The EU's phosphate conundrum

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In recent years, the fertilizer industry has been subject to a relatively high number of articles and analysis in mass media, given the significance of countries such as Russia and Belarus in global markets.

Much of the focus has been given to nitrogen (N, part of the broader hydrocarbon value-chain, and therefore closely tied to developments in natural gas) and potash (K, a particularly concentrated market in which both Russia and Belarus are significant exporters).

We think it's fair to state that phosphates (P) have received possibly less attention – and we hope to contribute with this short analysis to the sum of knowledge in the market and beyond.

A complex value chain

Perhaps more so than N and K, the world of P is exposed to different value chains, sometimes overlapping, and to different end-uses. Beyond agricultural destinations (fertilisers, animal feeds, see below), phosphoric acid is used in many sectors including in the production of industrial detergents, in metal bright-dipping, or – gaining more traction in recent years – in the production of lithium-iron-phosphate (LFP) as a cathode material for electric vehicles.

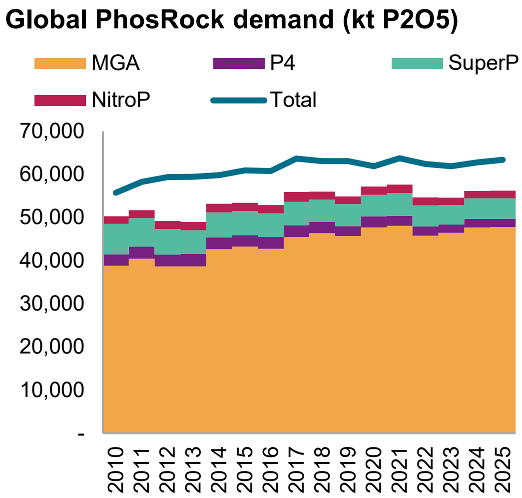
Elemental phosphorus (P_4 - white phosphorus) is used in the production of crop protection chemicals such as organophosphates (notably glyphosate), flame retardants, and is also used in smaller volumes to support strategic industries such as aerospace, solar panels, battery electrolytes ($LiPF_6$), semiconductors.

Inorganic phosphates are all around us on supermarket shelves, from toothpaste to food preservatives and leavening agents, as well as some well-known carbonated drinks.

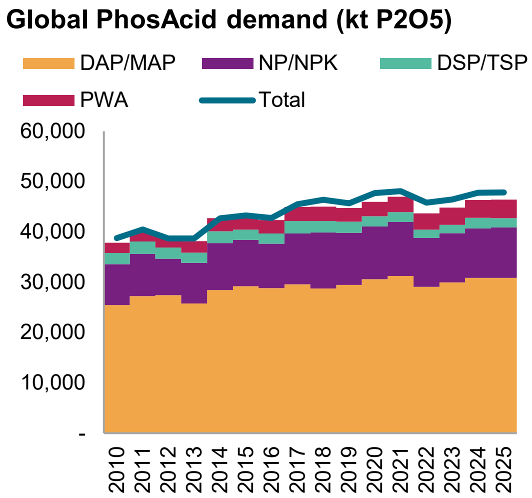
The chemical processes adopted in the industry are many and varied – yet they can summarized as follows:

- Reaction of a mineral source of phosphate (mostly phosphate rock) with an industrial acid (usually sulphuric), resulting in the production of "wet-process" phosphoric acid;
- Where necessary, concentration and/or purification of phosphoric acid in order to meet the requirements of specific end-use industries;
- Reaction of phosphoric acid with another chemical (mostly ammonia, calcium, sodium, potassium, lithium ...) in order to produce a phosphate salt or compound;
- If phosphoric acid is not isolated in the initial acidulation process, this can produce a superphosphate or a nitrophosphate product;
- Alternatively, the source of phosphate can be injected in an electric arc furnace to produce pure elemental phosphorus – which can then be used in anhydrous uses, to produce many different organophosphorus chemicals, or reacted with water to generate very high purity phosphoric acid.

As the charts below show, the production of wet-process phosphoric acid (MGA in the chart) represents the majority of demand for phosphate rock, and the fertilizer industry overall represents the largest share of phosphoric acid demand – with a growing contribution of non-fertilizer uses. Around 85% of mined phosphorus (from phosphate rock) is used in fertilisers, around 10% in animal feed additives, and the remainder in the many different industry and human food additive uses indicated above.



Source: S&P Global Commodity Insights.



