectiveness of the tool

The effectiveness of the instruments applied by the EU is assessed as extremely low for the following key reasons:

• Due to the political divisions within the EU, its member states failed to apply unified approaches to the exemption of Russian food and fertilizers from the sanctions regime. Some of the adopted instruments are only of an informational and advisory nature, and the implemented regulations do not create obligations for the EU countries to exempt food and fertilizers from the imposed restrictions.

• Some countries that are extremely important in terms of transport, transit, and transshipment of Russia-originated fertilizers (Baltic States, Poland) explicitly refused to implement any mechanisms of exemptions from the sanctions regimes on their territory.

• The implemented mechanisms significantly differ from the approaches used by the US and the UK: authorizations are issued for each individual transaction (operation) rather than for a specific scope of transactions and product types, which is incompatible with trade as usual.

In general, it should be noted that the governments of sanctions-imposing countries tried to implement carve-outs for fertilizers, as part of the agricultural goods family, from the sanctions effects. However, as shown earlier in this report, this negative impact still occurred and led to large economic and humanitarian losses. To a large extent, this is due to the fact that there are a number of gaps and peculiarities in the legislation, on the basis of which the sanctions were implemented. These features in the legislation did not allow to effectively protect the fertilizer sector, which is extremely important from the humanitarian perspective, from the sanctions. These features are analyzed in Appendix 4 in more detail.

Conclusion

Despite the statements about the inapplicability of sanctions to fertilizer and food supplies from Russia, the initiatives of Western countries to exempt these goods from sanctions regimes were ineffective. Even considering that the approach taken by the US is assessed as highly effective, the approaches of the UK, the EU, and Switzerland, which followed their lead, do not in fact provide effective carveouts for fertilizers and food from the imposed restrictions. The inefficiency of the EU approaches had a critical negative impact on Russian fertilizer supplies to global markets due to the historically established trade routes.

It can be also observed that all these manual-mode carveouts did not help in restoring the market balance in a timely and effective manner. Since the fertilizer market is complicated and inter-connected, the only effective way to restore the market balance is to lift any restrictions on the supplies of fertilizers disregarding the country of its origin. Otherwise, the risks to global food security from the negative impact of the sanctions will continue to grow.
Major Changes in the Fertilizers Market in 2022–2023 and Their Impact on Global Food Security

The Black Sea Grain Initiative
The implementation of the Black Sea Grain Initiative (the so-called “Grain Deal”) contributed to restoring food supplies from Ukraine. At the same time, most of the shipments went to high-income or upper-middle-income countries. Low-income countries, including those in Africa, received less than 3% of the shipments. Also, the Grain Deal failed to facilitate the supply of Russian fertilizers to the global market, and thus did not contribute to reducing the prices for these commodities.

Due to the continuous breach of those covenants, Russia withdrew from the Grain Deal in the summer of 2023, yet does not rule out rejoining the deal providing all the parties honor the package nature of the agreement. A speedy resumption of the Grain Deal is vital to maintain the progress achieved in lowering global food prices and to boost the political discussion on measures to ensure unhindered access of Russia-originated fertilizers to the global market.

9.1. The history of the Grain Deal and the obligations of the parties

The situation in the global markets, as well as a significant number of disruptions in supply chains, required some compromise solution that would ease the sanctions pressure on Russian food and fertilizers, as well as ensure the export of Ukrainian grain through the Black Sea. Such a compromise between Russia and Ukraine was reached through the mediation of Turkey and the UN in July 2022. In particular, on July 22, 2022, a package agreement called the Black Sea Grain Initiative (or the Grain Deal) was concluded between Russia, Turkey, Ukraine, and the UN. The deal was expected to lower market prices for food and curb global food inflation.

Russia and Ukraine each signed their own package of documents with Turkey and the UN. The “Russian” package included two documents: (1) the Memorandum of Understanding between the Russian Federation and the UN Secretariat on assistance in promoting Russian food and fertilisers on global markets (hereinafter, the Memorandum), and (2) the Initiative on the Safe Transportation of Grain and Foodstuffs from Ukrainian Ports (hereinafter, the Initiative). The Memorandum was set for 3 years and the Initiative for 120 days.

The Memorandum ran as follows:

- “A common priority for the Russian Federation and the [UN] Secretariat is to urgently address the growing global food insecurity concerns due to rising food and fertilizer prices in global markets, which is threatening to further undermine efforts to achieve the Sustainable Development Goals (SDGs), in particular SDG 2 – Zero Hunger.”

- “Noting the ongoing crisis in supply chains and disruptions in the logistics sector that contribute to sharp increase in prices for transportation and relevant expenses and in particular seriously affecting access of food and fertilizers for newly emerging economies and least developed countries.”

- “Noting the importance of unimpeded trade of fertilizers and the raw materials required to produce fertilizers (including ammonia) for the purpose of supporting global agricultural production.”

In order to establish unimpeded access to global markets for Russian food and fertilizers, including raw materials for their production, the parties to the Memorandum agreed on the following measures:

- The Russian Federation will inform the UN Secretariat of impediments to access of Russia-originated food and fertilizers (including raw materials) to global markets and facilitate unimpeded exports of food, sunflower oil, and fertilizers from Ukrainian-controlled Black Sea ports.

- The UN Secretariat will continue its efforts to facilitate the transparent unimpeded access of Russia-originated food and fertilizers (including raw materials) from Russia to the world markets (removing impediments in the sectors of finance, insurance, and logistics).”

- The UN Secretariat will also endeavor to engage relevant authorities and the private sector to effectively exempt Russia-originated food and fertilizers, including raw materials for their production, from measures imposed on Russia, based on the principle that those measures do not apply to these goods, taking into account critical global food security needs and the urgent requirements of the relevant food and fertilizer producers and traders in Russia.
The text of the Initiative included a description of specific measures to be taken by the parties to the Initiative to ensure safe transportation of grain and food from Ukrainian ports: the establishment of a joint coordination center in Turkey, setting up teams for ship inspections, and a humanitarian corridor for ship passage.

Russian officials repeatedly emphasized in their public statements the package nature of the agreement, i.e. the simultaneous implementation of the obligations and provisions stipulated in both documents (the Memorandum and the Initiative).

In addition, the package nature of these agreements was also reaffirmed in the final declaration of the 2022 G20 Summit in Indonesia. Specifically, according to the declaration:

“We welcome the Türkiye and UN-brokered two Istanbul Agreements signed on July 22, 2022 and consisting of the Initiative ...and the Memorandum ..., to ease tension and prevent global food insecurity and hunger in newly emerging economies. We emphasize the importance of their full, timely and continued implementation by all relevant stakeholders, as well as the UN Secretary-General’s calls for continuation of these efforts by the Parties.”

9.2. Impact on the market and humanitarian situation

Since the deal was announced, 32.9 mt of cargo, including various types of grain, sunflower products and others, had been exported from the Black Sea ports. Official data on deliveries made through the humanitarian corridor of the Grain Deal are published on the website of the Joint Coordination Center of Russia, Turkey, Ukraine, and the UN (hereinafter, JCC). The availability of detailed source data allows for a thorough analysis of the destinations countries, as well as product structure of the shipments, and to analyze which countries were the key beneficiaries of the Grain Deal.

The implementation of the Grain Deal, as well as the EU “Solidarity Lanes” for the overland export of goods from the territory of Ukraine, allowed to bring monthly exports of Ukrainian agricultural products almost to the pre-2022 level. Ukraine’s revenues from the implementation of the Grain Deal are estimated at USD 8–9 bn.

The entire volume of delivered goods had the following structure: corn 17 mt; wheat 9 mt; sunflower meal 1.8 mt; sunflower oil 1.6 mt; barley 1.2 mt; rapeseed 1 mt; soya beans 0.8 mt; other 0.5 mt.

Key ten receiving countries included China (8 mt), Spain (6 mt), Turkey (3.2 mt), Italy (2 mt), the Netherlands (2 mt), Egypt (1.5 mt), Bangladesh (1 mt), Israel (0.8 mt), Tunisia (0.7 mt), and Portugal (0.7 mt).

We could also rank the receiving countries based on their income levels. Thus, according to the JCC data, 14 mt of cargo (44%) were delivered to high-income countries, 12 mt (37%) to upper-middle-income countries, 6 mt (17%) to lower-middle-income countries, and only 1 mt (3%) to low-income countries.

Shipments to Africa amounted to about 4 mt (12% of the total), with shipments to Sub-Saharan Africa totaling only 0.9 mt (2.7%).
Consequently, the key beneficiaries of the agreement, in addition to Ukraine, were China, the EU, Turkey, and Egypt. Low-income countries did not receive any significant share of the food (less than 3%).

**Termination of the Grain Deal**

The deal was renewed several times after the 120-day Initiative expired, but after a year, on July 18, 2023, the Grain Deal was unilaterally terminated by Russia due to lack of progress in terms of resuming access of Russian food and fertilizers to global markets.

It can be observed from the media, that Russia laid down several conditions for the extension of the deal, none of which was fulfilled during the year the deal was in effect:

- resuming the work of the Togliatti-Odessa ammonia pipeline;
- lifting the restrictions on the supply of agricultural machinery and spare parts to Russia;
- unblocking of frozen assets and funds of fertilizer companies; and
- re-connection of Rosselkhozbank to the SWIFT system.

According to Russian Foreign Ministry officials, in June 2023, the UN recognized the impossibility of meeting these demands.93

At the same time, Russia had long stressed the problems with honoring Russia’s terms of the deal. For example, the Russian President Vladimir Putin stated in March 2023 that “Moscow insists on the package nature of the Grain Deal and full compliance with the key requirements of the Russian Federation”.94

In June 2023, the Russian Foreign Minister Sergei Lavrov stated, “The part of the package regarding Russian fertilizers and foods, proposed by the UN Secretary-General Antonio Guterres, is not being implemented. Only the Ukrainian part is being implemented, but only as a commercial deal rather than for the purpose mentioned by Guterres, which is to satisfy the needs of the poorest countries. ... The West is not willing to lift the barriers it itself has created to the delivery of Russian fertilizers to the poor countries of the Global South.”95

Indeed, as it was described in section 2 of the report, key obstacles that hinder the access of Russian fertilizers to the global markets remain in place. At the same time, if we were to compare the impacts of the Ukrainian grain supplies under the Grain Deal and the undersupply of sanctions-affected fertilizers and ammonia on the global food security, an extreme disparity could be observed.

As mentioned earlier, the supplies of Ukrainian grain under the Grain Deal amounted to about 32.9 mt. If we translate the indicated volume into calorie content and then into the number of people provided with food, we can conclude that due to the implementation of the Grain Deal, about 95 mln people were provided with food.

At the same time, if a similar calculation is made for fertilizers that “dropped out” of the market due to sanctions and restrictions against Russia (8 mt) and ammonia that “dropped out” of the market due to the blocking of the ammonia pipeline (2.7 mt), then, according to the team’s assessments, the undelivered volume of fertilizers and ammonia could have been used to produce enough agricultural products to provide food for about 199 mln people.
Adaptation Strategies Adopted by Sanctions-Affected Fertilizer Producers
10.1. Effects of the sanctions on fertilizer suppliers from Russia and Belarus

As was highlighted above, the sanctions against individuals associated with the Russian fertilizer industry, as well as various disruptions to trade that followed the implementation of those sanctions, significantly affected the supply of fertilizers from Russia and other regions (e.g. from the EuroChem plant in Lithuania). These limitations have caused a number of direct negative effects, which include:

a. ban on transportation of the products through the territory of the Baltic states;

b. direct sanctions against Belaruskali and restrictions against potash-containing products from Russia;

c. decline in production volumes at fertilizer and ammonia-producing plants due to the impossibility of exporting products, as well as due to the shutdown of operations at EuroChem factories in Europe by national authorities, as well as the arrest of Acron’s stake in Grupa Azoty (Poland);

d. blocking of large volumes of fertilizers in the European ports following the direct ban on the operations imposed by European national authorities;

e. surging fertilizer transportation costs as a result of the Baltic route blockage;

f. increase in maritime freight costs due to the ban on insurance of Russian fertilizers and unwillingness of several counterparties to transport products from Russia;

g. banking disruptions resulting in freezing significant amounts of funds on the European accounts of Russian fertilizer suppliers; and

h. refusal of some clients to pay for the already delivered products on the grounds of sanctions, resulting in the increase in the working capital requirements for the fertilizer producers.

As a result of the anti-Russia and anti-Belarus sanctions and their interpretations, the global market failed to receive 16.3 mt of fertilizers, while the cumulative losses of the fertilizer suppliers are estimated at approximately USD 12 bn.

All of the above resulted in an undersupply of 16.3 mt of fertilizers and ammonia to the global market in March 2022 – April 2023, and led to huge losses for the fertilizer producers. For instance,

- Belaruskali decreased its supply of potash to the global market by ~8.3 mt.
- Uralchem–Uralkali Group was unable to supply ~6.9 mt of fertilizers and ammonia to the global market due to the sanctions.
- EuroChem Group’s supply of fertilizers and ammonia decreased by ~1.3 mt.
- Acron Group reduced its supply by ~0.4 mt. Additionally, Acron Group was deprived of its non-controlling stake in Grupa Azoty – the largest fertilizer producer in Poland – which led to the loss of the company’s long-term investment in this asset.
- PhosAgro Group was the least subject to sanctions and even managed to increase the supply of products by ~1 mt, mainly through a ramp-up of production capacities.
- Industry-wide limitations, including rising logistics costs and the scarcity of the transshipment capacities in Russia (after the ban on transportation via the Baltic region), resulted in a ~0.4 mt decrease in fertilizer and ammonia supply from other producers.

In total, as a result of the anti-Russia and anti-Belarus sanctions and their interpretations, the global market failed to receive 16.3 mt of fertilizers, while the cumulative losses of the fertilizer suppliers are estimated at approximately USD 12 bn.
47. Losses of Russian and Belarusian fertilizer producers caused by sanctions, USD bn

<table>
<thead>
<tr>
<th>Lost EBITDA from reduced supplies</th>
<th>Lost revenue from arrested products in ports</th>
<th>Increased logistics costs due to blocking of Baltic transit</th>
<th>Increased freight costs</th>
<th>Frozen bank accounts</th>
<th>Arrears accounts receivable</th>
<th>Total losses of Russian and Belarusian fertilizer producers</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5</td>
<td>0.2</td>
<td>1.3</td>
<td>0.9</td>
<td>1.2</td>
<td>1.1</td>
<td>12.1</td>
</tr>
</tbody>
</table>

Source: working group analysis

Depending on the company, those losses were either partially or fully compensated for by the increase in fertilizer prices in the global market (much to the detriment of farmers around the world). Moreover, the dramatic drop in fertilizer supply from Belarus and Russia and the consequent price increase resulted in many global fertilizer producers receiving “artificial” excessive profits. According to the publicly available information of certain top international fertilizer producers, e.g., Yara, Nutrien, Mosaic, OCI, CF Industries, their revenues increased by 37–71% in 2022 compared to 2021, while the net earnings increased by 117–624%. And while those producers were unable to significantly increase the volume of supplies to help solve the fertilizer affordability crisis since they were limited in terms of production capacity, they still reported record profits due to increased prices.

It should also be noted that the higher prices alone might have proved insufficient to offset the losses of Russian and Belarusian producers, if the latter had not taken a number of corporate and commercial measures to adjust to the new circumstances. Those measures will be studied in detail in the following two sections.

10.2. Corporate actions

After personal sanctions were imposed on the owners and managers of key Russian-based fertilizer companies, they were forced to either completely divest or reduce their shares, as well as retire from their positions. These corporate actions were supposed to ensure fault-free functioning of the companies.

In March 2022, Dmitry Mazepin, who had previously owned 100% of Basic Chemical Company URALCHEM LCC (BHC URALCHEM), sold his controlling stake (52%). In addition, Mr. Mazepin resigned as the CEO of United Chemical Company Uralchem LCC, which is owned by BHC URALCHEM.

Andrey Melnichenko, the owner of EuroChem, retired as the beneficiary of the trust, which owns the company’s shares, and also resigned from the board of directors. Mr. Melnichenko’s wife automatically stepped in as the beneficiary of the trust. Later on, the EU imposed personal sanctions against her as well.

Similarly, in March 2022, following the introduction of personal sanctions by the EU, Andrey Guryev resigned as the CEO of PhosAgro and stepped down from the board of directors. His father Andrei Guryev Sr., the founder of PhosAgro, also left the company’s board of directors due to the sanctions.

In June 2022, Acron’s owner Viatcheslav Kantor reduced his share in the company to 40.85% by transferring shares to top managers of the company.

However, all those measures did not bring the expected results. More than a year has passed since those changes took place, and fertilizer companies still face operational disruptions, assets and funds freezes.

To a large extent, the operational disruptions of fertilizer companies are caused by the EU’s official position on the status of assets associated or previously associated with persons included in the EU sanctions lists. When the EU bodies believe it is common knowledge that a particular asset is in fact owned by a sanctioned person (to prove it, the EU typically relies on press reports or news in local newspapers), they treat an asset as belonging to a designated individual irrespective of the actual formal details of the ownership and control structure.
The ownership and control criteria used by the EU sanctions legislation are deliberately vague. Thus, the fertilizer producers related (or previously related) to sanctioned individuals found it extremely hard to prove that such individuals no longer owned the company and no longer exercised any form of control over it. In most cases, the EU official bodies perceive the abovementioned corporate actions as a circumvention of personal sanctions, not recognizing transactions aimed at change of ownership as adequate protection of assets. As it was stated in the EU FAQ concerning sanctions, “if there are reasonable grounds to believe that certain assets “belong to” or are “controlled by” the listed person, even if they are nominally owned by someone else, then these assets must be frozen”.

Thus, UralChem, Uralkali, EuroChem, and Minudobreniya moved their trading operations from Switzerland to Dubai (the United Arab Emirates).

In addition, Russian fertilizer exporters faced difficulties with payments in euros and US dollars. Uralchem announced that it had already started selling its products to Brazil with settlements in the Chinese yuan. According to experts, payments in the yuan currently account for 20–25% of Russian fertilizer exports.

Thus, despite the resignations and withdrawals of business owners and other corporate actions, as well as statements that sanctions do not target the supplies of food and fertilizers, companies continue to face difficulties. It forces them to restructure supply chains, adjust their distribution networks and change payment instruments, which also affects the stability of such companies and, in general, the volume of supply in the market.

10.3. Supply chain restructuring

The sectoral sanctions, blocking of logistical routes, and the refusal of key clients to cooperate forced Russian and Belarusian fertilizer producers to restructure their export flows. This section analyses the effects of these measures based on the changes in potash, MAP, urea, and UAN trade flows.

Potash fertilizers

The major changes in the commercial routes occurred for Uralkali–UralChem Group (Russia) and Belaruskali (Belarus), with both companies experiencing a significant drop in their export volumes. The exports of EuroChem – another producer of potash in Russia – have not changed significantly. The general trend is that some of the potash fertilizer exports from Russia and Belarus had to be redirected to newly emerging economies in Asia (32% in 2022 vs. 26% in 2021) and South America (32% in 2022 vs. 25% in 2021). At the same time, exports to Europe plunged.

Belaruskali

- Exports decreased by 64% (-7.6 mt) in 2022, with declines in all main markets except China, where import remained at the same level.
- The biggest declines were recorded in Europe (-93%, or 1.1 mt), SEA & Oceania (-80%, or 1.6 mt), South America (-61%, or 1.7 mt), and North America (-80%, or 0.6 mt).

Uralkali–Uralchem Group

- Total exports decreased by 45% (-4.1 mt) in 2022.
- Exports decreased across all the key regions: Asia (-1.8 mt), South America (-1.2 mt), Europe (-0.8 mt), and North America (-0.3 mt).

EuroChem Group

- Exports increased by 5% (+0.1 mt).
- Export to South America (Brazil) stayed almost at the same level (+0.2 mt).
- Loss of exports to Europe (-0.7 mt) was fully offset thanks to SEA & Oceania (+0.4 mt) and North America (+0.3 mt).

Breaking down Russian potash fertilizer exports by transshipment port in 2022 vs. 2021 also revealed that companies slashed their shipments through Baltic ports and the port of St. Petersburg. Instead, they ramped up exports through the ports of Murmansk and Ust-Luga:
• The port of St. Petersburg lost 4.4 mt (its share decreased by 25 p.p.) due to the reduction in Uralkali’s shipments.

• The volume of exports through the Baltic ports plummeted in 2022.

• The port of Murmansk gained 0.3 mt in transshipment operations (its share was up by 12 p.p.), mainly due to the redirection of EuroChem’s volumes from the Baltic ports.