Source: S&P Global Commodity Insights.

(MGA: Merchant-Grade Phosphoric Acid; MAP: monoammonium phosphate; DAP: diammonium phosphate; NP/NPK: other complex fertilizers with or without potash; SuperP: superphosphates; PWA: purified wet-process phosphoric acid; DSP/TSP: double/triple superphosphate; NitroP: nitrophosphates; P4: white phosphorus).

Europe has a long tradition of phosphate chemistry, and still significant capacity when it comes to products such as purified phosphoric acid and its derivatives, feed-grade calcium phosphates, or fertilizer-grade N-P-K complexes. However, it should be noted that with the exception of Finland there is currently no active phosphate rock mine in Europe, and efforts to use larger quantities of recovered phosphates still represent a very small part of the overall input into chemical plants.

This picture does not take into account the significant quantities of phosphorus imported into Europe in products further downstream, such as animal feeds and food products, nor the significant quantities of phosphorus recycling in Europe as organic materials.

To give an idea of this context, nearly 800 ktP/y are imported in animal feeds and food products, compared to 1,400 ktP/y imported as phosphate rock / phosphoric acid / fertilisers (Van Dijk et al. 2016 https://doi.org/10.1016/j.scitotenv.2015.08.048). Also, around 1,800 ktP/y are present in manure from livestock in the EU, much of which is returned to fields (recycling some of the phosphorus, depending on timing and method of application); in addition, around half of the phosphorus in sewage sludges (c. 150 ktP/y) and some phosphorus in food wastes and food industry by-products are also returned to fields (numbers based again on Van Dijk 2016).

Assessing the true phosphate balance for Europe is therefore immediately complex, as one needs to account for imports in the form of various downstream products, as well as upstream or mid-stream inputs such as phosphate rock, phosphorus, or phosphoric acid.

A highly concentrated international market

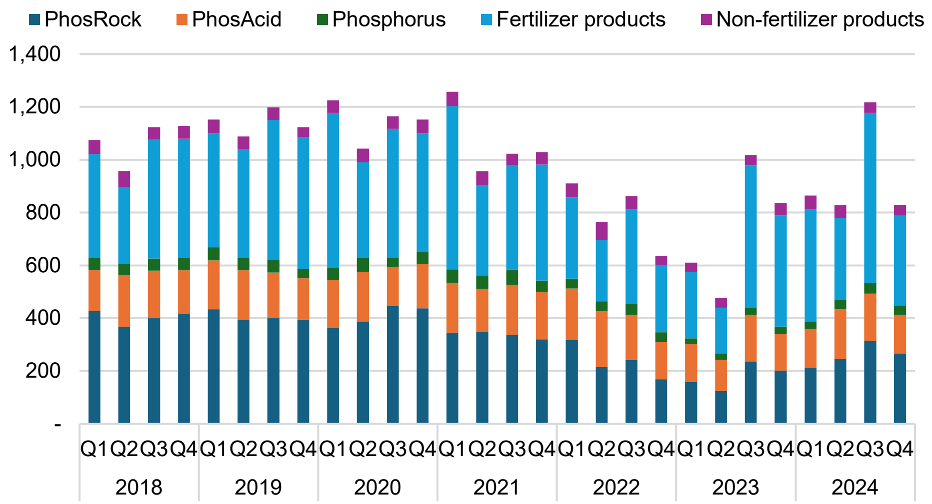
Given the role of phosphate rock as the starting point of the vast majority of the world's commercial phosphate production, it is unsurprising that a large share of global exports are concentrated in a relatively small number of geographies where phosphate deposits are exploited. Jointly, five countries alone account for more than 80% of international trade:

Morocco, Russia, the United States, Saudi Arabia, and China. Other significant areas of supply include Egypt, Tunisia, Jordan – as well as India and Brazil, with the latter two focussing almost entirely on domestic sales.

Looking now at Europe specifically, imports have historically fluctuated between 1.0-1.2 million metric tons P2O5 equivalent per quarter, with phosphate rock accounting for about 400,000 t P2O5, phosphoric acid for about 100,000 t P2O5, phosphorus and non-fertilizer products (mostly calcium and sodium phosphates) for another 100,000t P2O5, with the remainder consisting of fertilizer products such as DAP, MAP, NPKs, or superphosphates.

NOTE: other sources may give numbers as tP (tonnes of phosphorus). 1tP2O5 (phosphate) contains around 0.44 tP.