• The port of Ust-Luga gained 0.6 mt in transshipment operations (its share was up by 15 p.p.), mainly due to the redirection of Uralkali’s supplies from the Baltic ports.

MAP (phosphate group)

The total volume of exports remained almost unchanged and even slightly increased (from 2.5 to 2.6 mt). The two main exporters of MAP in Russia are PhosAgro and EuroChem. The general trend suggests that MAP supplies to Europe and the transit through the Baltics have significantly decreased, which was compensated for by the increase in supplies to North America (+0.2 mt) and the development of new markets in India and Australia (+0.4 mt).

PhosAgro

• Exports increased by 14% in 2022 (0.2 mt) after entering new markets (India, Australia) and ramping up shipments to North America (the USA).

• The increase in shipments to North America was facilitated by the shortages in the market caused by the suspension of supplies from the EuroChem plant in Lithuania (Lifosa) following the EU sanctions.

EuroChem Group

• EuroChem slightly reduced its total export of MAP (-0.1 mt).

• It also reduced its re-export from the port of Sillamae (Estonia) by 0.2 mt due to logistics issues (the main regions of re-export from Sillamae in 2021 were South America and Europe (Poland, Sweden)).

• Exports to South America (Brazil) grew due to an increase in direct shipments from Russian ports (due to re-export restrictions from the Sillamae port). As a result, EuroChem was able to increase its market share in the region.

• Exports to Europe remained the same as huge reductions in export shipments had already taken place in 2021 vs. 2020.

Breaking down Russian MAP exports by transshipment port in 2022 vs. 2021 also revealed that companies slashed shipments through the Baltic ports and redirected supplies to the ports of Ust-Luga and Murmansk:

• The port of Ust-Luga gained 0.5 mt in operations (its share was up by 13 p.p.).

• The port of Murmansk gained 0.5 mt in operations (its share was up by 5 p.p.).

• The volumes handled by the Baltic ports plummeted in 2022, as did their share.

Urea (nitrogen group)

The total volume of Russian urea exports increased by 17% (1.4 mt) in 2022 compared to 2021, up from 6.8 mt to 8.2 mt, due to export growth enjoyed by all main Russian producers. Among the majors, EuroChem and Acron increased their urea exports the most (by 15% and 30%, respectively). All regions demonstrated rising or stable consumption of Russian urea. At the same time, re-export (via Baltic ports and Finland) and offshore sales via Europe decreased from 2.1 mt to 1.3 mt.

EuroChem Group

• EuroChem’s urea exports demonstrated a 15% growth (0.3 mt) driven by South and North America.

• Urea supplies to Europe remained unchanged at 0.7 mt.

PhosAgro

• PhosAgro’s urea export remained at the same level in 2022, at around 1.6 mt.

• Its urea supplies to Europe were up by 0.3 mt, to Africa by 0.2 mt, while shipments to South America dropped by 0.2 mt.

• 0.6 mt of urea was re-exported through Finland in 2022.
Uralchem

- Uralchem's urea exports stayed at the same level in 2022, at around 1.4 mt.
- The decline in shipments to traditional buyer regions (South America, Europe) of 0.3 mt was offset through increased shipments to Asia (India).

Acron

- Acron boosted its urea exports by 30% (0.4 mt) in 2022, mainly thanks to an increase in shipments to Asia (India) and Central America.
- Its urea supplies to South America, which traditionally consumed the largest volumes of Acron's urea, remained almost unchanged at around 0.5 mt.

Breaking down Russian urea exports by transshipment port in 2022 vs. 2021 also revealed that companies slashed shipments through the Baltic ports and redirected supplies to the port of Ust-Luga. At the same time, non-sanctioned Russian companies, such as Ammoni, increased their exports via the ports in Finland:
  - The port of Ust-Luga gained 2 mt in operations (its share was up by 33 p.p.).
  - The volumes handled by the Baltic ports plummeted in 2022 (-0.4 mt), and so did their share.
  - Finland's ports gained 0.4 mt in volumes mainly due to the increase in shipments by Ammoni.
  - The volumes handled by the ports of Tuapse and St. Petersburg remained at approximately the same level as during the previous year, but their shares in overall operations slightly decreased.

UAN

Russian UAN exports dropped by 36% (0.8 mt) in 2022 compared to 2021. However, some of the regions, such as South America (Brazil, Argentina) and Central America (Mexico) demonstrated certain growth. It is also worth noting that in 2022 South America (Brazil) became a re-export hub for around 0.3–0.5 mt of Russian UAN to North America.

EuroChem Group

- EuroChem's UAN exports remained at approximately the same level as in 2021, with only a slight decrease of 0.1 mt.
- In 2022, EuroChem managed to enter new markets and redirected the volumes traditionally supplied to North America to South America and Europe. So, supplies to North America fell by 0.6 mt, while supplies to South America and Europe amounted to 0.3 mt and 0.2 mt, respectively.

Acron

- Acron's UAN exports plunged by 61% (0.8 mt) in 2022 compared to 2021, mainly due to the reassignment of North America's volumes to the Russian market (0.6 mt).
- Supplies to Europe dropped to zero. At the same time, Acron started to ship some of its UAN volumes to South America (0.2 mt) in 2022.

Since the UAN market in South America is not very developed, and also based on trade statistics from various sources, we can estimate that around 0.3–0.5 mt of Russian UAN, which was shipped to South America in 2022, was then re-exported to North America.

Breaking down Russian UAN exports by transshipment port in 2022 compared to 2021 also revealed that companies curbed shipments through the Baltic ports and started using the port of St. Petersburg instead:
  - Although it had not been used for transshipment of Russian UAN in 2021, the volumes handled by the port of St. Petersburg amounted to 0.9 mt in 2022 (its share accounted for 45%).
  - The volumes shipped through the port of Novorossiysk remained at approximately the same level as in the previous year (0.7 mt), and so did its share.
  - The volumes handled by the Baltic ports plummeted in 2022, and so did their share.
Conclusion

By and large, Russian producers were able to transform their supply chains and partially compensate for the decline in exports to some markets by increasing their supplies to alternative ones. To do so, they had to find new ports, establish new freight routes, reach out to new counterparties, etc. For instance, Russian companies curbed exports of potash, MAP, urea, and UAN through Baltic ports (down from 4.5 mt in 2021 to 1.1 mt in 2022), yet increased shipments through the port of Ust-Luga (up from 3.4 mt to 6.5 mt).

Overall, these supply chain adaptation measures helped to stabilize the prices and improve the market situation even more than the regimes of sanctions derogations and carveouts implemented by Western states in the manual mode.
Major Changes in the Fertilizers Market in 2022–2023 and Their Impact on Global Food Security
Appendix 1.
Detailed export dynamics

Nitrogen fertilizers

The positive trend in the global nitrogen fertilizer market continued until 2022. Overall, supply increased by almost 30% in 2012–2021, reaching 100.1 mt. However, changes in the global trade patterns during 2021–2022 and growing domestic production elsewhere in the world depressed exports by European producers burdened by additional costs of gas (detailed analysis is provided in chapter 2).

This added to their operating costs and reduced their competitiveness in the international market. In addition, European producers faced higher energy and logistics costs during that period. Despite this, the balance in the nitrogen fertilizer market did not change as significantly as that of phosphate and potash fertilizers. The cumulative decrease in global fertilizer supply in 2022 did not exceed 1.5 mt, or 2% year-on-year. The decline will be further explained in detail in the respective exporter-country chapters.

Nitrogen fertilizer supplies from Russia fell by 2.44 mt, largely due to the cessation of shipments to Latin America – down by 2.34 mt year-on-year in 2022. Africa, which had the worst fertilizer purchasing dynamics in 2022, received an additional 0.11 mt and 0.15 mt from Oman and Egypt, respectively. However, Saudi Arabia, one of the main suppliers of nitrogen fertilizers to Africa, reduced supplies from 0.44 to 0.28 mt. Asia cumulatively increased its nitrogen fertilizer imports by 2.67 mt. Russia (0.38 mt), Qatar (0.75 mt), and Saudi Arabia (0.60 mt) were the largest contributors to the increase in nitrogen fertilizer shipments to Asia.

The main directions of exports of nitrogen fertilizers from Russia and the CIS (mainly Belarus) changed significantly over 2021–2022. The change in the structure of destination markets was mainly due to a sharp increase in gas prices (which is the main raw material for the production of nitrogen fertilizers) in Europe and sanctions against Russia imposed by the EU, the US, the UK, and a number of other countries.
49. Changes in the structure of nitrogen fertilizer exports, 2021–2022, physical mt

Exports of nitrogen fertilizers from the Russian Federation dropped by 2.44 mt, largely due to the decrease in supply to Latin America (-2.34 mt in 2022 compared to 2021).

Sub-Saharan Africa, which showed negative dynamics in fertilizer procurement in 2022, received an additional 0.14 mt from Egypt. However, one of the main suppliers of nitrogen fertilizers to Africa, Saudi Arabia, reduced its supplies from 0.45 to 0.28 mt. Moreover, the supplies from Europe to SSA countries also dropped, for example, from Germany (-0.011 mt) and the Netherlands (-0.007 mt). Asia ramped up its imports of nitrogen fertilizers by a total of 0.8 mt. Such a small increase is explained by a strong drop in exports of Chinese fertilizers to Asia (-2.0 mt), as well as insufficient compensation from the countries of the Middle East. In 2022, Europe increased the import of nitrogen fertilizers by 3 mt following a shutdown of domestic production capacities due to negative profitability. Shipments of nitrogen fertilizers to Latin America decreased by 2.1 mt over the year – this was largely caused by a strong reduction in supplies from Russia (-2.3 mt) and Egypt (-1.2 mt).

**Phosphate fertilizers**

The global phosphate fertilizer market also demonstrated a long-term positive trend. Between 2012 and 2021, export shipments grew by 47%, or 20.2 mt, thus surpassing 69.3 mt. But in 2021–2022, restrictions on exports from China aimed at safeguarding the needs of the domestic market, coupled with reduced production capacity in China (closure of six export-oriented plants with an annual capacity of 2.75 mt), as well as redirection of export volumes to the domestic market in Egypt, significantly reduced the availability of these fertilizers in the global market. The above factors led to a drop in exports of this type of fertilizer (-9.7 mt in 2022 vs. the peak year of 2021).

China exported phosphate fertilizers mainly to Brazil. Together with exports from Egypt, Chinese shipments accounted for more than 60% of Brazil’s phosphate fertilizer imports in 2021. The global balance in the phosphate fertilizer market was also adversely affected by a decline in imports to the United States from Morocco and Russia due to alleged non-market pricing.
50. Exports of phosphate fertilizers, physical mt

<table>
<thead>
<tr>
<th>Year</th>
<th>Others</th>
<th>China</th>
<th>United States</th>
<th>Morocco</th>
<th>Russia</th>
<th>Saudi Arabia</th>
<th>Egypt</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>13.4</td>
<td>8.4</td>
<td>1.9</td>
<td>4.4</td>
<td>2.0</td>
<td>10.4</td>
<td>20.3</td>
<td>47.1</td>
</tr>
<tr>
<td>2018</td>
<td>11.0</td>
<td>8.7</td>
<td>1.9</td>
<td>4.4</td>
<td>4.4</td>
<td>4.8</td>
<td>2.7</td>
<td>59.6</td>
</tr>
<tr>
<td>2019</td>
<td>9.1</td>
<td>7.5</td>
<td>13.2</td>
<td>4.4</td>
<td>2.7</td>
<td>10.3</td>
<td>11.1</td>
<td>65.5</td>
</tr>
<tr>
<td>2020</td>
<td>6.3</td>
<td>6.0</td>
<td>12.9</td>
<td>4.4</td>
<td>2.7</td>
<td>10.3</td>
<td>5.4</td>
<td>65.8</td>
</tr>
<tr>
<td>2021</td>
<td>5.4</td>
<td>6.0</td>
<td>11.3</td>
<td>4.4</td>
<td>2.7</td>
<td>10.3</td>
<td>5.4</td>
<td>67.1</td>
</tr>
<tr>
<td>2022</td>
<td>4.0</td>
<td>5.4</td>
<td>22.8</td>
<td>4.4</td>
<td>2.7</td>
<td>10.3</td>
<td>5.4</td>
<td>69.3</td>
</tr>
</tbody>
</table>

51. Changes in the structure of phosphate fertilizer exports, 2021–2022, physical mt

First of all, the decline in phosphate supply was caused by export quotas enforced by China, which reduced Chinese exports from 13.4 to 8.7 mt. There was also a significant decrease in exports to Europe as Russia and Morocco had to reduce their exports to the EU. Since Asian countries needed to compensate for the reduction in supplies from China, they made up for the lost volumes by increasing imports from Morocco and Russia by 1.5 mt and 2.1 mt, respectively. Accordingly, total exports of phosphates from Russia increased by 0.7 mt, while Morocco’s exports dropped by 1.1 mt. Phosphate imports to Sub-Saharan Africa went up by 0.11 mt, mainly due to an increase in Moroccan exports (+0.12 mt).
In the African market, there was a steady upward trend in domestic production, mainly driven by the countries of North Africa. The total production of mineral fertilizers doubled between 2012 and 2022. The growth rates of individual types of fertilizers were even higher. The average annual growth rate of phosphate production in Morocco in 2015–2021 was 13.4% due to the systematic capacity ramp-up at OCP plants.

### Potash fertilizers

Potash fertilizer supply in 2021 grew by 55%, or 21.8 mt vs. 2012. However, the restrictions imposed against Russia and Belarus in 2021–2022 led to a collapse in the global market supply.

**52. Exports of potash fertilizers, physical mt**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Exports</th>
<th>Other Countries</th>
<th>Russia</th>
<th>Belarus</th>
<th>Canada</th>
<th>Germany</th>
<th>Others</th>
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<tr>
<td>2012</td>
<td>39.6</td>
<td>9.2</td>
<td>4.1</td>
<td>4.6</td>
<td>6.6</td>
<td>11.0</td>
<td>12.0</td>
</tr>
<tr>
<td>2018</td>
<td>60.4</td>
<td>11.0</td>
<td>4.1</td>
<td>4.6</td>
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<td>12.1</td>
<td>12.1</td>
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<td>2019</td>
<td>56.1</td>
<td>10.6</td>
<td>4.1</td>
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<td>6.6</td>
<td>10.3</td>
<td>11.6</td>
</tr>
<tr>
<td>2020</td>
<td>59.3</td>
<td>10.4</td>
<td>4.2</td>
<td>5.2</td>
<td>6.2</td>
<td>10.3</td>
<td>11.9</td>
</tr>
<tr>
<td>2021</td>
<td>61.4</td>
<td>10.4</td>
<td>4.3</td>
<td>4.2</td>
<td>6.9</td>
<td>10.3</td>
<td>12.5</td>
</tr>
<tr>
<td>2022</td>
<td>52.8</td>
<td>8.6</td>
<td>4.2</td>
<td>4.2</td>
<td>6.2</td>
<td>10.3</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Source: Global Trade Tracker

Global exports of potash fertilizers in 2022 decreased by 8.6 mt. Sanctions imposed by Western states against Belaruskali – one of the biggest global suppliers of potash fertilizers – as well as sanctions and logistical restrictions that hindered the supply Russian fertilizers to global markets triggered fundamental changes in the supply chain, which drove the collapse of exports. In particular, export from Belarus decreased by 6 mt (or 56%), export from Russia decreased by 2.5 mt (or 24%).

The largest decrease in Belaruskian exports were observed in the case of the EU (−1.4 mt vs. 2021) and Asia (−2.1 mt vs. 2021). Such a huge decline in exports to Asia is provoked by long logistical legs. The workload of the Baltic ports played a role here, as Belaruskali was forced to pivot, taking into account the restrictions. The reduction in deliveries from Russia and Belarus to Asia and Europe turned out to be one of the largest – the total drop in exports to Asia and Europe amounted to 2.3 and 2.0 mt, respectively.

Annual imports of potash fertilizers to Sub-Saharan Africa decreased by 0.13 mt, down to 0.62 mt, mainly due to the decline in Belarus exports (−0.10 mt), while the rest of the suppliers also slightly reduced their exports to Sub-Saharan Africa.

**53. Changes in the structure of potash fertilizer exports, 2021–2022, physical mt**

Source: Global Trade Tracker
Appendix 2.
Cases of changing food security in Sub-Saharan Africa

Kenya

Kenya imports 100% of the fertilizers it consumes. The lower availability and accessibility of fertilizers in the global market led to a 24% decrease in fertilizer application between 2020 and 2022. Due to the historically low consumption of fertilizers, any further reduction is immediately reflected in lower grain crop production and, as a result, in the rising numbers of people in the extreme phases of hunger (Phase 3+).

Kenya, a state in East Africa, was one of the most famine-stricken countries in the Sub-Saharan region in 2022, with about 15 mln people (27% of the population) suffering from hunger. The already severe situation was compounded by the decreased ability of farmers to purchase and apply necessary fertilizers, hindering agricultural production and exacerbating food insecurity.

Source: Global Report on Food Crises 2023 by Global Network Against Food Crises

Dynamics of the starving population in Kenya 2019–2022. mln people

54. Starving population in Kenya, 2019–2022, mln people
Despite a slight decline in the total number of hungry people (down from 15.15 to 14.83 mln since 2021), this reduction occurred in Phases 1 and 2. In 2022, the number of hungry people in the most critical phase – Emergency – soared by 200%, from 0.4 to 1.21 mln. The number of hungry people in Phase 3 – Crisis – increased by 57%, from 2.0 to 3.14 mln. These figures reflect the highest magnitude and severity of food insecurity in years; urgent action is required to reduce food shortages, protect the livelihoods of the most vulnerable segments of the population, and prevent and treat acute malnutrition. The deterioration of the food security situation caused by production decline requires immediate measures to develop agriculture in Kenya.

55. Changes in crop yields and fertilizer consumption in Kenya, 2012–2022, physical mt

56. Balance in the Kenyan fertilizer market, 2020–2022, physical mt

In 2022, overall fertilizer consumption decreased by 21%: while the consumption of nitrogen and phosphorus fertilizers decreased by 27% and 19%, respectively, potassium consumption marginally increased (+8%). The decrease in fertilizer consumption was caused by low affordability due to the rising prices: a 50-kilogram bag of urea cost USD 52.5 in 2022 compared to USD 27.6 in 2021 (+90%), a 50-kilogram bag of CAN cost USD 35 compared to USD 18.4 (+90%), while DAP in the retail market cost USD 42 compared to USD 27.6 (+52%). The increase in fertilizer prices led to a slump in fertilizer application rates.

Over the past three years, grain crop yields have declined along with fertilizer consumption. The annual yields decreased by 6% [-0.09 tonne/ha] in 2022 compared to 2021, and by 24% [-0.44 tonne/ha] in 2021 compared to 2020. The negative yield dynamics contributed to the decline in domestic crop production and exacerbated the deficit of staple foods (grains), which can only be compensated for by increasing the imports. This increased dependency on food imports further exacerbates the economic instability in the region, leading to more acute food insecurity.
The consumption of mineral fertilizers in Kenya is entirely made up of imported products. Local production is not developing due to the lack of necessary infrastructure and technologies, low resource base, lack of investment, and so on.

57. Import of mineral fertilizers to Kenya, 2021–2022, physical mt

The reduction in imports of nitrogen fertilizers to Kenya was due to rising fertilizer prices, which affected their availability. Besides, Kenya’s trading partners reduced fertilizer exports in order to protect domestic farmers. In 2022, imports from Saudi Arabia plunged by 62%, from 0.23 mt to 0.09 mt compared to 2021. Meanwhile Morocco increased fertilizer exports to Kenya by 256% (+0.088 mt), Russia by 69% (+0.087 mt), and China by 67% (+0.015 mt).

58. Changes in the balance in Kenya’s grain market, 2012–2022, physical mt

In 2021–2022, production of grain in Kenya declined to 3.7 mt (-6%) following a drop in the consumption of mineral fertilizers. Despite this, the consumption of grain in Kenya in 2022 increased by 5%, to 7.8 mt.

An extreme drought registered in 22 districts in 2022 also contributed to the decrease in grain production. As water supply points dried up, 2.5 mln heads of cattle perished from lack of water and pastures, causing an economic damage estimated at more than USD 1 bn.106

Reduced grain production triggered a 19% increase in imports in 2022. The increase in grain imports at higher prices, in turn, negatively impacted food prices in the domestic market, making it less accessible to the population. For instance, corn prices in Kenya, on average, rose from USD 300 to 500 per tonne in 2022 compared to 2021. Annual inflation peaked at 10% in October 2022, driven by food inflation (15%). All these factors had a negative impact on Kenya’s food security situation.107
By our estimates, to address Kenya’s hunger issue (with 15 mln people starving in 2022), it will be necessary to produce an additional 1 mt of grain. One of the solutions to the hunger problem is to increase the use of fertilizers in agricultural production. To produce an additional 1 mt of products, the use of 0.2 mt of mineral fertilizers per year will be required.

Another solution could involve increasing the sowing area of grain. Providing the average productivity of grain cultivation sustained over the past 5 years (1.61 tonnes/ha) remains unchanged, Kenya would need to expand its sowing areas by 1.4 mln ha.

Nigeria

Due to the low purchasing power of domestic consumers, high global fertilizer prices pushed producers to increase fertilizer exports, which led to a 7% decrease in fertilizer consumption in Nigeria in 2022 compared to 2021. While grain production remained at the same level, rapid population growth led to an increase in the number of people in the most extreme phases of hunger.

Nigeria is one of the countries facing a food crisis. The number of hungry people in Nigeria (Phase 2 or worse) was 39.3 mln in 2022 (an increase of 19% compared to 2021).

The main factors influencing food insecurity are the ongoing conflict in the country and the high level of food inflation.
60. Changes in crop yields and fertilizer consumption in Nigeria, 2012–2022

The total consumption of mineral fertilizers decreased by 7% as a result of the reduction in imports (-0.1 mt) and in the consumption of domestic nitrogen fertilizers (-5,000 tonnes). Grain yields increased by 1%, to 1.66 tonne/ha in 2022. Despite the reduction in fertilizer consumption in 2022 and the loss of agricultural land due to flooding, Nigeria managed to maintain crop yields at the levels of previous years. This was facilitated by an increase in subsidies to farmers in 2022, aimed at the mechanization of agriculture, specifically the purchase of agricultural machinery, development of irrigation systems, improvement of infrastructure in agri-industrial zones, and so on. However, considering the growing population and those in acute hunger phases, the current yield is insufficient to address the hunger issue. To boost local agricultural production and reduce the dependence on agricultural imports, Nigeria needs to increase fertilizer consumption.

61. Balance in the Nigerian fertilizer market, 2020–2022, physical mt

Fertilizer production in Nigeria tripled in 2022 after the opening of the Dangote fertilizer plant which currently is Africa's largest granulated urea fertilizer complex producing 3 mt of urea fertilizer annually. Since 2020, fertilizer exports from Nigeria have been on the rise, reaching 2.85 mt in 2022 (up from just 0.49 mt). This increase comes from the need to boost export revenues due to the rise in fertilizer prices in 2022. In November 2018, the Central Bank of Nigeria banned the use of foreign currency for NPK fertilizer imports to support domestic production. This move resulted in an explosive growth of mixed fertilizer manufacturing plants in Nigeria. However, in 2022, the productivity of these plants was undermined by reduced supply of phosphorus and potassium fertilizers, leading to a decline in the use of nitrogen-based fertilizers.
The reduction in imports was mostly triggered by the slump in imports of fertilizers from Russia (-0.14 mt, or 80%). In 2021, Russia was the major supplier of potash fertilizers to Nigeria, but then the 2022 reduction in potash fertilizer production in Russia hampered the imports of this product. Russia's exports to Nigeria were also impeded due to the logistics restrictions.

Total consumption of grain decreased by 2%, primarily due to a 20% reduction in the import of such crops (from 8.8 to 7.0 mt), mostly due to the conflict in Ukraine. Grain imports from Russia plummeted from 1 to 0.01 mt. Additionally, Nigeria continues to restrict and prohibit the import of food products due to the hikes in food prices triggered by the conflict. The aim of this restrictive policy is to encourage domestic food production. Such limitations typically lead to increased prices for both imported and local food products, negatively impacting the population’s ability to buy enough food.

Based on our estimates, Nigeria would need to produce an additional 10 mt of grain to address the issue of hunger. One way to tackle hunger is to increase the use of fertilizers in agricultural production. Producing an extra 10 mt of crops would require the use of 2.7 mt of mineral fertilizers.

Another solution could involve expanding the cultivation area for grain crops. Providing the average productivity of grain cultivation achieved over the past 5 years (1.66 tonnes/ha) remains the same, Nigeria would need to increase the cultivated area by 37%, which is equivalent to an additional 6 mln ha.
Ethiopia

Due to the response measures taken, Ethiopia was able to keep its agricultural production and the number of hungry people at the 2021 levels and even achieve a 9% increase in grain production.

In 2022, the number of people facing hunger in Ethiopia increased by 0.2 mln. Due to the response measures taken, Ethiopia was able to keep its agricultural production and the number of hungry people at the 2021 levels and even achieve a 9% increase in grain production. However, despite the huge agricultural potential of Ethiopia, a 13% decrease in fertilizer consumption in 2022 significantly hindered the development of the agricultural sector.

Ethiopia is one of the countries in East Africa that is experiencing a rather acute food shortage. The number of hungry people in Ethiopia was estimated at 26.4 mln (about 28% of the total population of the country) in 2022.

Approximately 10.7 mln people lacked the means to meet their minimum food needs. The main factors contributing to the increase in the number of hungry people were high food prices, caused by the consequences of several seasons of below-average rainfall, fertilizer price growth, and prolonged conflicts.

65. Changes in crop yields and fertilizer consumption in Ethiopia, 2012–2022, physical mt

The total consumption of mineral fertilizers decreased by 13% (from 1.7 mt in 2021 to 1.4 mt in 2022) and remained lower compared to 2020 (94% of the 2020 level). In 2022, yields increased slightly compared to 2021 (+4%, to 3.1 tonne/ha), but were 6% lower than in 2020. In 2022, Ethiopia managed to partly overcome the challenges and increase the yields and production of grain crops. Agricultural inputs, such as seeds and fertilizers, along with animal health services and forage provision, aided farmers in enhancing their agricultural output. Financial assistance amounting to USD 74 mln also addressed some of the food needs. These measures helped curb the rise in the number of hungry people, despite a rapid population growth (+3 mln people in 2022).
However, these measures alone are insufficient to eradicate the issue of hunger. Ethiopia has significant potential in grain crop production, but is hindered by limited access to agricultural resources, especially fertilizers and seeds of major crops.

66. Balance in the Ethiopian fertilizer market, 2020–2022, physical mt

<table>
<thead>
<tr>
<th>Year</th>
<th>Export</th>
<th>Production</th>
<th>Import</th>
<th>Changes 2020-2021 YoY</th>
<th>Changes 2021-2022 YoY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>1.54</td>
<td>1.54</td>
<td>1.65</td>
<td>0.12</td>
<td>-0.22</td>
</tr>
<tr>
<td>2021</td>
<td>1.65</td>
<td>1.65</td>
<td>1.43</td>
<td>-0.22</td>
<td>0.12</td>
</tr>
<tr>
<td>2022</td>
<td>1.43</td>
<td>1.43</td>
<td>1.04</td>
<td>0.22</td>
<td>0.22</td>
</tr>
</tbody>
</table>

67. Import of mineral fertilizers to Ethiopia, 2021–2022, physical mt

As to the changes in the structure of mineral fertilizer imports in 2022, shipments from Saudi Arabia and China decreased the most (-0.14 and -0.05 mt, respectively – an almost 100% decline in imports from those countries to Ethiopia). Following China’s restrictions on the export of phosphate fertilizers aimed at protecting the domestic market, Saudi Arabia reoriented fertilizer exports to Asian countries. The loss of those volumes was partly offset by Egypt, as imports increased by 47% (from 0.24 to 0.35 mt).
Changes in the balance in the Ethiopian grain market, 2012–2022, physical mt

Despite the reduction in fertilizer consumption, grain production in Ethiopia increased by 9% (from 23 to 25 mt in 2021 and 2022, respectively). This can be attributed to the high proportion of fertilizer consumption used for coffee cultivation, which accounts for about 30% of Ethiopia’s production. However, the import of grain decreased in 2022 (-1 mt) due to supply disruptions and high grain prices. We estimate that an additional 1.8 mt of grain products will be needed to eliminate hunger in Ethiopia. One way is to increase the use of fertilizers in agricultural production. Producing an additional 1.8 mt of grain requires increasing fertilizer application by 0.25 mt.

Another solution may be to increase the sowing area. Providing the average productivity of grain cultivation sustained over the past 4 years (3.16 tonnes/ha) remains unchanged, Ethiopia would need to expand the area by 27% (an additional 2.2 mln ha).

The Democratic Republic of the Congo (DRC)

The period of 2020–2022 saw a 50% increase in the number of hungry people due to high population growth rates and stagnation of food production. The crisis in the fertilizer market led to a 3% decrease in consumption and a slight drop in yields (2%), but further impoverishment of soils can have far-reaching consequences.

The DRC is located in Central Africa and is the third most populated country in Sub-Saharan Africa (110 mln people). The DRC is faced with one of the largest food crises in the world: in 2022, it was home to the largest number of hungry people in the world, including 26.4 mln people in Phase 3 – Crisis – and above. Despite its vast mineral and natural resources, 72% of the population of the Congo is below the poverty line. Over the decades, the DRC has experienced many crises: conflicts, political tensions, epidemics, malnutrition, and food insecurity.
69. Starving population in the DRC, 2018–2022, mln people

This happened largely due to improved security in certain areas, the opening of the border with Angola, and the rehabilitation of key roads that facilitated the resumption of trade, as well as the easing of measures against COVID-19.

70. Changes in crop yields and fertilizer consumption in the DRC, 2012–2022

In 2022, fertilizer consumption in Congo increased from 0.058 to 0.062 mt vs. 2021, but was still 3% (2 tonnes) lower than in 2020. Fertilizer consumption in the DRC remains low, given the large scale of potential arable land, of which only 10% is cultivated. For comparison, the volume of fertilizer consumption in Kenya is 0.58 mt, Nigeria 1.3 mt, Ethiopia 1.4 mt. Such inadequate use of fertilizers can be explained by underdeveloped agricultural production, high poverty levels (72% of rural households and 59% of urban households live below the poverty line). The low level of fertilizer consumption affects grain yields in the country, which decreased from 0.88 kg/ha in 2021 to 0.87 kg/ha in 2022.
71. Balance in the DRC’s fertilizer market, 2020–2022, physical mt

<table>
<thead>
<tr>
<th>Year</th>
<th>Export</th>
<th>Apparent Consumption</th>
<th>Import</th>
<th>Production</th>
<th>Changes</th>
<th>Changes</th>
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<tbody>
<tr>
<td>2020</td>
<td>0.064</td>
<td>-0.006</td>
<td>0.058</td>
<td>0.062</td>
<td>+0.004</td>
<td>0.004+</td>
</tr>
<tr>
<td>2021</td>
<td>0.058</td>
<td>0.004</td>
<td>0.062</td>
<td>0.062</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: FAOSTAT, working group analysis

Fertilizer consumption in the DRC consists entirely of imported fertilizers. Local production of mineral fertilizers is not developing due to the lack of necessary infrastructure and technology, lack of investment, high levels of poverty, etc. However, the country has the potential to become a new leading producer of potash fertilizers thanks to its large deposits of potash ores (about 573 mt of estimated reserves of potassium salts). South African company Kanga Potash, which had received a license to mine and produce potash in the DRC, announced in 2022 that it was seeking to raise about USD 500 mln for the first phase of its potash development project north of Pointe Noire.

72. Import of mineral fertilizers to the DRC, 2021–2022, physical mt

Source: Global Trade Tracker

Imports of mineral fertilizers to the DRC mainly come from three main suppliers: South Africa, Tanzania, and Russia. While South Africa reduced fertilizer exports to Congo in 2022 compared to 2021 by 7% (-0.003 mt), Tanzania increased its supply by 9% (0.001 mt), and Russia doubled its exports (+0.002 mt).

Consumption of grain in Congo increased by 1%, to 4.14 mt, in 2022 compared to 2021. However, given the size of its population and the number of hungry people in the country, which increased by 30.7 mln between 2018 and 2022, this volume of grain consumption is not enough to ensure food security in the country. Local production accounts for 79% of all grain consumption in the country, which in 2022 increased by 1% (0.03 mt). In 2022, there was a 6% decrease in imports (-0.05 mt), while domestic production was hit by crop diseases, such as cassava mosaic and the fall armyworm, which affected maize crops.

In October 2022, excessive rainfall and floods in several localities, especially in the central-northern provinces of Maniema, Chopo, and Equator, damaged the harvesting areas and hampered access to land. In addition, conflicts in the country and a mass exodus disrupted the participation of households in agricultural activities. Despite the efforts to prevent conflicts and stabilize the situation, insecurity persists, with more than 100 armed groups operating...
in the DRC. In 2022, Ituri and North Kivu experienced a peak in violence not seen since 2019, resulting in deaths, displacement, destruction of crops, and loss of livelihoods.113

73. Changes in the balance in the DRC’s grain market, 2012–2022, physical mt

According to our estimates, in order to eliminate the problem of hunger in Phase 2 and above (71.3 mln people), Congo will need to produce an additional 4.8 mt of grain products. One solution is to increase the use of fertilizers in agricultural production. Production of an additional 4.8 mt of grain will require the use of 0.7 mt of mineral fertilizers per year.

Another solution may be to increase the area of grain crops. Providing the average productivity of grain cultivation sustained over the past 5 years (0.86 tonnes/ha) remains unchanged, Congo would need to expand irrigated areas by 40.4 mln ha (out of 80 mln ha of arable land, only 3.7 mln ha is currently irrigated).

74. Starving population in Mozambique, 2018–2028, mln people

In 2022, the level of fertilizer consumption decreased by 20%, while grain production remained at the same level. This led to an increase in grain imports.

Mozambique, a country in Southern Africa with a population of 33 mln people, had approximately 9.8 mln malnourished individuals in 2022, accounting for around 30% of the total population (+7% compared to 2021). According to the Food Security Information Network, in 2022, 16 mln people (almost 50% of the total population) were in Phase 2 of hunger – Stressed – and above, including approximately 3 mln people in Phase 3 (Crisis) and 320,000 people in Phase 4 (Emergency).
One of the significant factors contributing to the high number of starving people in the country were the attacks by non-state armed groups, destroying infrastructure and causing forced mass migration of the population, leading to the destruction of cultivated lands.

75. Changes in crop yields and fertilizer consumption in Mozambique, 2012–2022

The majority of imported fertilizers are redirected to other interconnected countries within Africa. The events of 2022 further reduced fertilizer consumption and availability due to price hikes and logistical challenges. Mozambique’s crop yields remain low due to the limited fertilizer consumption. However, thanks to a 25% increase in fertilizer consumption in 2020, crop yields saw a 63% increase by 2021. To sustain and further enhance this level of yields, an increase in fertilizer consumption is necessary.

76. Balance in Mozambique’s fertilizer market, 2020–2022, physical mt

Fertilizer imports to Mozambique decreased by 0.2 mt in 2022 compared to 2020. Since Mozambique exports a portion of the imported fertilizers, exports also decreased by 0.1 mt.

In 2022, the consumption of mineral fertilizers in Mozambique decreased by 20%, to 0.55 mt. This is attributed to historically low demand for fertilizers among farmers in Mozambique due to high levels of poverty.

Source: Technical Working Group (FTWG) by Africa Fertilizer, FAOSTAT

Source: Technical Working Group (FTWG) by Africa Fertilizer
77. Import of mineral fertilizers to Mozambique, 2021–2022, physical mt

The reduction in the import of nitrogen fertilizers is mainly attributed to the lack of fertilizer exports from Russia in 2022 (down from 0.1 mt to zero). In contrast, China, Indonesia, Nigeria, and South Africa increased their exports of nitrogen fertilizers, which amounted to 0.3 mt in 2022. The import of potassium fertilizers remained unchanged. As for phosphate fertilizers, their import significantly decreased due to a 99% reduction in supplies from China.

78. Changes in the balance in Mozambique’s grain market, 2012–2022, physical mt

Grain production in Mozambique remained at the same level in 2022 (2.5 mt), which contributed to the worsening of the hunger situation. Factors that hindered the growth of grain production in the country include cyclones and floods, which destructed some of the cultivated areas. To maintain and enhance the production of grain crops following a loss of over 100,000 ha of agricultural land, it is necessary to increase fertilizer consumption.114

As a result of the decline in domestic production, the country increased grain imports by 13%, to 1.7 mt. In previous years, Mozambique relied heavily on wheat supplied from Russia and Ukraine, but in 2022 an increase in imports from India helped to compensate for reduced supply from those countries. The total consumption of grain grew by 4% to reach 4.2 mt.

By our estimates, to address Mozambique’s hunger issue, it will be necessary to produce an additional 1.1 mt of grain products. One of the solutions is to increase the use of fertilizers in agricultural production. To produce an additional 1.1 mt of grain, the use of 0.2 mt of mineral fertilizers per year will be required.
Another solution could involve increasing the sowing area of grain. Providing the average productivity of grain cultivation sustained over the past 5 years (0.9 tonnes/ha) remains unchanged, Mozambique would need to expand its sowing areas by 3.8 mln ha.

South Africa

South Africa, located at the southern tip of the continent of Africa, is one of the more economically developed and relatively prosperous countries in Sub-Saharan Africa. It is also a BRICS member, having a broader representation on the international scene. Yet, just like less economically stable African countries, South Africa also experienced a pronounced rise in the number of undernourished people in 2021–2022. This makes South Africa worth analyzing separately.

As illustrated in the figure below, in 2022 the number of undernourished people in the country reached 4.7 mln (7.8% of the total population), which is 0.7 mln, or 18%, higher than in 2021 and 1.1 mln, or 31%, higher than in 2020.

79. Starving population in South Africa, 2018–2022, mln people and % of the population

South Africa fertilizer market dynamics and grain production

In 2022, fertilizer consumption in South Africa dropped by 9%. However, this drop was cushioned by the fact that in the previous year the country bolstered its fertilizer consumption by 37% compared to 2020, which helped it sustain grain yields and production in 2022. However, maintaining this level of grain production entailed significant additional financial costs, which became a serious burden on farmers and consumers.


South African fertilizer market is import-dependent, as around 80–85% of fertilizer consumption has been historically sustained through imported products. The local fertilizer market is open and generally reflects the prices in the international market. The relative size of the market (much bigger than the rest of SSA) attracts multiple producers, making market competition very sharp.
Thus, import prices on the CFR level are very competitive during the season. Moreover, Foskor, a local producer of phosphate fertilizers, tries to compete against imported fertilizers, which means that even the pricing for domestically manufactured products depends on the global market.

In 2022, as a result of the global fertilizer crisis, the price of imported fertilizers in South Africa, according to GTT, skyrocketed on average by 65%. It led to a 13% decrease in imports (-0.32 mt) in 2022 compared to 2021, while domestic production marginally increased by 2% (+0.02 mt). South Africa experienced shortages of fertilizers available for its farmers as a result of the decline in fertilizer imports. In August–September 2022 (the period of peak prices), fertilizer imports in South Africa decreased by around 0.3 mt (40%) compared to the same period of 2021. However, no compensation mechanisms were implemented to help local farmers. This led to warnings from local agriculture sector players regarding the impact on crop yields and, ultimately, the cost of food for consumers.

The details of changing fertilizer market balance in South Africa are illustrated in the figure below.

**81. Balance in the South African fertilizer market, 2020–2022, physical mt**

<table>
<thead>
<tr>
<th>Year</th>
<th>Apparent Consumption</th>
<th>Export</th>
<th>Import</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>2.54</td>
<td>0.34</td>
<td>0.93</td>
<td>0.82</td>
</tr>
<tr>
<td>2021</td>
<td>2.57</td>
<td>0.34</td>
<td>0.94</td>
<td>0.94</td>
</tr>
<tr>
<td>2022</td>
<td>2.23</td>
<td>0.04</td>
<td>0.47</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Source: working group analysis

Due to the changes in the fertilizer market that happened in 2022, trade flows experienced large-scale redirections, and South Africa also felt those changes. In 2022, the largest share of imported fertilizers came from Russia (17%). However, Russia was only the 4th largest fertilizer supplier to South Africa in 2021. At the same time, Germany and the Netherlands, which together accounted for almost 16% of fertilizer supplies to South Africa in 2021, significantly lowered their supplies in 2022, as they had to meet domestic demand first amidst falling fertilizer supply from their traditional trade partners.