EU imports of key phosphate products in thousand metric tonnes P2O5



Source: S&P Global Commodity Insights.

Somewhat unsurprisingly, demand for upstream products (rock, acid, P4) has been comparatively more stable, as the main demand driver is supporting the production of downstream products at Europe-based chemical plants. Fertilizer imports were instead more prone to fluctuations, reflecting the impact of drivers such as weather or more broadly farm economics.

What is immediately apparent from the chart above is the sheer size of the decrease in overall imports between 2021 and the first half of 2023 – a direct reflection of demand disruption linked to high phosphate prices which were experienced in Europe since the invasion of Ukraine by Russia.

What is also visible is the joint decrease both in terms of downstream and upstream imports, in particular phosphate rock: the idling of fertilizer production particularly in Lithuania but also affecting Romania has caused a significant decrease in phosphate rock imports. This underlines the fragility of the European phosphate value chain, with strongly inter-related company structures not allowing for local production to offset challenges in downstream markets.

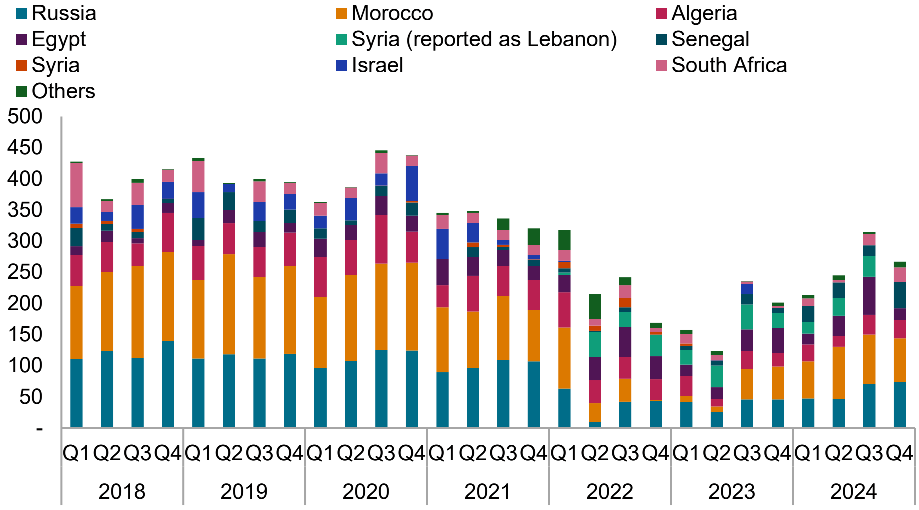
In this context, efforts to increase local supply of phosphate rock and alternatives such as processed sewage ash or stabilized manure or digestate are of particular importance, as they would offer a genuine alternative to an industry otherwise heavily reliant on imports from a few corporate entities. There are also projects to develop new sources of phosphate rock in Europe, notably in Finland (Finnish Minerals Group), Norway (Norge Mining), and Sweden (LKAB – aiming at P recovery from iron ore mining activities). High upfront capital requirements have so far prevented the required funds to be secured to bring these projects into active production units, yet a combination of higher prices in recent years, and a more focussed assessment of supply chain risks for phosphates and potentially recovered rare earth elements (REEs) could see a revival of interest in such developments.

That said, clearly the market was able (or forced) to rebound in the second half of 2023, and the significant push for market share by many key producers is also very visible in data for Q3 2024, where both Russia and Morocco placed almost record volumes in the EU as a whole.

Such a strong reliance on imports of P-bearing products across the value chain, matched with a comparatively concentrated supply side for the global phosphate market, increases the risk profile and impact of disruptions to established trade flows. Morocco alone accounts for 32% of total EU phosphate imports between 2018 and 2024; Russia for 24%; Israel for 9%, followed by Algeria, Egypt, Kazakhstan, Tunisia, and South Africa (jointly accounting for an additional 17% of value chain imports).

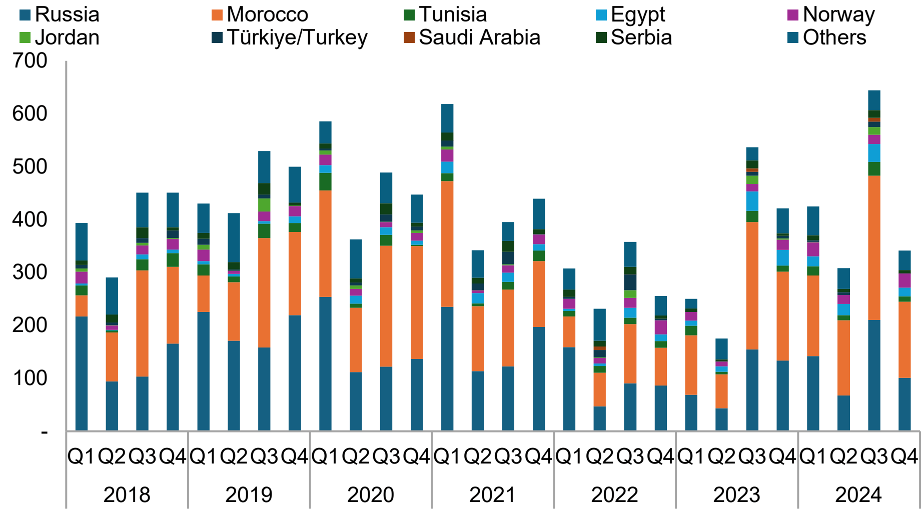
In other words, two countries alone account for more than half of EU phosphate imports , and seven countries only represent more than 80% of total EU imports. While indeed the market share of Russian fertilizers has decreased from an average of 40% between 2018 and 2021 to 25-30% in 2022-2024, is still a significant contributor to European availability – and a fierce competitor to European fertilizer producers thanks to its significant cost advantages in terms of domestic access to all key raw materials: natural gas, phosphate rock, sulphur, and potash and an absence (to date) of any tariffs or sanctions on fertiliser imports from Russia

EU phosphate rock imports by key partner



Source: S&P Global Commodity Insights.

EU phosphate fertilizer imports by key partner



Source: S&P Global Commodity Insights.

Can Europe find enough P without Russia?

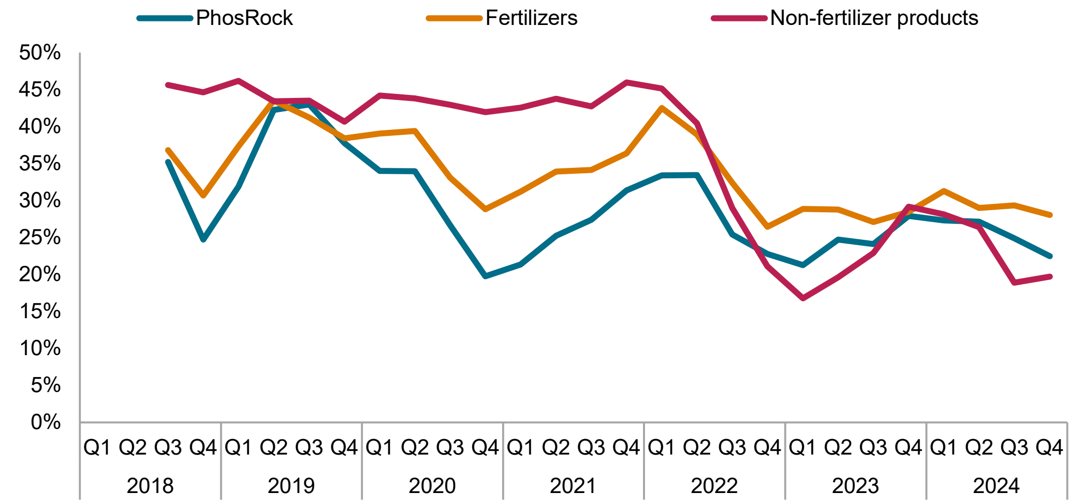
It would be unfair to claim that no effort has been placed into diversifying the sourcing of phosphate products away from Russia since 2022, as visible in the chart below showing the evolution of Russia's market share in applicable sub-sectors of the P value chain. However, it is also clear that the European industry is still highly exposed to Russian products, with about 25% of fertilizer imports, and 30% of phosphate rock imports still coming from Russia. Exports of phosphoric acid from Russia have been virtually non-existent for decades (to Europe or elsewhere).

In some cases, this reflects a very proactive effort by Russian fertilizer exporters, who since 2022 have been willing to place material in EU-based warehouses even without confirmed sales – and offering for purchase prices to be settled at the time of sale. Such convenient terms, factually representing zero-interest credit lines in a global outlook of high interest rates, were not to be easily disregarded by most European importers.