Despite the accumulated problems, in 2022 South Africa managed to restore its domestic grain consumption back to the 2020 levels after the fall in 2021. However, it was not enough to combat the rising food insecurity, as the food prices also grew, to a large extent – due to the rising prices of fertilizers. The food prices rose by almost 10% in the national currency (ZAR) in 2022 compared to 2021, although they stayed on approximately the same level in USD terms due to the strong depreciation of the ZAR during 2022.
It is also worth noting that over the past few years South Africa significantly increased its grain exports, mainly thanks to improving domestic production. Today South Africa is one of the major suppliers of agricultural products to the African continent.

82. Changes in the balance in the South African grain market, 2012–2022, physical mt

<table>
<thead>
<tr>
<th>Year</th>
<th>Consumption</th>
<th>Imports</th>
<th>Production</th>
<th>Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>2.6</td>
<td>14.7</td>
<td>17.4</td>
<td>5.1</td>
</tr>
<tr>
<td>2013</td>
<td>2.9</td>
<td>12.8</td>
<td>15.1</td>
<td>3.6</td>
</tr>
<tr>
<td>2014</td>
<td>2.2</td>
<td>2.5</td>
<td>17.5</td>
<td>3.1</td>
</tr>
<tr>
<td>2015</td>
<td>2.0</td>
<td>2.3</td>
<td>17.1</td>
<td>2.7</td>
</tr>
<tr>
<td>2016</td>
<td>2.2</td>
<td>1.7</td>
<td>19.9</td>
<td>2.8</td>
</tr>
<tr>
<td>2017</td>
<td>3.6</td>
<td>4.0</td>
<td>19.5</td>
<td>2.6</td>
</tr>
<tr>
<td>2018</td>
<td>3.1</td>
<td>1.5</td>
<td>19.0</td>
<td>2.7</td>
</tr>
<tr>
<td>2019</td>
<td>3.1</td>
<td>1.5</td>
<td>19.0</td>
<td>2.7</td>
</tr>
<tr>
<td>2020</td>
<td>2.7</td>
<td>1.5</td>
<td>19.0</td>
<td>2.7</td>
</tr>
<tr>
<td>2021</td>
<td>2.8</td>
<td>1.5</td>
<td>19.0</td>
<td>2.7</td>
</tr>
<tr>
<td>2022</td>
<td>2.8</td>
<td>1.5</td>
<td>19.0</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Source: USDA FAS (United States Department of Agriculture Foreign Agricultural Service)

In 2022, the number of undernourished people in South Africa increased by 0.7 mln (18%) compared to 2021 and by 1.1 mln (31%) compared to 2020. If the growth rate of 2021–2022 remains unchanged in the nearest future, the number of undernourished people in the country will increase by 2.3 mln by 2025 and reach 7 mln.

83. Projected number of undernourished people in South Africa, mln

Economic damage

At least two types of economic losses for South Africa as a result of fertilizer market crisis may be distinguished:

- farmers’ profit losses (around USD 0.4 bn in 2022); and
- rising consumer spending (around USD 4.6 bn in 2022).

Farmers’ profits dropped as a result of surging fertilizer prices in 2022. In 2021, South African producers of maize, which is the country’s most important and commonly cultivated type of crop, spent around 22% of their incomes on fertilizers. In 2022, fertilizer prices jumped by an average of 65%, while the price of maize increased only by 2% (13% in national currency terms). It means that the share of farmers’ incomes spent on fertilizers increased up to 35% in 2022, while their profit margin declined from 29% to 18%. Such a drop in profit margin is equivalent to lost profit of USD 19 per tonne compared to the previous year. If we extrapolate these effects to the total volumes of crop production in South Africa in 2022, total losses of farmers might be estimated at around USD 0.4 bn.
Rising food prices also led to consumers overpaying. As local food prices, according to the FAO, increased by an average 9.3% (in national currency) in 2022 vs. 2021, the annual food spending per person also surged. In 2022, it equaled USD 909 per person, which is approximately at the same level as in 2021 and 41% higher compared to the 2020 levels. However, in national currency, annual food spending per person continued growing and reached ZAR 14,874 in 2022, up 9% compared to 2021. Such a difference in dynamics may be explained by the strong depreciation of the ZAR during 2022, when the exchange rate increased by around 11%. The share of food expenses in total consumer spending remained largely unchanged at around 21%.

As a result of all these changes, in 2022 South African consumers “overpaid” around ZAR 75.7 bn, or USD 4.6 bn, for food in comparison to the 2021 levels.

### Appendix 3.

**Cases of changing food security in Asian countries**

**India**

In the Asian region, India accounts for the highest absolute number of undernourished people. According to the FAO, 234 mln people (~17% of the total population) are starving. This figure (in relative terms) is slightly lower than the total for Sub-Saharan Africa, but still very high. The reason, again, stems from the problems with the affordability and availability of food.

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**84. South Africa people’s spending on food per annum, 2021–2022, %**

Source: working group analysis, FAOSTAT, FRED

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**85. Starving population in India, 2020–2022, mln people**

Source: FAOSTAT

Food insecurity in India has drastically increased since 2019. Rising poverty and food insecurity are likely to exacerbate tensions and social instability. Millions of people are resorting to negative coping strategies that, if prolonged, are likely to set back their social and economic development much longer than the current crisis. The problem of malnutrition could have been solved by increasing grain consumption. Taking into account the 3,400 kcal/kg calorific value of wheat and ~800 kcal/person/day gap between current and target food consumption among the undernourished people, we estimate that consumption of an additional ~20 mt of grain is required to adequately nourish the 234 mln hungry people in India. This figure represents an almost 7% gap between target consumption and current production volumes. And, as can be seen in the figure below, this deficit in consumption further increased in 2022.
Grain consumption in India is almost completely sustained through domestic production. This determines the importance of high yields for providing the population with a harvest. Food imports (or reducing food exports) is not a viable option for India, since high volatility of the global food prices makes it impossible for newly emerging economies to purchase products at global prices (or to abandon the substantial revenues from exported crops). Moreover, according to the FAO, households in the Asia Pacific region, including India, tend to spend 30% to 40% of their incomes on food. Households with a low income have to make trade-offs to meet the cost of food, health, education, and shelter. That is why domestic production of affordable crops is absolutely essential for India. And the production of crops is largely dependent on fertilizer availability, which is driven by price fluctuations in the fertilizer market.

In the last two years, the trends for population growth and fertilizer consumption began to diverge in India. As can be seen in the figure below, over 2021-2022 the population of India grew by 21 mln people (1.5%), while fertilizer consumption generally stagnated and decreased by 0.3 mt (0.4%). It is one of the key reasons for the spread of hunger in India, as domestic food production heavily depends on fertilizer consumption.
Historically, India has met most of its fertilizer demand through domestic production: the share of imported fertilizers in consumption is around 35%. Fertilizer consumption in 2012–2020 increased by 13.1 mt (26.4%) thanks to own production development (16% growth over the same time period) and, even more substantially in relative terms, through an increase in import (57% growth over the same time period). Indian fertilizer exports have historically been insignificant.

88. Fertilizer production and import dynamics in India, 2012–2022, physical mt

Over the last two years, fertilizer production continued its growth trend and increased by 4.3% since 2020. However, fertilizer imports decreased by around 1.8 mt (7.2%) in 2022 compared to 2020. The ramp-up in domestic production of fertilizers only allowed to compensate for the reduction of fertilizer imports, but did not help to increase fertilizer consumption in order to produce more crops domestically.

Thus, we conclude that the slight drop in fertilizer consumption can be fully attributed to the decline in fertilizer import. One of the reasons behind India’s inability to continue expanding their fertilizer imports was the fertilizer market crisis which unfolded in 2022 and was described in detail in previous chapters of the report. According to the GTT, the average price of imported fertilizers to India surged by almost 50% in 2022 compared to the previous year. It led to devastating humanitarian and pronounced economic losses for India, which accounted for 18% of the world’s population in 2022.

In 2022, India managed to minimize the negative effects of reduced fertilizer availability through substantial state subsidies for fertilizers. The government provides financial support to companies that sell fertilizers to farmers, a key vote bank, at below-market rates. India is a top importer of urea and a major buyer of diammonium phosphate needed to stimulate its huge agriculture sector which employs about 60% of the country’s workforce. The fertilizer subsidy budget in India increased from USD 14.1 bn in 2021 to USD 26.2 bn in 2022 in order to offset the impact of price increase and enable the importers to attract required volumes. However, India’s estimated losses from the increased fertilizer prices exceed the amount of subsidies. Moreover, officials are considering slashing the fertilizer subsidy bill to 1.75 tn rupees (USD 21.4 bn) for the 2023/2024 fiscal year as global prices fall, but it is still above the seven-year-average.

In 2022, the number of undernourished people in India increased by 12 mln (5%) compared to 2021 and by 34 mln (17%) compared to 2020. However, the overall situation in Asia is expected to normalize in the foreseeable future, which, by 2025, will help bring the number of undernourished people in India down to the 2020 levels of around 192 mln (-42 mln compared to 2022).
As mentioned above, in 2022 India increased its subsidy budget by USD 12.1 bn, which partially helped to level out some of the economic damage, but still was not enough to offset the estimated losses. Moreover, it is worth noting that the subsidies as such do not eliminate the economic losses, but rather transfer those losses from one economic agent to the government on the whole.

At least two types of economic losses for India as a result of the fertilizer market crisis may be distinguished:

- farmers’ profit losses (around USD 5.7 bn in 2022); and
- an increase in consumer spending (around USD 39.4 bn in 2022).

Farmers’ profits dropped as a result of the surge in fertilizer prices in 2022. In 2021, Indian farmers producing maize spent around 19% of their incomes on fertilizers (based on the 31% share of fertilizers in production costs, which is typical for the subcontinent). In 2022, the fertilizer prices grew on average by 50%, while the price of maize increased by only 0.3% (around 7% in the national currency terms). It means that the share of farmers’ incomes spent on fertilizers increased up to 28% in 2022, while their profit margins declined by 9 p.p., down to 29%. Such a drop in profit margins is equivalent to under-receiving profits of USD 19 per tonne compared to the previous year. If we extrapolate these effects to the total volumes of crop production in India in 2022, total losses of farmers might be estimated at around USD 5.7 bn.

Consumers also felt the burden of increasing food prices. According to the FAO, food prices on average increased by 7% (in the national currency) in 2022 compared to 2021, and annual food spending per person also surged. In 2022, it equaled USD 448 per person, which is approximately at the same level as in 2021 and 35% higher compared to the 2020 levels. However, in the national currency terms, the annual food spending per person continued growing in 2022 and reached INR 35,200 in India, which is 7% higher compared to 2021. This may be explained by the strong depreciation of the INR during 2022, when the exchange rate for INR rose by around 6%. The share of these expenses in the total consumer spending stayed at the 2021 levels, which is 4 p.p. higher than in 2020. As a result, in 2022 Indian consumers “overpaid” around INR 3.1 t, or USD 39.4 bn, for food in comparison to the 2021 levels.

Pakistan

Pakistan is another striking example of the worsening situation with hunger in Asia. In Pakistan, according to the FAO, 43 mln people (~18% of the total population) are starving. In relative terms, this figure is slightly lower than the total for Sub-Saharan Africa, but still very significant – 1 p.p. higher than in India. And, similarly to India, this problem is mainly associated with the insufficient affordability and availability of food.
91. Starving population in Pakistan, 2020–2022, mln people
Source: FAOSTAT

The problem of malnutrition in Pakistan could have been solved by increasing grain consumption. Taking into account the 3400 kcal/kg calorific value of wheat and ~800 kcal/person/day gap between the current and target food consumption among the undernourished people, we estimate that an additional ~4 mt of grain is required to adequately nourish the 43 mln hungry people in Pakistan. This gap in consumption correlates with an almost 9% gap between the target consumption and current production volumes. And, as can be seen in the figure below, this deficit in consumption keeps surging each year.

92. Grain consumption and deficit in Pakistan, physical mt
Source: FAOSTAT, USDA, working group analysis

Just like in India, grain consumption in Pakistan is almost completely sustained through domestic production, which explains the importance of high yields for providing the population with a harvest. Food imports (or reducing food exports) is not a viable option for Pakistan for the same reasons as explained in the previous deep-dive. So, producing affordable domestic crops is absolutely essential for Pakistan. In turn, production of crops is largely dependent on fertilizer availability, which is driven by price fluctuations in the fertilizer market.
In the last two years, the trends for population growth and fertilizer consumption began to diverge in Pakistan. As can be seen in the figure below, over 2021–2022 the population of Pakistan grew by 9 mln people (3.8%), while fertilizer consumption generally stagnated and marginally decreased by 0.01 mt (0.1%). It is one of the key reasons for the spread of hunger, as domestic food production largely depends on fertilizer consumption.

Over the last two years, fertilizer production continued its growth and increased by 4.4% since 2020. However, fertilizer imports decreased by 0.2 mt (14.1%) in 2022 compared to 2020. The increase in domestic production of fertilizers allowed to compensate for the reduction in fertilizer import, but it was not enough to achieve the increase in fertilizer consumption required to produce more crops domestically.
One of the reasons behind the inability of Pakistan to start expanding their fertilizer import was the fertilizer market crisis which unfolded in 2022 and was described in detail in previous chapters of the report. According to the GTT, the average price of imported fertilizers to Pakistan surged by almost 25% in 2022 compared to the previous year, leading to both humanitarian and economic losses.

In 2022, the number of undernourished people in Pakistan increased by 7 mln (18%) compared to 2021 and by 14 mln (47%) compared to 2020. However, the overall situation in Asia is expected to normalize in the foreseeable future, which by 2025 will help bring the number of undernourished people in Pakistan down to the 2021 levels of around 35 mln (-8 mln compared to 2022).

95. Projected number of undernourished people in Pakistan, mln

1. Farmers’ profits dropped as a result of the surging fertilizer prices in 2022. In 2021, local farmers producing maize spent around 19% of their incomes on fertilizers (based on the 31% share of fertilizers in production costs, which is typical for the subcontinent). In 2022, fertilizer prices grew on average by 25%, while the price of maize in Pakistan stagnated (but increased by 25% in the PKR terms). It means that the share of farmers’ incomes spent on fertilizers increased up to 24% in 2022, while farmers’ profit margins declined by 3 p.p., down to 35%. Such a drop in farmers’ profit margins is equivalent to under-receiving profits of USD 8 per tonne compared to the previous year. If we extrapolate these effects to the total volumes of grain production in Pakistan in 2022, total losses of farmers might be estimated at around USD 0.3 bn.

2. Consumers also felt the burden of increasing food prices. According to the FAO, food prices increased on average by 25% (in the PKR terms) in 2022 compared to 2021, so the annual food spending per person also surged. In 2022, it equaled USD 382 per person, which is approximately at the same level as in 2021 and 2020. However, in the national currency terms, the annual food spending per person continued growing in 2022 and reached PKR 78,200, which is 25% higher than in 2021. This may be explained by the strong depreciation of the PKR during 2022, when the exchange rate for PKR increased by around 26%. The share of these expenses in total consumer spending also stayed at the 2020–2021 levels (41%).

96. Annual food spending in Pakistan, 2020–2022, %

As a result, in 2022 consumers in Pakistan overpaid around PKR 3.7 tn, or USD 18 bn, for food compared to the 2021 levels.

The Philippines

According to the recent estimates, around 5.9 mln Filipinos (5.1% of the total population) were undernourished in 2021–2022. This is the second highest figure for Southeast Asia and the sixth highest figure for Asia in general.
The problem of malnutrition in the Philippines could have been solved by increasing grain consumption in the country. Using the calculation methodology described in chapter 3, we estimate that an additional ~0.5 mt of grain is required to adequately nourish the 5.9 mln hungry people. This gap in grain consumption correlates with an almost 2.4% gap between the target consumption and current production volumes. This deficit in consumption keeps growing each year, triggering a further increase in the number of undernourished people. The abovementioned additional consumption of ~0.5 mt of grain equals 0.2 mt in additional fertilizer supply, and the order of magnitude of this value indicates that the reduction in fertilizer consumption is not likely to be the key reason for the persistence of malnutrition in the Philippines, but it definitely adds to the problem.

97. Grain consumption and deficit in the Philippines, physical mt

Source: FAOSTAT, working group analysis

Myanmar

The combination of a political and economic crisis persisting since the February 1, 2021 military takeover, rising intensity of the ongoing conflict in many parts of the country, the impact of the COVID-19 pandemic and the outbreak of hostilities in 2022, and sanctions on trade and finance imposed by some countries, has deteriorated the food security situation in Myanmar.
According to the recent estimates, 2.1 mln people were recorded as undernourished in Myanmar in 2022 (+3.9% of the country population). The country is seeing high food inflation rates (up to 18% in 2022), ongoing hostilities, a stagnant economy, and depreciation of the local currency (11.6% in August alone and a total depreciation of 37% since the military takeover in February 2021).

Myanmar is also highly vulnerable to any fertilizer import volatility. With most inorganic fertilizers imported from abroad, the disruption of the Yangon port operations due to the political crisis and international fertilizer supply chain disruptions led to increased prices and an overall decline in fertilizer consumption (-62%, down from 1.6 mt to 0.6 mt) since 2020, reduced both farmers’ incomes and credit availability. Domestic prices of urea and compound fertilizers in July 2022 were up 90% and 75%, respectively, compared to the previous year.\textsuperscript{120}

The problem of malnutrition could have been partly solved by increasing grain consumption in the country. Using the calculation methodology described in chapter 3, we estimate that an additional $0.2$ mt of grain is required to adequately nourish the 2.1 mln hungry people in Myanmar. This gap in grain consumption correlates with an almost 2.4% gap between the target consumption and current production volumes. And this deficit in consumption is increasing each year, entailing an increase in the number of undernourished people. The abovementioned additional consumption of $0.2$ mt of grain equals to less than 0.1 mt in additional fertilizer supply. The order of magnitude of this value indicates that the reduction in fertilizer consumption is not likely to be the core reason for the persistence of malnutrition in Myanmar, but it adds to the problem considerably. If no further action is taken, the number of undernourished people in Myanmar may keep growing by 0.3 mln people each year, reaching 3 mln (5.5% of the country’s population) by late 2025.

98. Grain consumption and deficit in Myanmar, physical mt

<table>
<thead>
<tr>
<th>Year</th>
<th>Cereals consumption deficit, mt</th>
<th>Fertilizers consumption, mt</th>
<th>Number of undernourished people, mln</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>$0.13$</td>
<td>$1.6$</td>
<td>$1.5$</td>
</tr>
<tr>
<td>2021</td>
<td>$0.15$</td>
<td>$1.0$</td>
<td>$1.8$</td>
</tr>
<tr>
<td>2022</td>
<td>$0.18$</td>
<td>$0.6$</td>
<td>$2.1$</td>
</tr>
</tbody>
</table>

Source: FAOSTAT, working group analysis

Sri Lanka

According to the recent estimates, around 1.1 mln people (around 5% of Sri Lanka’s population) were undernourished in 2021–2022. Compared to other countries in Asia, this share is not particularly high.
However, Sri Lanka is undergoing the worst economic crisis since its independence, which is undermining local markets and income sources and has compounding effects on food security. Inflation increased from 5.7% in September 2021 to a record 69.8% in September 2022. Similarly, food inflation continued increasing and reached a new record high of 94.9% by September. Reduced foreign reserves, increased global prices and a 45% devaluation of the Sri Lankan rupee in just two months (March–April), led the country to default on its debt in May 2022 for the first time in its history.

The economic downturn, shortages of imported goods, including fuel and gas, reduced agricultural production and high prices disrupted livelihoods, with two in five households reporting a more than 50% decline in income compared to the same period in the previous year. Challenges to put food on the table are common with 61% of households regularly applying consumption-based coping strategies such as purchasing less preferred food, reducing portion sizes, or skipping meals. Two in three households had to spend more than 65% of their budgets on food and therefore faced difficulties meeting other essential needs.

The decision to ban chemical fertilizers in 2021 led to reduced rice and maize yields (-40%), which became the trigger for the abovementioned food inflation crisis. Although the ban was reversed by the end of 2021, elevated global prices, cancelation of government subsidies, and the lack of foreign reserves did not allow to secure the import of required agricultural inputs. As the shortage and high prices for fuel and agricultural inputs continue, paddy production for the next Maha season (a cultivation season in Sri Lanka, which starts by September and ends by March) is expected to be severely affected, which will have further negative impact on food security. The social tension was reflected in protests against the Government held since March 2022 in response to the economic crisis, prompting the resignation of the entire cabinet and the President.

As can be seen from the figure below, malnutrition is not an acute problem in Sri Lanka, with only about 1.1 mln undernourished people recorded in 2022, and not much shortage of grain can be seen in the country despite the decline in grain consumption in 2022. Using the calculation methodology described in chapter 3, we estimate that an additional ~0.1 mt of grain is required to adequately nourish the 1.1 mln hungry people in Sri Lanka. This figure represents an almost 3.1% gap between the target consumption and current production volumes, which is equivalent to an additional fertilizer requirement of under 0.1 mt. All this indicates that the food security situation in Sri Lanka is not yet dramatic. However, the extremely high food inflation driven by the ban on fertilizers might exacerbate the situation and drive up the number of undernourished people in the country in the upcoming years.

99. Grain consumption and deficit in Sri Lanka, physical mt

[Diagram showing grain consumption and deficit, with percentages and quantities for 2020, 2021, and 2022 for cereals consumption, cereals consumption deficit, fertilizers consumption, and number of undernourished people.]
Appendix 4 (Overview of Policy and Legal Procedures Existing in Major Economic Actors Which Affect the Fertilizer Supply, hereinafter also referred to as the “Appendix”) is prepared by Lupicinio International Law Firm.

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Receipt and consideration of the Appendix shall be deemed acceptance of all of the foregoing.

A brief overview of major legal and regulatory obstacles that impede efficient carve-outs for fertilizers from sanctions can be found below. Primarily, these obstacles include:

1. Lack of legal powers of the EU Commission to influence the implementation of sanctions by EU Member States, as well as the lack of legally binding sanctions interpretations.
2. Lack of sufficient coordination of sanctions policies between authorities within several countries, as well as between the countries themselves.
3. Lack of formalized requirements to assess the potential negative impact of sanctions on third parties.
4. Simplistic approach to reviewing existing sanctions measures and failure to take into account real market data on the sanctions’ impact.
5. Lack of legally clear and horizontally applied exceptions for fertilizers and the fertilizer industry from all sectoral sanctions programs.
6. Use of trade barriers and trade restrictive measures, which do not formally qualify as sanctions, directly against Russian fertilizers.

Hence, to secure an efficient level of security for fertilizers against the sanctions, it is advisable to review changes to governmental policies and regulations aimed at improving the imbalances outlined above.

It should be noted that fertilizers are just one example of goods currently impacted by the sanctions regime. The sanctions may have an impact on other goods and markets in the future due to the imbalances outlined above. Therefore, governments should ensure more consistent engagement and cooperation in the area of international law to:

• set up a legal mechanism for setting off the negative effects of sanctions restrictions on the markets through an analysis of their negative impact on third countries; and
• establish legal liability of sanctions-imposing states for such negative effects on third countries.

Such legal and policy reforms could be discussed, inter alia, within the framework of negotiations in the United Nations International Law Commission on the Draft Articles of Responsibility of States for Internationally Wrongful Acts (hereinafter, "Draft Articles"). The current version of the Draft Articles does not cover the issue of unilaterally applied restrictive measures, such as sanctions, and does not qualify whether sanctions represent a valid instrument under international law and under which conditions. Some mechanisms should be incorporated into international law, such as (i) consultations with third parties, and (ii) requirements for sanctions to be commensurate with the actions they aim to redeem, analogous to the legal doctrine of counter-measures.

Additionally, it is recommended that legal regulation of sanctions be discussed at other specialized international forums, such as the World Trade Organization, UNCTAD, the UN General Assembly meetings, and the OECD.

Lack of centralized sanctions-related implementation: the EU legislative and implementation process

Lack of competence at the level of the EU Commission to impose binding rules on sanctions implementation

Member states have delegated some sovereignty in specific areas to make collective decisions and implement common policies. In terms of the EU foreign and security policy (CFSP), they have transferred several competencies on Trade Agreements, International Sanctions, Neighborhood Policy, Development Aid and International Cooperation, Security and Defence Policy through the Common Security and Defence Policy and Diplomatic Representation.

These policies align with the common interests and goals of the EU member states, and decisions in these areas require unanimity or qualified majority voting among member states, ensuring they retain some control and participation.121

EU law is quite laconic as regards the competence and powers of the EU bodies to impose sanctions and the relevant procedures. As a general rule, Article 29 of the Treaty on the European Union (TEU) gives the Council of the European Union the power to adopt decisions "which shall define the approach of the Union to a particular matter of a geographical or thematic nature".

Additionally, Article 215 of the Treaty on the Functioning of the European Union (TFEU) sets out a more precise legal framework for the imposition of sanctions. Sanctions (in the EU’s official terminology – "restrictive measures") may be adopted by the Council of the European Union against natural or legal persons and groups or non-state entities. For this, a special procedure set out in paragraph 1 of Article 215 of the TFEU must be followed: the Council adopts the necessary measures by a qualifying majority on a joint proposal from the High Representative of the Union for Foreign Affairs and Security Policy and the EU Commission.

These two articles are the only legislative provisions of the EU treaties which govern sanctions-related policies and processes within the EU. As may be seen, they briefly outline the legislative power of the Council to adopt "necessary measures", which take the form of "restrictive measures" following a special procedure. The EU Commission as the key bureaucratic institution of the EU is involved only as a co-elaborator of sanctions measures, which must be proposed to the Council jointly by the High Representative and the Commission. The EU treaties are silent on any further rights of the EU Commission regarding measures already adopted, as well as on the procedures for elaborating proposals for new measures under the procedure outlined in Article 215 of the TFEU. The EU Commission has issued several guidelines on sanctions implementation, the most recent example being the Commission’s Frequently Asked Questions on the implementation of Council Regulation No 833/2014 and Council Regulation No 269/2014, which set out the legislative framework for Russia-related sanctions. However, these FAQs and guidelines do not have any legal effect. The EU Commission itself in a preface to the Russia FAQs notes that "only the Court of Justice of the EU is competent to interpret EU law" and that the national authorities of the EU Member States and economic operators may make use of this guidance to achieve the uniform application of sanctions across the EU, but are not obliged to.

All in all, both the TFE and TFEU limit the use of guidelines to several policy cases, such as common foreign and security policy (Article 25 of the TEU), or broader guidelines on the economic policies of the EU (Article 121 of the TFEU).

However, Article 19 of the TEU and Article 267 of the TFEU
grant exclusive competence to interpret acts of institutions, bodies, offices, or agencies of the EU, and of the treaties on the EU, to the Court of Justice of the EU. Both EU treaties are silent on any possibility of the EU Commission issuing any legally binding guidance or any decision which could have an interpretative effect for the Member States and economic actors.

EU decisions and regulations governing specific sanctions regimes put the implementation burden on the EU Member States, limiting the Commission’s powers only to information gathering. For example, under Regulation No 833/2014, all authorizations for derogations\(^2\) from the existing sanctions regime against Russia must be granted by the competent authorities of the EU Member States, with no involvement of the EU Commission in the derogation process. Meanwhile, the EU Commission gathers a plethora of information regarding sanctions implementation and granted derogations, which EU Member States are obliged to provide. In this light, the EU Commission becomes the most knowledgeable actor in the sanctions implementation field by knowing everything that is going on in all EU Member States, but with no real power to influence the process.

As a result, we are seeing a situation where EU Member States and economic actors are legally responsible for sanctions implementation but lack the necessary information gathered from different sources. Meanwhile, the EU Commission, which is legally a part of the sanctions elaboration and adoption process, is deprived of real decision-making powers in the implementation of the sanctions. This inevitably leads to different interpretations and applications of sanctions by EU Member States and economic operators, resulting in the failure of the EU Commission to be an efficient mediator, which it would be should it have powers to issue legally binding interpretations of the sanctions.

Lack of harmonization in sanctions interpretation and implementation across the EU

The European Union operates under a framework known as the Common Foreign and Security Policy (CFSP), which encompasses a wide range of foreign policy and security-related issues, including the imposition of sanctions on individuals, entities, or countries. When the Council of the European Union adopts a Decision regarding sanctions, it is binding on all Member States, and they are obligated to comply with that decision.

However, how each Member State implements the sanctions can vary. While the overarching objectives and restrictions are the same for all EU countries, the specific legal and administrative procedures for implementing sanctions may differ from one Member State to another. This variation can be influenced by a variety of factors, including each country’s legal system, administrative capabilities, and national interests.

As a result, the diversity in implementation can lead to practical challenges. For example, it may affect the consistency and effectiveness of the sanctions regime across the EU. It can also result in differences in the level of enforcement or interpretation of sanctions measures in various Member States. This can make it challenging for businesses, individuals, and organizations operating within the EU, as they must navigate potentially different regulatory environments depending on the country in which they are active.

Nonetheless, the practical reality is that there can be variations in how sanctions are implemented at the national level within the EU due to the decentralized nature of the EU’s decision-making and enforcement process.

Furthermore, it is important to note that within each Member State, various national authorities\(^3\) are responsible for enforcing sanctions, and their interpretations and applications of sanction rules may differ significantly.

Consequently, in a situation where the EU Commission lacks legal powers in the sanctions-implementation field, EU law effectively fails to set up legal boundaries for uniform sanctions implementation by the EU Member States. According to the above-mentioned Article 29 of the TFE, Member States shall ensure that their national policies conform to the Union’s positions. This is the only sanctions-relevant provision of EU law, which contains certain requirements for EU Member States to coordinate their positions with the Union’s positions. However, the real legal meaning of this provision remains obscure.

EU legislative acts on Russia-related sanctions do not contain any obligation for any of the EU Member States or their competent authorities to ensure uniform application of Russia-related sanctions or even to achieve a certain degree of harmonization of measures related to sanctions application.

In June 2023, Regulation No 833/2014 was amended to contain a provision which requires EU Member States to exchange information on the application of sanctions with
The lack of substantial legal requirements on the leading to non-compliance with these provisions. diverse methods of applying sanctions within Member States, to, practical implementation often falls short due to the information is theoretically expected to be rigorously adhered achieve a certain degree of harmonization or unanimity in their implementation actions. Hence while the exchange of information is theoretically expected to be rigorously adhered to, practical implementation often falls short due to the diverse methods of applying sanctions within Member States, leading to non-compliance with these provisions.

The lack of substantial legal requirements on the harmonization of sanctions-related implementation measures leads to a situation where different EU Member States take different approaches in determining the scope of the sanctions, mainly the applicability of the ownership and control criteria to frozen assets and whether entities which are not themselves listed should be frozen due to alleged control by sanctioned persons.

If we closely examine the fertilizer sector, this difference in approach has resulted in substantially different interpretations of ownership and control of Russian-based fertilizer companies in different EU Member States. In most cases, sanctioned persons have either de-listed (thus, no longer having any ownership or legal participation in the companies concerned) or left the regulatory and governance boards of such companies. However, such de-listings and resignations have been interpreted differently by different EU Member States. Another example is the granting of derogations and authorizations to work with Russian companies by the EU Member States, with some Members eager to provide such derogations, and others reluctant to do so because of the Russian origin factor.

Several EU Member States maintain national sanctions listings which do not correspond to the sanctions listings maintained at the EU level. Most notably, the Lithuanian Financial Crime Investigation Service (FNTT) has published a list of natural and legal persons designated as sanctioned in Lithuania (as deemed controlled by a person or entity sanctioned at the EU level). Importantly for this study, this list sanctions Lithuanian subsidiaries of major fertilizer companies – EuroChem (AB Lifosa, UAB EuroChem Logistics International), and PhosAgro (UAB PhosAgro Baltic) – even though these companies are not listed at the EU level. Similarly, Poland has sanctioned EuroChem Polska Sp. z oo, PhosAgro JSC, PureFert Holding Limited, PAO Acron, and other entities related to the Russian fertilizer sector or trading in Russian fertilizers.

We are observing a situation in which certain EU Member States grant their authorizations or confirmations of non-sanctioned status to an entity, whereas other EU Member States refuse to grant such authorizations to the same entity or to entities with similar or analogous ownership structures (i.e. subsidiaries of a single group). For example, the French regulator DG Tresor granted a sanctions clearance to EuroChem Agro France (a French subsidiary of EuroChem Group AG) but did not grant similar clearances to other EU subsidiaries of EuroChem Group (such as AB Lifosa in Lithuania). Similarly, EuroChem Agro Hungary Kft. – a Hungarian subsidiary of the Group – is deemed sanctioned, whilst it has the same ownership structure as its French sister company.

In the meantime, the EU Commission stated in its Opinion of November 8, 2019, that the unilateral adoption of national asset freeze measures for reasons related to the achievement of the Common Foreign and Security Policy objectives as set out in Article 215 TFEU would have a clear impact on the functioning of the internal market and would undermine the purpose and effectiveness of the above-mentioned provision of the TFEU. Therefore, they would not be compatible with EU law.

In addition to differences in interpretation of sanctions, EU Member States apply different procedures for confirming the sanctions status of entities and assets: e.g. in France, such status is confirmed only by the Direction generale du Tresor, and in Hungary, the confirmation is established through a court decision upon a filing from the National Tax Authority (NAV). At the same time, Hungary, for example, does not have any procedure for confirming the non-sanctioned status of an entity or for revoking issued court orders.

It is clear that the lack of legal obligations to achieve the necessary level of harmonization between EU Member States in the application of EU sanctions creates legal and practical obstacles and contributes to more negative implications arising from the incorrect application of existing restrictive measures in the EU.
Lack of instruments at the level of the EU Council to adopt single uniform sanctions interpretation tools and mechanisms

The TFE and the TFEU – two EU-founding treaties – provide no room for the EU Council or the EU Commission to adopt legally binding guidance and interpretations of EU law, including sanctions, as examined above. However, the treaties give wide legislative power to the EU Council to formulate its decisions and regulations in a manner that would ensure unified interpretation of sanctions tools and mechanisms. For example, Regulation 833/2014 and Regulation 269/2014 contain a section of definitions applied for these Regulations, as well as binding interpretations of certain conditions and exemptions from the sanctions regime.

However, in general, the existing EU sanctions legal framework contains no provisions which would allow the EU Council to perform an ex-post evaluation of the application of sanctions, or to offer suggestions on how to ensure the uniform applicability of sanctions across the EU Member States. Though Decision 2014/512/CFSP of 31 July 2014, which is a prime basis for the overall legal framework of sanctions against Russia, is reviewed every 6 months (as required by Article 9 of the current version of the Decision), the review concerns the renewal of the existence of the general legal framework of sanctions against Russia in its entirety, rather than particular aspects of this sanctions regime, such as application and implementation.

In the context of the EU sanctions framework, it is evident, based on the EU’s legal precedents and European Union Court of Justice case law, that the Council conducts only a superficial review every six months. These reviews involve minimal data analysis regarding the potential adverse consequences of the sanctions, focusing primarily on the individuals and entities listed in the sanctions measures. They lack comprehensive assessments encompassing the macroeconomic, geopolitical, and geostrategic dimensions. In essence, these reviews are notably deficient in their depth and scope.

Since February 2022, the EU Council has failed to produce any legally binding framework to remedy the lack of harmonization and uniformity in the application of sanctions against Russia, leaving this to the sole responsibility and will of the EU Member States.

Lack of centralized sanctions-related implementation: The US process

No powers for other executive branch bodies (like the State Department) to overcome the OFAC decision

The U.S. legal framework which sets out the grounds for its adoption, implementation, and application of sanctions is more straightforward than in the EU. US laws (such as the International Emergency Economic Powers Act (50 U.S.C. 1701 et seq.) (IEEPA), the National Emergencies Act (50 U.S.C. 1601 et seq.) do not provide for a list of sanctioned persons (“specially designated persons, SDN”), but authorize the Secretary of the Treasury to determine the specific individuals and entities to be sanctioned. The Office of Foreign Assets Control, being part of the U.S. Treasury, administers and enforces economic sanctions programs. Designations of individuals and entities made by OFAC are based on the criteria and powers given by specific Presidential Executive Orders, which define the scope of each OFAC-managed sanctions program.

Though executive orders would usually provide for necessary consultations with the U.S. Secretary of State or the U.S. Department of Justice before designating certain natural persons or entities as SDN, U.S. law does not require soliciting such advice in all cases. Moreover, U.S. law does not provide for a general requirement for ex-post assessment of already applied sanctions and SDN designations, nor does it put the OFAC’s decisions on sanctions matters under the scrutiny of other executive branch agencies or legislative branches (like the Congressional review).

This means that OFAC has broad and discretionary power to designate natural persons and entities as SDN, thus subjecting them to the whole range of U.S. restrictive measures, on its determination. Though the U.S. OFAC has proven to be the most experienced national competent authority responsible for sanctions policies (specifically as regards the fertilizer market, as it issued three General Licenses for the continuous operation of the fertilizer market), its decision-making process is not dependent on considerations which may arise with other executive branch bodies of the U.S. Government or other actors, such as NGOs and the general public opinion.
In addition, U.S. laws impose several restrictions on the possibility of reviewing OFAC’s actions. According to the Administrative Procedure Act, only actions by administrative bodies for which there is no other adequate remedy can be subject to judicial review. Admissibility for review is also limited by the discretion of powers given to a particular agency. OFAC as the sole governmental agency responsible for sanctions implementation has a broad authority under the U.S. statutes and relevant instruments (such as Presidential Executive orders), which limits the ability of designated parties and third parties to challenge OFAC’s policies and decisions.

Overall, the U.S. sanctions implementation process, though more elaborate and uniform than in the EU, still lacks the necessary transparency and the possibility of challenge and review.

Lack of OFAC’s policy influence on other bodies to ensure harmonious sanctions implementation

The U.S. OFAC maintains a broad variety of tools to ensure the uniform implementation of the U.S. sanctions regimes. As part of its commitment to regulatory transparency and customer service, it publishes answers to questions of general applicability (FAQs) related both to the general aspects of the U.S. sanctions laws and to the specifics of certain U.S. sanctions programs. Moreover, OFAC runs an elaborate licensing system, which includes general licenses (targeting undefined general audiences and setting up general legal frameworks) and specific licenses, which authorize certain types of conduct for a specific entity. In specific cases, OFAC can provide assistance and support in the form of comfort letters and statements issued to applying entities or persons and confirming that dealing with such entities or persons would not violate U.S. sanctions laws.

However, only the licensing system has binding legal power, meaning that licenses directly authorize certain types of actions that usually involve a sanctions-related element. OFAC’s FAQs are intended only as general information to assist persons subject to United States jurisdiction to comply with the legal requirements and to facilitate an understanding of the scope and purposes of sanctions programs. OfAC’s comfort letters and any other correspondence do not represent a valid legally binding instrument and serve only as an indication of the OFAC’s position under the state of affairs existent at the date of issuance of the relevant document. This means that though OFAC’s position serves as authoritative guidance to economic actors and market players in terms of sanctions implementation, they cannot serve as the final source of information as regards sanctions implementation ambiguities.

Neither of these positions can serve as a decisive stance for assessments made by other executive branch agencies, such as the Department of Commerce, the Department of State, the Department of Justice, or the Federal Reserve System. These agencies continue to act on their own behalf and are not statutorily bound by OFAC’s determinations.

Lack of centralized sanctions-related implementation: other countries

Lack of sanctions-related practices and regulations in other economies (e.g. Australia or Switzerland)

Unlike the EU and the U.S., other countries, such as Switzerland, the United Kingdom, and Australia, had little experience in implementing full-scale autonomous sanctions regimes before the Ukrainian crisis. As a result, these countries decided to compensate for the absence of sanctions-related practices and regulations by mainly copying the decisions adopted by the main players in the sanctions field.

In Switzerland, the legal basis for the implementation of sanctions measures is the Federal Act on the Implementation of International Sanctions (the Embargo Act) adopted in 2002. This is a framework law that authorizes the Federal Council to impose non-military measures to implement sanctions. Previously, Switzerland implemented sanctions that had been imposed by the United Nations and did not have much experience in implementing autonomous sanctions regimes.

On 28 February 2022, 5 days after the EU adopted the first package of sanctions against Russia, the Federal Council released the Ordinance on Measures connected with the Situation in Ukraine, which adopted a few sanctions mainly concerned with trade and financial issues. However, on 4 March 2022, the Federal Council changed its mind and approved a revision of the Ordinance, thus adopting the EU sanctions in force at that time. Over time, the Swiss Federal
Council has continued to adopt further sanctions against Russia virtually mirroring all the measures imposed by the EU. However, neither the Embargo Act nor the Ordinance obliges the Swiss Federal Council to follow EU sanctions. It does so as a de facto policy action, not as a legal action.

Implementation and enforcement of Swiss sanctions are the responsibility of the State Secretariat for Economic Affairs (SECO). However, the implementation of new restrictive measures by SECO often raises considerable difficulties in practice for business due to the limited official guidance.