At the same time, the interpretation of these volumes as a "pre-emptive supply push" clearly also put additional pressure on European producers of compatible products, who would at times face low residual requirements by their traditional distributors. Calls about further discouraging imports of Russian products ensued – with Poland strongly on the forefront of recent proposals.

At present, the EU has no specific import tariffs on phosphate rock nor fertilisers from Russia, and fertilisers are excluded from sanctions on transport, trade or storage of these products from Russia. However, the European Commission's proposal on 28th January 2025 (https://ec.europa.eu/commission/presscorner/detail/en/ip_25_340), while still pending an opinion by the European Parliament and European Council, would see this change, with an initial 13% tariff applicable until June 2026 (additional to the current 6.5% third-country duty applicable), doubling in 2027 and rising to a "prohibitive" 100% in June 2028. The draft also includes measures aimed at increasing the flexibility of the policy, should it result in undue pressure on Europe's farmers for example.

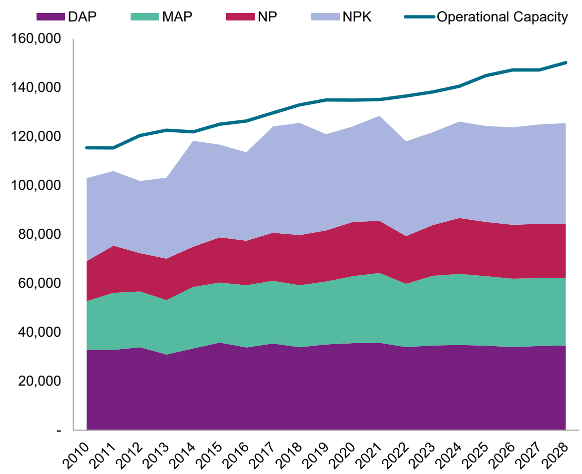
Market share of Russian phosphates in the EU market, % of total, 3-quarter average



Source: S&P Global Commodity Insights.

Technically, the world's total phosphate fertilizer capacity is sufficiently underutilized, meaning that if Russian products were factually removed from the EU import scene (e.g. should prohibitive import tariffs be deployed as proposed by the European Commission for June 2028, see above), trade routes could re-adjust.

Global production vs capacity (operational), '000t



Source: S&P Global Commodity Insights.

Each alternative, however, brings with it important downsides:

- Perhaps the easiest solution would be to accommodate more imports from Morocco, where OCP continues to expand its capacity, yet that would further increase the exposure of the European phosphate industry to its current largest supplier.
- China has systematically shown a desire to control the amount of phosphate products exported, on the grounds of a desire to keep local prices affordable to farmers and to control the pace of depletion for mineral reserves.
- Reliance on US exports might be tangled in trade disputes, and importantly they could overlap in terms of the timing of fertilizer applications.
- A suspension (or removal) of third-country duties on Saudi Arabia – similar to that enacted for nitrogen products in 2022 – could pave the way to a new supplier, and a

growing one in terms of capacity, although this would also incur significant additional freight charges.

If there is one aspect in which the European industry is perhaps lagging is its desire to commit to direct participation and funding of specific projects directly “within” the industry. A direct equity stake in specific production units, or investment in new chemical plants e.g. in Egypt, Tunisia, Algeria, would be the safest way for European importers to secure a stable source of supply, while also removing some of the price risk at the corporate level.

Such investment may well match the degree of integration of potential companies involved: European companies relying on imported phosphate rock have plenty of options (some within Europe, or Canada) when it comes to bringing new mines on-stream, or some may instead prefer to support new phosphoric acid plants in areas of surplus phosphate rock.

And of course, any effort in developing new genuine areas of supply through better recovery of waste streams would easily find a place in the market.

To summarize: due to the lack of sufficient mineral reserves, the European market is inevitably in a structural deficit when it comes to phosphates. If it were to seriously try and diversify its phosphate procurement, let alone factually impede the profitable arrival of Russian products via tariffs, the number of options is limited, and might require an element of direct investment in new supply – at least for bulk commodities or primary raw materials.

Supply-chain security comes at a cost – a cost which in the past decade has not attracted much interest by current players, but which perhaps will appear as less daunting in the near future, as the changes to the geo-political landscape suggest an even larger hidden cost lies behind global value chain.

Assuming trade will return to being as frictionless as much of the 2000s and 2010s, while admirably optimistic, might be a risky bet.