Another illustrative example of sanctions regulation development in progress is the UK. The UK has long implemented sanctions imposed by the UN and, before Brexit, the EU. Since the UK departed from the EU, the UK government has sought to both preserve the policy objectives of pre-Brexit EU sanctions under English law and establish an independent, autonomous UK regime through the implementation of the Sanctions and Anti-Money Laundering Act 2018 (SAMLA) and European Union Withdrawal Act 2018. But in fact, the UK autonomous sanctions regime has departed from EU regulations in several key ways, including through new powers to designate persons “by description”, or powers to issue general licenses, which is close to the U.S. model. In the meantime, the UK safeguards certain features of EU sanctions law, such as ambiguous “ownership” and “control” definitions concerning the assets of designated persons. The UK sanctions body – the Office of Financial Sanctions Implementation – also adopts U.S.-like practices of financial penalties against non-complying entities.

At the same time, the UK seeks to preserve the opportunity to effectively adopt other countries’ restrictive measures. For example, in 2022, the UK Parliament approved a mechanism for designating persons via the urgent procedure. This urgent procedure effectively allows the UK to fast-track listings made by the US, the EU, Canada or Australia. Overall, the UK sanctions system is still evolving, which causes uncertainties and a lack of clarity for market players and economic operators.

Australia increased its attention to sanctions following the Ukrainian conflict. Even though the history of Australian autonomous sanctions regimes dates back to 2011, when the Autonomous Sanctions Act 2011 (hereinafter, “the Sanctions Act”) and the Autonomous Sanctions Regulations 2011 (hereinafter, “the Sanctions Regulations”) were adopted, the dedicated regulator, the Australian Sanctions Office (ASO), was established only on 1 January 2020. The Australian sanctions regime is still rudimentary. For example, it is less transparent than other countries’ sanctions regulations and has a lack of sanctions-related practices and regulations. Australia also has no clear policy definition as regards the scope of owned or controlled assets and provides little or no information on its official interpretation of sanctions to economic operators.

Absence of an effective coordination mechanism, sanctions remain a diverse instrument with different scopes and depth

The other challenge for economic actors working with the Russian fertilizer sector is the absence of an effective coordination mechanism between the US, the UK, the EU and other nations such as Australia in imposing sanctions. The response has led to certain divergences in the approach to sanctions, for example, with some individuals and entities designated in one or more jurisdictions but not in others. Another major point of divergence is the determination of the scope of the sanctions and interpretation of the so-called “ownership and control” criteria, which determine the assets subject to freeze as belonging or being under the control of a designated entity or individual. Therefore, economic actors face the challenge of complying with differing sanctions requirements across multiple jurisdictions, bearing significant over-compliance costs.

Western countries have issued some policy statements on better sanctions cooperation. For example, at the Group of Seven (G7) Summit in Hiroshima, Japan on 19 May 2023, the “G7 Leaders Statement on Ukraine” announced further coordinated steps to prevent the evasion and circumvention of sanctions, including:

- continuing work in the G7 Russian Elites, Proxies, and Oligarchs (REPO) Task Force and the G7 Enforcement Coordination Mechanism;
- engaging with third-world countries to ensure sanctions are not circumvented;
- reinforcing coordination to take action against third-world country actors [...] including preventing third-world country branches of Russian banks from being used to avoid sanctions; and
• fully mapping holdings of Russia’s sovereign assets immobilized in G7 jurisdictions and keeping them immobilized until Russia pays for the damage it has caused to Ukraine.

On the other hand, the G20 in Delhi discussed the fertilizer issue as a top priority. The moderate and respectful tone of the institutional statement is in stark contrast to the aggressive and hasty intervention of the EU and Ukrainian representatives. The New Delhi Leaders Declaration unequivocally affirms the commitment of G20 member countries to promote unrestricted, open, and equitable trade in agriculture, food, and fertilizers. It underscores their pledge to abstain from imposing export restrictions in these crucial sectors.

The US and the EU, as well as the US and the UK, are strengthening their partnership in sanctions policies. For example, in July 2023 the US and the UK held an Inaugural Strategic Sanctions Dialogue with a commitment to strengthen cooperation on sanctions strategy, design, targeting, implementation, mitigations, and enforcement, by bringing together departments and agencies from both countries to discuss priorities across geographic and thematic sanctions regimes. However, sanctions regimes remain very diverse and overlapping. Different countries use different methods for legislating on and implementing sanctions, define different scopes for similar sanctions programs and have different policy views on the sanctions’ impact and real economic and policy effects. This divergence will continue to impact the markets, including the fertilizer sector.

The absence of coordination is notably exemplified in the Joint Comprehensive Plan of Action, where despite the agreement to lift sanctions on Iran and promote a return to normalcy in the financial sector, no substantial progress has been made. This vividly illustrates the apprehension prevalent in the financial sector, where institutions operate with unwavering fear, resulting in a collective adoption of defensive, risk-averse policies, and an aversion to proactive measures.

The impact of sanctions on third parties

Limited legal ability to analyze the negative impact of sanctions on third countries

The European Union lacks a comprehensive mechanism to evaluate the potential adverse impact of its sanctions on third parties when implementing international sanctions. In this context, it is of utmost importance to rigorously evaluate the so-called “over-compliance” with sanctions and the broader consequences they generate.

As stated by the Special Rapporteur of the United Nations Organizations, Alena Douhan, the excessive enforcement of sanctions has far-reaching implications for human rights by impeding the procurement of essential goods like food, medicines, medical equipment, and spare parts for sanctioned countries while hindering intergovernmental organizations and humanitarian NGOs in funding aid programs and compensating their employees in those regions.

This overzealous approach extends sanctions to unintended targets, including entire populations, especially in the banking sector, resulting in disruptions to legitimate trade, higher transaction costs, and asset freezes for non-sanctioned individuals. Moreover, it hampers states in fulfilling their obligations, such as paying pensions to retired nationals abroad, participating in international organizations, and conducting diplomatic functions, thereby jeopardizing human rights, including freedom of information, even after the sanctions expire, without necessarily advancing their intended objectives or hastening their removal.

The negative repercussions of the EU’s sanctions against Russia are becoming more evident for third countries. In light of these developments, the African Union has made a strong call for the cessation of sanctions directed at Russia, emphasizing their harmful consequences for the African continent. Macky Sall, the President of Senegal and the current head of the African Union (AU), recently highlighted the pressing need to lift the sanctions. He pointed out that these measures hinder the importation of vital commodities like grain and fertilizers, thereby posing substantial challenges to food security across the continent.

Failure to meet the proportionality principle of sanctions vis-a-vis their impact on third parties

The EU possesses a wide range of instruments which could potentially be used to evaluate the impact of its restrictive measures on third parties. These comprise impact assessments per se, stakeholder consultations and evaluation/fitness checks. However, the use of these instruments in the area of sanctions policy is strictly limited.
EU law regarding sanctions does not specifically require a third-party impact assessment of the potential negative consequences which may be caused to natural persons and entities not directly targeted by the sanctions policies and programs. Ex-ante impact assessment exists in the EU in the form of impact assessment by the EU Commission, as indicated in the Commission’s Communication COM 2002/276 on Impact Assessment. According to the EU Commission’s Better Regulations Guideline, an impact assessment is required for Commission initiatives that are likely to have significant economic, environmental or social impacts or which entail significant spending, and where the Commission has a choice of policy options.

Article 11 of the TEU requires the Commission to carry out broad consultations with interested parties to ensure that the EU action is coherent and transparent. However, according to the Better Regulations Guidelines, it does not cover stakeholder consultations prepared and conducted by any EU agency or Commission body before the Commission finalizes draft delegated and implementing acts. Most of the Commission’s sanctions-related elaborations take place at this stage, thus being exempt from the stakeholder consultation requirements.

A fitness check is a comprehensive evaluation of a policy area that usually addresses how a set of related legislative acts have contributed to the attainment of policy objectives. Fitness checks can also be conducted for horizontal issues, focusing on specific matters across many different legislative acts (e.g. reporting obligations). According to publicly available information, no fitness check has been ever conducted as regards the existing sanctions policy vis-a-vis the Russian fertilizer/agricultural sector.

As can be seen, sanctions policies and actions, not being legislative proposals or delegated acts, are not prima facie subject to the Commission’s impact assessment. Moreover, the existing impact assessment procedures do not account for the interests of non-EU parties which could potentially be targeted by a proposed initiative. The EU does not make use of its available instruments in respect of the sanctions domain, which naturally limits the ability of third parties (including non-EU parties) to raise legitimate concerns over potential negative effects of the EU restrictive measures on such third parties.

In contrast to the EU, the U.S. laws contain no instruments available to OFAC or legally binding on OFAC or any other executive agency regarding the assessment of the potential negative impact of U.S. sanctions programs on third parties. Specific sanctions laws and programs may contain provisions requiring OFAC to provide such assessment. For example, Section 241 of the Countering America’s Adversaries Through Sanctions Act of 2017 (CAATSA) required OFAC to deliver a report to the U.S. Congress, which would analyze, inter alia “the potential impacts of imposing secondary sanctions concerning Russian oligarchs, Russian state-owned enterprises, and Russian parastatal entities, including impacts on the entities themselves and the economy of the Russian Federation, as well as on the economies of the United States and allies of the United States.” Any other assessment of the potential negative impact of U.S. sanctions policies remains at OFAC’s discretion.

Sanctions are adopted in perpetuity (as in the US) or are renewed without deep diving into the case (as in the EU)

In the US, the Presidential Executive Orders which usually set up a basis for sanctions policy programs and further implementation actions by OFAC have no restricted validity in time. The same applies to sanctions programs, which are administered following specific pieces of legislation. For example, the longest existing U.S. sanctions program – against Cuba – is found in the Trading with the Enemy Act which has been in force since 1917. U.S. sanctions laws do not usually require any scheduled revision of applied sanctions policies and their efficacy. This means that U.S. sanctions are generally adopted until their revocation by the legislative or the executive branch, should there be a policy interest in doing so. This sets up a framework for the almost perpetual existence of U.S. sanctions programs and complicates their review.

As regards the EU, Decision 2014/512/CFSP of 31 July 2014, which forms the prime basis for the overall legal framework of sanctions against Russia, is reviewed every 6 months (as required by Article 9 of the current version of the Decision). However, this review concerns the sanctions program in its entirety.

The EU Regulations which established the detailed conditions of sanctions programs, notably against Russia, are valid indefinitely and are not subject to any scheduled reviews either in full or in part. This means that neither the EU Council nor the EU Commission is legally obliged to assess the real status quo with the effects of sanctions implementation or to draw up proposals on sanctions review. As seen from EU
Council practice, the overwhelming majority of personal sanctions, for example, are continuously prolonged without any additional examination of specific cases, and sectoral sanctions do not undergo any amendments.

**Sectoral sanctions on the fertilizer sector**

**Sanctions against Russian and Belarusian potash in the EU and the UK**

While restrictive EU and UK measures provide exceptions for fertilizer supplies, they do not apply to potash. During 2021, the EU and the UK imposed restrictions on Belarus. In March 2022, a new package of sanctions led to a total ban on potash imports from Belarus and restricted the capacity of Belarus to use EU territory for transit.

In April 2022, officially to avoid any diversion effects or re-exports of Belarus potash by Russian companies, the EU also decided to extend the restrictions to Russian potash. The EU imposed an import ban on Russian potash to the Union as part of the EU’s fifth sanctions package against Russia on 8 April 2022 (a prohibition on the purchase, import, or transfer of potash was introduced in Article 3i of Regulation 833/2014), subject to limited quotas. These sanctions were designed in such a way that they prohibited any operation involving Russian potash, even if such potash was destined for third countries, and not the EU.

On 19 September 2022, the EU Commission updated its FAQs on Russian potash and clarified that it can be transited through the EU to third countries and services may be provided concerning Russian potash exports to third countries by EU operators. The contradiction between Regulation 833/2014 and the interpretation adopted by the EU Commission in its FAQs creates space for uncertainty. It leads to unintended negative ramifications for the export of Russian potash to third countries.

**Insurance sanctions**

EU Regulation 833/2014 imposes a wide range of prohibitions on insurance services for different sectors of the Russian economy. The general restrictions on Russia discourage insurers from providing their services to the fertilizer sector, even though there are no targeted prohibitions on insuring supplies of fertilizers from Russia. In addition, international insurance companies are cancelling insurance policies already issued to Russian companies, if they are allegedly owned or controlled by sanctioned persons. The Joint War Committee of Lloyds of London added the Black Sea to its so-called “Listed Areas”, meaning that insurance premiums for shipments from Black Sea ports are subject to war risks and are thus higher.139

It should be noted that sanctions against Russian potash in their initial stage before the issuance of the EU Commission’s FAQ prohibited, inter alia, insurance of potash sales and shipments.

**Transportation and shipping sanctions**

The EU has imposed significant restrictions on the Russian transportation sector, impeding the stabilization of fertilizer shipments from Russia. Road transportation by Russian carriers into EU territory is currently prohibited. The EU has also prohibited access, after 16 April 2022, to ports and, after 29 July 2022, to locks on the territory of the Union, to any vessel registered under the flag of Russia, except access to locks to leave the territory of the Union. The EU has also sanctioned the Russian Maritime Register of Shipping: vessels certified by the Register cannot enter EU ports.

According to Articles 3ea and 3l of Regulation 833/2014, the competent authorities may authorize a vessel to access a port or lock and the transportation of goods by road transport under such conditions as they deem appropriate after having determined that the access is necessary for the purchase, import or transportation of fertilizers. These exclusions have not prevented the transport blockade of fertilizers. EU sectoral sanctions, in practice, block the transportation of Russian fertilizers and raw materials for their production on the territory of the countries of the Baltic region. Individual member states of the EU retain a degree of discretion regarding the implementation of such waivers.

**Banking sanctions**

The Western allies have imposed significant sanctions on the Russian banking sector, impeding their ability to handle payments for Russian fertilizers. Major Russian banks (including VTB, Tinkoff, Sber, Alfa, Otkritie, Sovcombank, Rosselkhozbank, Rosbank, Bank Rossiya and others) are subject to blocking sanctions imposed by the U.S., the EU, and the UK. Ten major Russian banks have also been
de-SWIFTed by the EU, meaning that international payments and bank wires are no longer available for clients of those banks.

EU and U.S. regulations do not provide for exemptions from the banking sector sanctions for trade in Russian fertilizers. Thus, EU Regulation 833/2014 does not allow the use of accounts in Russian banks subject to restrictive measures for trade in fertilizers. U.S. General License 6c, which generally authorizes dealings with Russian fertilizers and producers of Russian fertilizers, does not contain a specific authorization to perform transactions through accounts in Russian banks on OFAC’s SDN list.

**Industrial equipment sanctions affecting the Russian fertilizer sector**

The U.S., EU and UK apply a broad range of export controls and restrictions regarding the supply of industrial equipment to Russia.

For example, the U.S. Bureau of Industry and Security (BIS), which is responsible for export control regulations, has placed Export Control Classification Number (ECCN) items in Categories 3, 4, 5, 6, 7, 8, or 9 (which comprises the overwhelming majority of industrial products and electronics) under the compulsory licensing regime for exports to Russia. At the same time, the BIS applies a so-called “presumption of denial” as regards requests for licensing potential exports to Russia, meaning that even though exports are possible de jure, they are prohibited de facto. The complexity of U.S. export control rules puts almost all items which contain parts of U.S. origin at risk of being subject to U.S. rules.

EU sanctions on exports of industrial equipment, as outlined in Regulation 833/2014, cover a wide range of products, such as electronic devices and components, semiconductors, extraction and mining equipment, equipment for telecommunication purposes, software, lasers, marine technologies and other items. Also, all goods which fall under the dual-use goods definition are also subject to export restrictions. Regulation 833/2014 contains no exceptions that would allow the supply of restricted industrial equipment for the needs of the fertilizer industry. The only exception provided by the EU sanctions regime concerns contracts which were in force before sanctions were imposed, with the authority to apply for derogations having elapsed in 2022 for all applicable cases. The sanctions regime currently does not allow for exports of restricted industrial goods for new industrial projects in the Russian fertilizer sector.

**Trade policy decisions against the Russian fertilizer market**

**Revocation of the MFN for Russia and distorting duties on Russian fertilizers (UK, Canada, Australia)**

Certain countries have suspended the application of the most-favoured-nation treatment principle in international trade with Russia in response to its military actions in Ukraine. On March 11, the G7 leaders announced the planned revocation of the MFN status for Russia.

Currently, the MFN regime has been revoked by Canada, the UK, Australia and the United States, though the scope of goods targeted by revocation varies. Canada and Australia have imposed a flat additional 35% import duty on all Russian goods, including all types of fertilizers. The UK has implemented the revocation of MFN treatment for certain goods from Russia in the form of an additional 35% (The Customs (Additional Duty) (Russia and Belarus) Regulations 2022). The announced list of goods subject to additional tariffs includes phosphate, potash and compound fertilizers. However, nitrogen fertilizers are covered by tariffs.

The United States has adopted Law #117-110 – Suspending Normal Trade Relations with Russia and Belarus Act. The law suspends the “normal trade relations” status of Russia, denying the benefits of the MFN regime to Russian goods. The bill denies MFN tariff treatment and makes Russian goods subject to the Column 2 tariffs of the US Tariff Nomenclature. The President is granted the authority to increase tariffs on Russian goods above the rates set in Column 2, but only upon consultation with the Ways and Means Committee. This authority elapses in December 2024. Normal Trade Relations status can be reinstated if there is an acceptable ceasefire in Ukraine. Fertilizers are not currently subject to the suspension of MFN treatment.
Trade remedies against Russian phosphates (US) and nitrates (EU) and their distortive effect, including lack of third-party negative impact assessment

Russian fertilizers have historically been a target for trade remedies (antidumping and countervailing duties) by the EU and the U.S. Currently the U.S. maintains a countervailing duty on Russian phosphates ranging from 9.19% to 47.05% depending on the producer. The EU introduced an antidumping measure against imports of ammonium nitrate originating in Russia in 2020. This measure was revoked by the Court of Justice of the EU in July 2023.

Neither the EU nor the U.S. statutes governing trade remedy investigation requires the investigative authorities to carry out an assessment of the impact of such measures on general market conditions and third countries; likewise, the statutes do not provide for assessments of potential negative impacts on industries other than that directly subject to an investigation. The EU has a so-called “Community interest clause” which requires assessing if a proposed trade remedy measure has some other impacts on the entire EU, which should be considered notwithstanding other statutory factors. However, these considerations remain with the EU Commission as a closed-door policy tool and do not involve large negotiations with all potentially affected stakeholders, including from third countries.

Therefore, the process for imposition of trade remedies remains a potential tool for causing more global market distortions, especially in the fertilizer sector.

Frequently, these regulations are hastily crafted and inadequately coordinated, especially when they are implemented as urgent measures. Consequently, there is a lack of coherence within the system. While there are indeed exceptions in the fertilizer sector, they are often entangled with other restrictive measures that hinder their practical application.

Appendix 5.
Deep dives on key fertilizer exporters

The main suppliers of fertilizers to the global market, as noted above, are Russia, China, Saudi Arabia, the United States, Canada, the European Union, and Morocco, which is the largest producer in Africa. Below we have analyzed in detail the cases of how the balance of production and supply in each of these countries has changed.

Russia

100. Map of production capacities in Russia
Source: working group analysis

Annual production in 2022
- Urea >500 kt
- Nitrogen fertilizers >300 kt
- Ammonium
- Potash >500 kt
- Phosphates & NPK >300 kt

Madrid, 11th September 2023,

Lupicinio Rodríguez Jiménez
Managing Partner
101. Balance in the Russian fertilizer market, 2020–2022, physical mt

Export volumes from Russia sank by 4.1 mt in 2021–2022 due to lower sales of potash (-2.5 mt) and nitrogen (-2.4 mt) fertilizers; sales of phosphate fertilizers were not affected (+0.8 mt).

Source: Global Trade Tracker, working group analysis

102. Fertilizer exports from Russia, 2021–2022, physical mt

Source: Global Trade Tracker
Nitrogen fertilizers

About 39% of Russian exports of nitrogen fertilizers in 2020–2021 were shipped to Brazil and the United States, which in 2022 reduced the volume of fertilizer imports from the Russian Federation by 1.9 mt compared to 2021. Although other countries in America and Europe maintained the volume of imports of this type of fertilizer from Russia, and despite the fact that Russia provided significant discounts to foreign buyers, it failed to maintain its export volumes at the level of 2020–2021.

Phosphate fertilizers

Despite the global decline in exports, Russia increased supplies of phosphate fertilizers to the world market by 8% in 2022 compared to 2021 due to an increase in exports to India (+1.9 mt) and Brazil (+ 0.4 mt). As a result, exports to China, Thailand, Poland, and Mexico decreased by a total of 0.8 mt. Consumption in Poland decreased most significantly (-19%) due to its high dependence on Russian products, which accounted for up to half of the country’s imports. Poland tried to compensate for the missing volumes by imports from the Netherlands, but it was not possible to completely replace Russian phosphates.

Potash fertilizers

Difficulties with the sale of export volumes of potash fertilizers, associated with the loss of the markets of Europe and the United States and the blocking of Uralkali-owned terminals in the ports of Latvia, brought down the export volumes of potash by 17%, from 61.4 mt in 2021 to 52.4 mt in 2022. The decline in exports from the Russian Federation affected the provision of agricultural enterprises in Paraguay the most as consumption dropped by 72% (by 0.24 mt). Paraguay is 100% dependent on imports, and Russia’s share amounted to 54% in 2021.

Among the main types of fertilizers, domestic production of potash was the worst hit by the decline in exports: by the end of 2022 production decreased by 29% compared to the previous year, from 14.9 mt to 10.6 mt. This happened against the backdrop of problems with the export of products from the Russian Federation and Belarus due to the sanctions and because domestic demand was insufficient to cover the entire surplus of export volumes.

Morocco

Morocco is one of the few fertilizer-producing countries in Africa. It accounts for more than 80% of the total phosphate fertilizer production in the region and 70% of complex fertilizers (NPK). Several enterprises of OCP are located in the country, which is a monopoly producer of fertilizers in Morocco (100% of production capacity).
104. Map of production capacities in Morocco

Source: Global Trade Tracker, open sources, working group analysis

105. Dynamics of fertilizer production in Morocco, 2015–2022, physical mt

Source: working group analysis

Over the six years from 2015 to 2021, Morocco significantly increased its production capacity, while also increasing domestic fertilizer consumption. From 2015 to 2021, production growth averaged 24% per year, so the country managed to increase its annual fertilizer production from 4 mt to 11.8 mt. However, in 2020—2022, the production of phosphate fertilizers in Morocco fell due to the rising prices for gas that Morocco imports.

Most of the volumes produced in the country are exported and consumed outside of Africa (shipments mainly go to Brazil and India).

106. Balance in Morocco’s fertilizer market, 2020–2022, physical mt

Source: Global Trade Tracker, working group analysis

Figure 104. – Map of production capacities in Morocco

Figure 106. – Balance in the fertilizer market of Morocco in 2020-2022. physical mt
107. Fertilizer exports from Morocco, 2021–2022, physical mt

The volume of supplies of phosphate fertilizers decreased by 1.1 mt per year due to Brazil (-1.2 mt), the United States (-0.06 mt), and Côte d’Ivoire (-0.07 mt), yet India increased supplies by 0.8 mt. At the same time, Brazil was not able to fully compensate for the lost volumes of supplies from Morocco, which accounted for 18% of the country’s consumption. The overall decline in consumption was caused by a decrease in the availability of fertilizers due to the rising prices, as well as the complexity of supply chains.

Phosphate fertilizers

Almost the entire volume of fertilizers produced at Moroccan enterprises are phosphate fertilizers. In 2020, out of the 10.4 mt of exports, nitrogen and potash fertilizers accounted for as little as 12,000 tonnes.

The largest decrease in exports in 2022 was due to the volumes supplied to Brazil. In general, annual exports sank by 1.2 mt. The volume of supplies from Morocco was also negatively affected by the restrictions imposed by the United States. The U.S. International Trade Commission determined that the U.S. industry suffered material damages due to imports of Moroccan fertilizers, which are subsidized by the national government. As a result, imports from Morocco to the United States decreased by 0.06 mt.

108. Map of production capacities in Canada

Source: working group analysis
Canada is one of the world’s largest producers of potash fertilizers. In 2020, its share in the total volume of exports of this type of fertilizer to the global market was about 42%. By 2022, it increased to 46% following a reduction in the global market. At the same time, in 2021–2022 Canada’s total supplies to the global market decreased by 1.0 mt, down to 25.9 mt in 2022. Of the total volume of exports in 2022, potash fertilizers accounted for 24.0 mt, nitrogen fertilizers – 1.7 mt, phosphate fertilizers – 0.1 mt.

109. Fertilizer exports from Canada, 2021–2022, physical mt

Source: Global Trade Tracker

Potash fertilizers

The US accounts for half of all potash fertilizer exports. Moreover, Canada is the main supplier of these products to the US (its share in total supplies exceeds 80%, or 21 mt per year). This indicates the high dependence of the United States on fertilizer production capacity in Canada. Due to a decrease in exports of 0.6 mt in 2022, imports to the United States also fell, but even more drastically – by 1.5 mt.

110. Balance in Canada’s fertilizer market, 2020–2022, physical mt

Source: Global Trade Tracker, working group analysis
Phosphate and nitrogen fertilizers

Canada produces very little phosphate fertilizers, satisfying the need for this type of fertilizer through imports, mainly from the United States (the US accounted for more than 90% of consumption in 2020). In this connection, the reduction in US exports to Canada led to a 13% decrease in the consumption of phosphate fertilizers in 2022 compared to 2020, down to 2.2 mt.

The country also imports nitrogen fertilizers. In 2021, 1.3 mt were imported, in 2022 – 1.6 mt. In 2021, 19% of imports came from Russia; this share decreased to 2.4% following the introduction of sanctions restrictions at the end of 2022.

The United States

111. Map of production capacities in the USA

The United States is the third largest producer of nitrogen fertilizers (24.3 mt in 2022), the fourth largest producer of phosphate fertilizers (9.3 mt in 2022), and also produces small amounts of potash fertilizers. At the same time, the US is a major importer of fertilizers: in 2021, it was the world’s third largest importer of nitrogen and potash fertilizers, importing 8.5 and 12.0 mt, respectively.
The production of nitrogen fertilizers in the United States is on an upward trend, which is primarily due to the low gas prices in the country. From 2015 to 2022, nitrogen production increased from 18.1 to 24.3 mt.

Between 2020 and 2022, phosphate fertilizer production fell by 1.9 mt, to 9.3 mt, yet the United States remained the fourth largest producer in the world. Of these, 5.4 mt are exported. The US has extremely weak production of potash fertilizers (1.5 mt per year) due to the lack of potash reserves. Therefore, to meet the domestic demand, the United States imports potash fertilizers. In 2022, the volume of imports amounted to 11.2 mt (84% of the supplies came from Canada).

In 2022, fertilizer consumption fell by 8.4 mt vs. 2021, to 47 mt. It was caused by a significant drop in imports (-6.7 mt) and an increase in exports (+2.8 mt).

In 2021, the United States saw a sharp increase in imports of nitrogen fertilizers – from 8.8 to 10.9 mt, while exports decreased by 0.7 mt – to 1.9 mt. In 2022, the United States established LNG supplies to Europe, and also reduced fertilizer imports from Russia. As a result, the volume of imports returned to even lower values, amounting to 8.2 mt in 2022.
The volume of exports of nitrogen fertilizers from the United States amounted to 3.7 mt in 2022, which is more than twice the export of 2021 (1.7 mt). The US mainly exports nitrogen fertilizers to Canada (28%), Brazil (8%), and Mexico (8%). In 2022, the growth was mainly driven by an increase in supplies to the leading importers, but it is also worth noting an increase in supplies to Europe and Latin America, primarily due to a drop in exports of nitrogen fertilizers from Russia. For example, shipments to France increased from almost zero to 0.6 mt, to Belgium – from zero to 0.196 mt, and exports to Chile grew by 167%.

The volume of exports of phosphate fertilizers in 2022 rose by 13% (0.6 mt) to 5.4 mt. The reason is the same as with nitrogen fertilizers. The growth in demand for gas from Europe, which is one of the components of di- and mono-ammonium phosphates, has led to a redistribution of production capacity. The main importers, as with nitrogen fertilizers, are Canada (36%), Brazil (31%), Argentina (8%). All other countries have an extremely insignificant share (<5%), mainly Latin American countries.
Despite the large production volumes, for such a huge country as the United States, those volumes are not enough. The US imported 10.9 mt of nitrogen in 2021; in 2022 the volumes were down to 8.2 mt (imports from Canada decreased by 15%, from Qatar – by 7%). Imports of phosphates to the United States decreased from 3.8 to 2.2 mt by 2022; the volume of imported potash fertilizers decreased from 13.7 to 11.2 mt by 2022.

Canada is a key supplier of potash fertilizers to the United States due to convenient logistics routes compared to any other competitor. In 2020–2021, Russia accounted for some imports of potash to the United States (8-9%), but the sanctions and other restrictions led to a decrease in its share.

### China

#### 116. Map of production capacities in China

![Map of production capacities in China](source)

China is one of the largest exporters of phosphate and nitrogen fertilizers in the world. In addition, China is both the largest producer and largest consumer of ammonia in the world, with more than 30% of the global ammonia production capacity. Unlike with other global producers, the key raw material for ammonia production (84% of all volumes) is coal, not natural gas.

The production of nitrogen fertilizers in China in 2022 amounted to 48 mt, slightly decreasing vs. the 2020 levels. About a third of the produced volumes are exported (14.6 mt in 2022). Phosphate fertilizer production remains stable and the highest in the world at 88.1 mt in 2021 and 82.2 mt in 2022.

In 2021, China’s exports of nitrogen fertilizers increased to 15.1 mt, due to the disposal of supplies from other exporters.
In 2021–2022, restrictions were imposed on the export of phosphates to reduce prices in the domestic market, due to which the volume of exports fell from 13.7 mt in 2021 to 8.3 mt in 2022. Historically, China exported 13–15% of phosphate fertilizers produced, but in 2022 reduced the volume of supplies to 10%.

China is the third largest importer of potash fertilizers. Compared to its demand, China’s own production of potash fertilizers is low (12.2 mt in 2022) due to the low resource base, so the entire volume of consumption has to be sustained through imports. In 2022, the country imported 8.2 mt of potash fertilizers, increasing the volume by 0.3 mt vs. 2021.

As of 2022, the main importers of Chinese nitrogen fertilizers were Brazil (31%), India (12%), Vietnam (8%), Turkey (6%), Malaysia (5%), and Indonesia (4%). The largest increase in imports in 2022 occurred in Brazil as it increased supplies by 55% (1.6 mt), primarily due to a reduction in exports.
from Russia. China is the largest player in the Asian market and accounts for 27% of all exports to that region, and in 2021 the share was even higher at 35%. China’s import of nitrogen fertilizers is practically non-existent as the country is fully self-sufficient in this respect.

The main importers of Chinese phosphate fertilizers in 2022 were India (18%), Brazil (17%), Australia (9%), Vietnam (9%), and Japan (6%). The structure of exports in 2022 also changed on the back of the restrictions: deliveries to Brazil decreased by 57%, to Thailand – by 51%, to Argentina – by 61%, and supplies to Pakistan decreased by a factor of 22, from 1.051 mt to 0.048 mt.

Saudi Arabia

120. Map of production capacities in Saudi Arabia

Saudi Arabia is a major producer and net exporter of phosphate and nitrogen fertilizers as its own level of consumption is extremely low: Saudi Arabia exports most of the fertilizers produced, as there is very little arable land in the country. The production of potash fertilizers is at an extremely low level. In 2022, Saudi Arabia ranked 12th in the world among the producers of nitrogen fertilizers with a volume of 4.3 mt, and 6th among the producers of phosphate fertilizers with 5.6 mt.

In 2022, the production of nitrogen fertilizers increased by 2%, while the production of phosphate fertilizers decreased by 3%.
122. Balance in the Saudi Arabian fertilizer market, 2020–2022, physical mt

From 2020 to 2022, exports of fertilizers decreased only by 0.1 mt. In 2021, export declined by 0.5 mt, but then bounced back almost to the 2020 volumes.

The largest decrease in exports of nitrogen fertilizers from Saudi Arabia occurred in 2021 (-0.9 mt). However, in 2022, exports regained 0.6 mt, mostly through increased supply to India (+0.5 mt).

123. Fertilizer exports from Saudi Arabia, 2021–2022, physical mt

Saudi Arabia exports nitrogen fertilizers to Asia and Oceania, specifically to Thailand, Australia, India, as well as the United States. In 2022, exports to India accounted for 20% of Saudi Arabia’s total shipments, while Australia, Thailand, and the United States each imported 18%. At the same time, the volume of exports to Thailand from 2021 to 2022 decreased by 16% (0.13 mt), to the United States decreased by 6% (0.05 mt), and to Australia increased by 24% (0.14 mt). The main growth...
for the period of 2022 came from India, which increased the supply of nitrogen fertilizers from Saudi Arabia by 3.5 times to 0.78 mt. In 2022, Saudi Arabia reduced its supplies to South Africa by 6% (0.02 mt), down to 0.25 mt.

As in the case of nitrogen fertilizers, India is the main consumer of Saudi Arabia’s phosphate fertilizers: about 50% of phosphate exports go to India. An important export destination for Saudi Arabia is Brazil, which accounted for 18% of the exports in 2022. For Brazil, attracting supplies from Saudi Arabia was a critical issue, since the country needed to compensate for the loss of imports from Russia.

The European Union

124. Map of production capacities in the European Union

European countries are major players in the fertilizer market in terms of total imports, which account for 23% (49.1 mt) of global foreign trade. Trade within European countries accounts for 58% of imports to European countries, but in 2021 the role of external countries was no less significant.

Russian and Belarusian volumes played a significant role in the consumption structure of European countries, accounting for 14.8% (7.4 mt) in 2021. The imposition of sanctions restricting imports of fertilizers from Russia and Belarus led to the loss of 30% of the volumes from these countries. The overall reduction in imports amounted to 2%: in addition to the missing volumes from the CIS countries, imports from Morocco were also limited following the allegations of non-market pricing.
126. Fertilizer imports to Europe, 2021–2022, physical mt

Source: Global Trade Tracker

Europe was able to partially compensate for the retired volumes using other suppliers. China increased its supplies to Europe by 8 times (0.5 mt), Canada by 25% (0.3 mt), and imports from the United States increased many times over (by 1.0 mt).

Changes in imports primarily affected the European countries that are net importers of fertilizers. Imports into France, which imports 100% of consumed nitrogen fertilizers, decreased by 0.5 mt due to lower exports from Spain, Belgium, and Morocco. Imports of potash fertilizers to Belgium fell by 13% (0.2 mt) due to the loss of 0.3 mt of Belarusian and 0.06 mt of Russian fertilizers. Countries importing large volumes of fertilizers from Russia and Belarus were hit particularly hard. Poland had to reduce fertilizer consumption by 0.8 mt, Bulgaria by 0.1 mt, and Estonia by 0.2 mt.

127. Fertilizer exports from Europe, 2021–2022, physical mt

However, the EU’s attempts to keep consumption unchanged had a negative impact on other countries as export volumes were reduced by 11%. The main reduction was due to a drop in the volumes supplied to China (-44%, or 0.4 mt), the USA (-16%, or 0.3 mt), and Thailand (-29%, or 0.2 mt).

Despite the significant reductions in exports to developed countries, the most vulnerable countries with low availability of fertilizers were the first to suffer. SSA’s net imports from Europe decreased by 0.5 mt (0.3 mln of nitrogen and 0.2 mt of phosphate fertilizers). Supplies from Europe significantly decreased for South Africa (0.2 mt), Kenya (0.12 mt), Côte d’Ivoire (0.15 mt); exports to Nigeria were reduced by 3 times.
and supplies to Zambia, Zimbabwe, Uganda, and Madagascar were completely stopped. Given the already limited availability of fertilizers, that negatively affected the provision of fertilizers to the agro-industrial complex of Sub-Saharan Africa.

Moreover, despite the actions taken on the global market, the total consumption of fertilizers by European countries fell by 11%, as in addition to the retirement of export volumes, there was a significant drop in local production of nitrogen fertilizers due to the rising gas prices (18%) and declining business margins. At the moment, more than half of the nitrogen fertilizer production capacity is shut down due to high gas prices, which creates the potential for further reduction of production capacity and prioritization of imports. That will “pull” more of the already scarce volumes from the global market.

### Appendix 6.

**Methodology**

**Approach to data on fertilizers**

In this report all the fertilizer market indicators, such as trade, production, consumption, etc., are analyzed in terms of physical weight, because this report involves the assessment of changes in fertilizer trade, where most of actual cross-border data comes only in terms of physical weight. This is the case for GTT (Global Trade Tracker), which serves as a primary source of fertilizer trade data for the report. Other sources used in assessment of production, consumption, prices dynamics, fertilizer cost curves data and all other indicators include data sets and reports of different agencies (such as Argus, AfricaFertilizer, AFRIQOM, etc.).

However, when analyzing the accumulated loss of global fertilizer and ammonia supply in Chapter 2, different data sources were used to assess each of the effects. For instance, the analysis of Russian fertilizer and ammonia export reduction was based not only on GTT data, but also on some other sources for the following reasons:

a. In February 2022 Russia and Belarus, two large exporters of fertilizers, stopped publishing data on their exports, which means that now the analysis of export volumes in GTT can be done only through the thorough analysis of imports by country and the sources of trade flows (the so-called “mirror” data on export).

b. The GTT covers only a limited list of countries, and for some countries data appears with delays.

c. For Russia, data sources with more detailed and accurate export statistics are available. Therefore, in Chapter 2 we base our estimates for Russian fertilizer export volumes on these sources instead of GTT, which is used in all other cases as a source of trade data. For Belarus and other countries, GTT data is used.

We should also note that the statistics regarding fertilizers in Africa (including data for stocks, application rates, etc.) is very limited, which explains the extensive usage of modelling and approximations in our work.
Approach to data on hunger

To start with, the terminology of food security and food insecurity must be explained. Food security exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food, which meets their dietary needs and food preferences for an active and healthy life. Household food security is the application of this concept to the family level, with individuals within households as the focus of concern. Respectively, food insecurity exists when people do not have adequate physical, social, or economic access to food as defined above.

Clearly, food security is a multi-dimensional observed phenomenon. Four main dimensions of this phenomenon may be distinguished, and for the achievement of food security all four of them must be fulfilled at the same time:

- physical availability of food;
- economic and physical access to food;
- food utilization; and
- stability of the three above-mentioned dimensions over time.

There are different ways to measure the state of food security. Often, these approached include the measurement of Sub-nutrition (hunger), which is typically indirect and based on the food balance sheets and national income distribution and consumer spending data. The following indicators are commonly referred to when analyzing the state of food security:

- prevalence of undernourishment (%), and the corresponding number of undernourished people;
- Integrated Food Security Phase Classification [IPC] / Cadre Harmonisé [CH] Classifications of food insecurities;
- number of hunger hotspots;
- the FAO Food Price Index (FFPI); and
- domestic food price inflation.

Out of the variety of available indicators that reflect the state of food security in the countries, in this work we primarily refer to the indicator of the number of undernourished people, published by the FAO. This indicator shows the estimated number of people at risk of undernourishment. As mentioned on the FAOSTAT website, it is calculated by applying the estimated prevalence of undernourishment to population in each period.

There are several reasons why we opted to rely on it:

a. It is one of the most comprehensive and widely-used indicators regarding hunger. E.g. this indicator (only in relative terms – Prevalence of Undernourishment, %) is used to assess the progress in achievement of the UN sustainable development goal (”Zero Hunger” (SDG 2)).

b. It is available both for the world as a whole and for individual countries.

c. It is updated annually and is already available for the year 2022.

d. The methodology behind this indicator is consistent in time (as the scope of countries and approach to calculation do not change), which allows to compare indicator’s values both in terms of different geographies and different time periods.

Approach to estimating the impact of the fertilizer industry on the efficiency of world agriculture and global food security

The growth of the global food demand is driven by the population growth and dietary changes. Currently, the world’s population is growing by more than 200,000 people every day and is expected to reach 8.6 bn by 2030, 9.7 bn by 2050, and 10.4 bn by 2100 (up from 8 bn today). Moreover, rising incomes in newly emerging economies cause dietary changes, which translates into the increased level of food consumption per capita. The most basic measure of food supply and security is the daily calorie intake. According to Harvard University World Energy Database, between 1960 and 2020 the global average increased by ~25% (450 kcal/person/day) and now consists of ~3,000 kcal/person/day, which means that ~8,500 tonne kcal are consumed annually by the global population. Overall, the population growth along with dietary changes cause an increase in global food demand.
The average daily diet, however, varies greatly between regions and is highly dependent on the level of income. In particular, according to the United Nations Food and Agriculture Organization (UN FAO), people in the least developed, low-income countries consume on average 2,200 – 2,500 kcal per capita daily, while in the wealthiest countries like the United States and the European Union this indicator reaches 3,500–3,900 kcal. This perfectly illustrates the fact that food insecurity is the problem of the less developed, low-income economies, and it exists around the globe mainly because of poverty and thus insufficient funds to afford food.

The development of nitrogen fertilizers significantly supported global population growth. Scientific studies, such as Stewart et al. (2005), indicate that fertilizers contributed to 40% of global food production in 2,000, while later studies by Erisman et al. (2008) and Smil (2011) put the figure of fertilizer contribution to global food supplies at ~50%. The results of these studies have been widely accepted and were cited by the United Nations and International Fertilizers Association, with the consensus being that ~50% of the people on the planet are currently kept fed as a result of mineral fertilizer use, as ~50% of the world’s food production relies on fertilizers. Thus, half of the world’s population currently depends on fertilizer use in agriculture for its daily rationing.

The agriculture yields are set by the efficiency of absorption (capture) of light energy and the efficiency of its transduction into biomass. Photosynthesis uses light energy to convert carbon dioxide and water into carbohydrates for plant growth and development. At the time of plant growth, essential nutrients (such as nitrogen, phosphorous, and potassium) are required by the plant for its unimpeded growth. In order to satisfy the constantly growing demand for plant-based products, agriculture must ensure that plants get proper nutrition during their development. This is achieved by incorporating mineral fertilizers that contain the necessary nutrients into the soil.

In order to measure the efficiency of applying fertilizers to the soil and compare different fertilizers with each other, such a universal indicator as the share of nutrient content per physical unit of fertilizers is used. Taking into account the actual content of the nutrients in the fertilizers applied to the soil, ~188.5 mln nutrient tonnes of mineral fertilizers should be annually used by global agriculture.

According to the abovementioned estimates, these 188.5 mln nutrient tonnes of fertilizers are required for the production of plant-based products which constitute 50% of the food consumed by the global population annually. It means that each 1 tonne of fertilizers (in nutrient terms) corresponds to the production of food with energy value of ~22 mln kcal.

The calorie intake is very different in developed countries and newly emerging economies, and according to the FAO, the calorie intake per person per day in the low-income countries is equal to ~2,200 kcal. Thus, the application of 1 tonne of fertilizers is sufficient to produce enough food to feed ~27 people from the most vulnerable regions during the year.

Moreover, the energy value of 1 tonne of fertilizers is equivalent to the energy value of ~6.4 tonnes of wheat (according to the EU Commission, whole grain wheat has the energy value of 3,400 kcal/kg).

The abovementioned methodology was reviewed and approved by an independent expert, and basically uses the same methodology as the calculations by the independent agency Gro Intelligence, which is funded by the Bill and Melinda Gates foundation and whose results have been cited by the WFP.

Appendix 7. List of abbreviations

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<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAAP</td>
<td>Africa Adaptation Acceleration Program</td>
</tr>
<tr>
<td>AIP</td>
<td>Affordable Input Programme (of Malawi)</td>
</tr>
<tr>
<td>AMIS</td>
<td>Agricultural Market Information System</td>
</tr>
<tr>
<td>AN</td>
<td>Ammonium Nitrate</td>
</tr>
<tr>
<td>ASO</td>
<td>Australian Sanctions Office</td>
</tr>
<tr>
<td>AU</td>
<td>African Union</td>
</tr>
<tr>
<td>BIS</td>
<td>US Bureau of Industry and Security</td>
</tr>
<tr>
<td>BRICS</td>
<td>Grouping of Brazil, Russia, India, China, and South Africa</td>
</tr>
<tr>
<td>CAATSA</td>
<td>Countering America’s Adversaries Through Sanctions Act</td>
</tr>
<tr>
<td>CAN</td>
<td>Calcium Ammonium Nitrate</td>
</tr>
<tr>
<td>CAR</td>
<td>Central African Republic</td>
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</tbody>
</table>

The calorie intake is very different in developed countries and newly emerging economies, and according to the FAO, the calorie intake per person per day in the low-income countries is equal to ~2,200 kcal. Thus, the application of 1 tonne of fertilizers is sufficient to produce enough food to feed ~27 people from the most vulnerable regions during the year.

Moreover, the energy value of 1 tonne of fertilizers is equivalent to the energy value of ~6.4 tonnes of wheat (according to the EU Commission, whole grain wheat has the energy value of 3,400 kcal/kg).

The abovementioned methodology was reviewed and approved by an independent expert, and basically uses the same methodology as the calculations by the independent agency Gro Intelligence, which is funded by the Bill and Melinda Gates foundation and whose results have been cited by the WFP.

Appendix 7. List of abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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</thead>
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<tr>
<td>AAAP</td>
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<td>Affordable Input Programme (of Malawi)</td>
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<td>BRICS</td>
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<td>CAN</td>
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</tr>
<tr>
<td>CAR</td>
<td>Central African Republic</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Definition</td>
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</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>CFR</td>
<td>Cost and Freight</td>
</tr>
<tr>
<td>CFSP</td>
<td>Common Foreign and Security Policy framework</td>
</tr>
<tr>
<td>CIRAD</td>
<td>The French Agricultural Research Centre for International Development</td>
</tr>
<tr>
<td>CIS</td>
<td>Commonwealth of Independent States</td>
</tr>
<tr>
<td>CPI</td>
<td>Consumer Price Index</td>
</tr>
<tr>
<td>DAP</td>
<td>Diammonium Phosphate</td>
</tr>
<tr>
<td>DM</td>
<td>Developed Markets</td>
</tr>
<tr>
<td>DRC</td>
<td>The Democratic Republic of the Congo</td>
</tr>
<tr>
<td>ECCN</td>
<td>Export Control Classification Number</td>
</tr>
<tr>
<td>EEAS</td>
<td>European External Action Service</td>
</tr>
<tr>
<td>EPC</td>
<td>Engineering, Procurement and Construction</td>
</tr>
<tr>
<td>ETB</td>
<td>Ethiopian Birr (currency)</td>
</tr>
<tr>
<td>EXW</td>
<td>Ex Works (Incoterms basis of delivery)</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
</tr>
<tr>
<td>FAQ</td>
<td>Frequently Asked Questions</td>
</tr>
<tr>
<td>FFPI</td>
<td>FAO Food Price Index</td>
</tr>
<tr>
<td>FNTT</td>
<td>Lithuanian Financial Crime Investigation Service (Lithuanian: Finansinių nusikaltimų tyrimo tarnyba)</td>
</tr>
<tr>
<td>GIEWS</td>
<td>Global Information and Early Warning System on Food and Agriculture</td>
</tr>
<tr>
<td>GNI</td>
<td>Gross National Income</td>
</tr>
<tr>
<td>GTT</td>
<td>Global Trade Tracker</td>
</tr>
<tr>
<td>HEA</td>
<td>Households Economic Analysis</td>
</tr>
<tr>
<td>HLPF</td>
<td>UN High-Level Political Forum (on sustainable development)</td>
</tr>
<tr>
<td>IEEPA</td>
<td>International Emergency Economic Powers Act (a US federal law)</td>
</tr>
<tr>
<td>IFA</td>
<td>International Fertilizer Association</td>
</tr>
<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
</tr>
<tr>
<td>INR</td>
<td>Indian Rupee (currency)</td>
</tr>
<tr>
<td>IPC/CH</td>
<td>Integrated Food Security Phase Classification (IPC) and the Cadre Harmonisé (CH)</td>
</tr>
<tr>
<td>JCC</td>
<td>Joint Coordination Centre (for the Black Sea Grain Initiative)</td>
</tr>
<tr>
<td>KCL</td>
<td>Potassium Chloride</td>
</tr>
<tr>
<td>KES</td>
<td>Kenyan Shilling (currency)</td>
</tr>
<tr>
<td>LCU</td>
<td>Local Currency Unit</td>
</tr>
<tr>
<td>LDZ</td>
<td>JSC Latvian Railway (Latvian: Latvijas dzelzceļš or LDz)</td>
</tr>
<tr>
<td>LNG</td>
<td>Liquefied Natural Gas</td>
</tr>
<tr>
<td>MAP</td>
<td>Monoammonium Phosphate</td>
</tr>
<tr>
<td>MFN</td>
<td>Most Favoured Nation</td>
</tr>
<tr>
<td>MOP</td>
<td>Muriate of Potash</td>
</tr>
<tr>
<td>MoU</td>
<td>Memorandum of Understanding</td>
</tr>
<tr>
<td>NAAIAP</td>
<td>National Accelerated Agricultural Inputs Access Programme</td>
</tr>
<tr>
<td>NAV</td>
<td>Hungarian National Tax Authority (Hungarian: Nemzeti Adó- és Vámhivatal)</td>
</tr>
<tr>
<td>NCPB</td>
<td>National Cereals and Produce Board</td>
</tr>
<tr>
<td>NGN</td>
<td>Nigerian Naira (currency)</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Definition</td>
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</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organization</td>
</tr>
<tr>
<td>NPK</td>
<td>Complex fertilizers containing both three main nutrients – Nitrogen, Phosphorus, and Potassium</td>
</tr>
<tr>
<td>NW EU</td>
<td>Northwestern Europe</td>
</tr>
<tr>
<td>NWF</td>
<td>National Welfare Fund (Russian)</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Cooperation and Development</td>
</tr>
<tr>
<td>OFAC</td>
<td>Office of Foreign Assets Control (of the US Department of the Treasury)</td>
</tr>
<tr>
<td>OFSI</td>
<td>UK Treasury’s Office of Financial Sanctions Implementation</td>
</tr>
<tr>
<td>PDARR</td>
<td>Project for Development of Agriculture and Rehabilitation of Rural Roads</td>
</tr>
<tr>
<td>PFJ</td>
<td>Planting for Food and Jobs (inputs subsidy programme of Ghana)</td>
</tr>
<tr>
<td>PJSC</td>
<td>Public Joint Stock Company</td>
</tr>
<tr>
<td>PKR</td>
<td>Pakistani Rupee (currency)</td>
</tr>
<tr>
<td>QMV</td>
<td>Qualified Majority Voting</td>
</tr>
<tr>
<td>REPO</td>
<td>G7 «Russian Elites, Proxies, and Oligarchs» Task Force</td>
</tr>
<tr>
<td>SAMLA</td>
<td>Sanctions and Anti-Money Laundering Act (UK)</td>
</tr>
<tr>
<td>SDN</td>
<td>Specially Designated Persons</td>
</tr>
<tr>
<td>SEA</td>
<td>South East Asia</td>
</tr>
<tr>
<td>SECO</td>
<td>Swiss State Secretariat for Economic Affairs</td>
</tr>
<tr>
<td>SGD</td>
<td>Sustainable Development Goals</td>
</tr>
<tr>
<td>SOFI</td>
<td>State of Food Insecurity report (by WFP)</td>
</tr>
<tr>
<td>SOP</td>
<td>Sulphate of Potash</td>
</tr>
<tr>
<td>SSA</td>
<td>Sub-Saharan Africa</td>
</tr>
<tr>
<td>SWIFT</td>
<td>Society for Worldwide Interbank Financial Telecommunications</td>
</tr>
<tr>
<td>TEU</td>
<td>Treaty on the European Union</td>
</tr>
<tr>
<td>TFEU</td>
<td>Treaty on the Functioning of the European Union</td>
</tr>
<tr>
<td>TSP</td>
<td>Triple Super Phosphate</td>
</tr>
</tbody>
</table>

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<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>TTF</td>
<td>Title Transfer Facility</td>
</tr>
<tr>
<td>UAN</td>
<td>Urea Ammonium Nitrate</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UNCTAD</td>
<td>United Nations Conference on Trade and Development</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UNSC</td>
<td>United Nations Security Council</td>
</tr>
<tr>
<td>USDA</td>
<td>United States Department of Agriculture</td>
</tr>
<tr>
<td>USDA FAS</td>
<td>United States Department of Agriculture Foreign Agricultural Service</td>
</tr>
<tr>
<td>WFP</td>
<td>World Food Programme</td>
</tr>
<tr>
<td>WTO</td>
<td>World Trade Organization</td>
</tr>
<tr>
<td>YoY</td>
<td>Year-over-Year (analysis)</td>
</tr>
<tr>
<td>ZAR</td>
<td>South African Rand (currency)</td>
</tr>
</tbody>
</table>
Footnotes

1 Million.

2 Million tonnes. As explained in more detail in the Methodology section, for the purposes of this report, the term “tonne” stands for a metric tonne in terms of physical weight.

3 According to the FAO classification, IPC/CH Phase 3 is characterized by the inability to provide a minimum level of nutrition without depleting essential livelihood assets; Phases 4 and 5 are characterized by severe food shortages and the inability to compensate for nutritional deficiencies.

4 Inflation for 2020–2021 and 2021–2022 is 9% and 11%, respectively.

5 GNI in current USD grew by 6–7%, while population grew by 2–3%.


7 WFP

8 According to the Global Trade Tracker.

9 Global Fertilizer Shortage – Bloomberg

10 Estimates are made for the period until April 2023 due to data availability issues.

11 0,8 mt from Latin America, 0,4 mt from the Middle East, and 0,6 mt from Europe and North America.

12 Year-on-year growth of costs: 2020–2021: 12%, 2021–2022: 10% (growth in USD terms, i.e. including the factor of domestic currencies depreciation against the USD).

13 With crop area remaining unchanged at the 2022 level.

14 Estimates are made for the period since the inception of the factors until their termination or, if they still persist, until April 2023 (due to data availability issues).


18 Global fertilizer market remains unstable. https://www.world-grain.com/articles/18653-global-fertilizer-market-remains-unstable

19 Dutch govt to allow shipment of 20,000 tons of Russian fertilizer to Malawi. https://www.reuters.com/article/ukraine-crisis-netherlands-fertilizers-idINL1N3271TN


23 Exodus from the Baltics: redirection of Russian cargo from the neighboring Baltic ports. https://en.portnews.ru/comments/3222/


26 Global fertilizer market remains unstable. https://www.world-grain.com/articles/18653-global-fertilizer-market-remains-unstable


Major Changes in the Fertilizers Market in 2022–2023 and Their Impact on Global Food Security

Russia supply shock forces rethink for chemicals and fertilizer groups. https://www.ft.com/content/d23f4a3e-e7a4-487c-b27a-a4fa402fbd6b


0.8 mt from Latin America, 0.4 mt from the Middle East, and 0.6 mt from Europe and North America.

Please see Appendix 6 for more information about the calculation methodology.

The gap is calculated based on production volumes, as it is through domestic production that sufficient consumption should be ensured (Figure 26).


Global Crisis Response Group, Brief No. 2

Estimates are made for the period since the inception of the factors until their termination or, if they still persist, until April 2023 (due to data availability issues).

The World Fertilizer Availability Index is the ratio of the food price index to the fertilizer price index for end users.


Calculating soil nutrient balances in Africa at different scales: II. District scale.” Fertilizer research 35.

Bationo, A., Hartemink, A., Lungu, O., Naimi, M., Okoth, P., Smaling, E., & Waswa, B. Knowing the African soils to improve fertilizer recommendations. Improving soil fertility recommendations in Africa using the decision support system for agrotechnology transfer (DSSAT), 19–42.

Hasanuzzaman, Mirza, Marcelo Carvalho Minho Teixeira Filho, Masayuki Fujita, and Thiago Assis Rodrigues Nogueira, eds. 2020. Sustainable Crop Production.


The production forecast calculations assume the same harvesting area.

NGN by 4%, ETB by 20%, KES by 4%.

FAOSTAT

IPC

Frequently asked questions concerning sanctions adopted following Russia’s military aggression against Ukraine and Belarus’ involvement in it. (europa.eu)


Global Report on Food Crises 2023 by Global Network Against Food Crises.


The Observatory of Economic Complexity.

USDA FAS

USDA FAS (United States Department of Agriculture Foreign Agricultural Service).

Poverty & Equity Brief, the Democratic Republic of the Congo, April 2021.


Global Report on Food Crises 2023 by Global Network Against Food Crises.

USDA FAS (United States Department of Agriculture Foreign Agricultural Service).

BRICS is a grouping of the world economies of Brazil, Russia, India, China, and South Africa formed by the 2010 addition of South Africa to the predecessor BRIC.

Please see Appendix 6 for more information about the calculation methodology.

The gap is calculated based on production volumes, as it is through domestic production that sufficient consumption should be ensured.

Please see Appendix 6 for more information about the calculation methodology.

The gap is calculated based on production volumes, as it is through domestic production that sufficient consumption should be ensured.


Unanimity is required for key areas like treaty changes, taxation, foreign policy, and EU enlargement, where every member must agree. The European Union uses qualified majority voting (QMV) for most decisions, excluding those mentioned above. In these cases, approval is based on a majority of member states and population.

It is important to note that when it comes to international sanctions, Member States of the European Union possess the authority to impose sanctions independently, provided that they do not undermine the EU's collective sanctions regime. In essence, they have the flexibility to enact sanctions that are more stringent or specific to their national interests, but they cannot enact sanctions that are less severe or contradictory to the EU's established sanctions framework. This means that while Member States maintain the ability to exercise sanctions beyond the EU's actions, they are bound by the overarching EU sanctions policy, which sets a baseline for common action in pursuit of shared foreign policy goals. Under specific circumstances, Member States may grant authorization for particular actions. However, it is crucial to emphasize that such authorizations must consistently align with the provisions outlined in the regulation.


An illustrative case highlighting the absence of harmonization and the Commission's tardiness in implementing measures for the uniform enforcement of sanctions can be observed in the recent proposal regarding penalties for violations of international sanctions. In December 2022, the Commission drafted the Proposal for a Directive of the European Parliament and of the Council on the definition of criminal offences and penalties for the violation of Union restrictive measures which aims to establish minimum rules concerning the definition of criminal offences and penalties in the event of violation of EU sanctions. Currently, Member States have different definitions of what constitutes a violation of EU restrictive measures and the penalties to be applied, which leads to divergent levels of enforcement of EU sanctions in Member States. One of the key explanations for the absence of harmonization in this context is the European Union's limited jurisdiction in criminal matters, which prevents it from pursuing cases of non-compliance with sanctions through court and criminal proceedings. By criminalizing violations of EU sanctions at EU level, the EU aims to ensure a similar level of enforcement across the EU. Violations of restrictive measures covered by this Directive include making funds or economic resources available to or for the benefit of a sanctioned person, entity or body, engaging in transactions that are prohibited or restricted by Union restrictive measures, trading in goods or services whose import, export, sale, purchase, transfer, transit or transport is prohibited or restricted by Union restrictive measures, as well as the provision of brokering or other services related to such goods and services. However, this proposal is not in force and is still pending discussion in the European Parliament and the Council. Both institutions will have the opportunity to propose amendments, and both will have to approve the proposed Directive before it enters into force.

Another illustrative case that underscores the absence of harmonization in sanctions policies revolves around the concept of trusts. The Council of the European Union has consistently taken a skeptical, distrustful, and cautious stance on trusts in various international legal proceedings. However, it is noteworthy that on July 1, 1985, the Hague Convention on the Law Applicable to Trusts and on their Recognition was signed, to which several member states, such as Cyprus and Italy, have adhered. This situation introduces a notable paradox. While some countries readily accept trusts as legitimate legal instruments, others view them as potential means to circumvent sanctions. Consequently, this issue engenders significant contradictions in the policies adopted by individual Member States.

https://fntt.lt/en/international-financial-sanctions/4254


Regarding the legal significance of this document issued by the Commission, it is essential to understand that it serves as an indication rather than a binding obligation. This means that while the document provides valuable guidance and insight, it does not carry the force of law and does not impose legally binding requirements. Instead, it offers...
recommendations or suggestions that can inform decision-making and actions but allows flexibility for interpretation and implementation by relevant parties.


129 Judgment of the General Court of 21 March 2012, Fulmen and F. Mahmoudian v Council, Joined Cases T-439/10 and T-440/10, ECLI:EU:T:2012:142, paragraphs 96, 97 and 98: "Thus ... the review of legality which it [the Council] must carry out ... is not confined to ascertaining the abstract <<similarity>> of the grounds relied on, but must include the question whether those grounds are sufficiently supported in law by specific evidence and information. Nor can the Council maintain that it is not required to adduce such evidence".

130 https://ofac.treasury.gov/frequently-asked-questions/note-on-frequently-asked-questions

131 https://www.whitehouse.gov/briefing-room/statements-releases/2023/05/19/g7-leaders-statement-on-ukraine/


133 https://www.state.gov/inaugural-u-s-uk-strategic-sanctions-dialogue/


139 https://www.lmalloyds.com/lma/jointwar


141 The graph shows a non-exhaustive list of companies and their assets

142 Detailed in 2.2.
Major Changes in the Fertilizers Market in 2022–2023 and Their Impact on Global Food Security

2023