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INTERNATIONAL TRADE IN AGRICULTURAL INPUTS – RECENT EVOLUTIONS AND IMPLICATIONS FOR THE ROMANIAN AGRI-FOOD SECTOR

ABSTRACT

At global level, inputs such as fertilisers and pesticides represent major factors influencing positively agricultural production, replenishing soil fertility, thus contributing to food production. On the other hand, they are important polluters, and they have lately raised serious concerns regarding food safety. Yet, given the significant growth of the global population, they are supporting increasing agricultural outputs. The present paper examines the global, European and Romanian fertilisers production and trade, in terms of exports, imports, and geographical orientation. Recent international developments, such as the military conflicts in Ukraine and Middle-East brought extreme volatility in the energy prices (oil and natural gas), as well as in supply of these essential raw materials. Blockages in the transport routes (*e.g.* in the Hormuz strait, through where about one third of the global fertiliser trade is channelled) are expected to decrease availability and increase fertilisers prices, which are likely to result in higher production costs for farmers, lower agri-food production and higher prices for consumers.

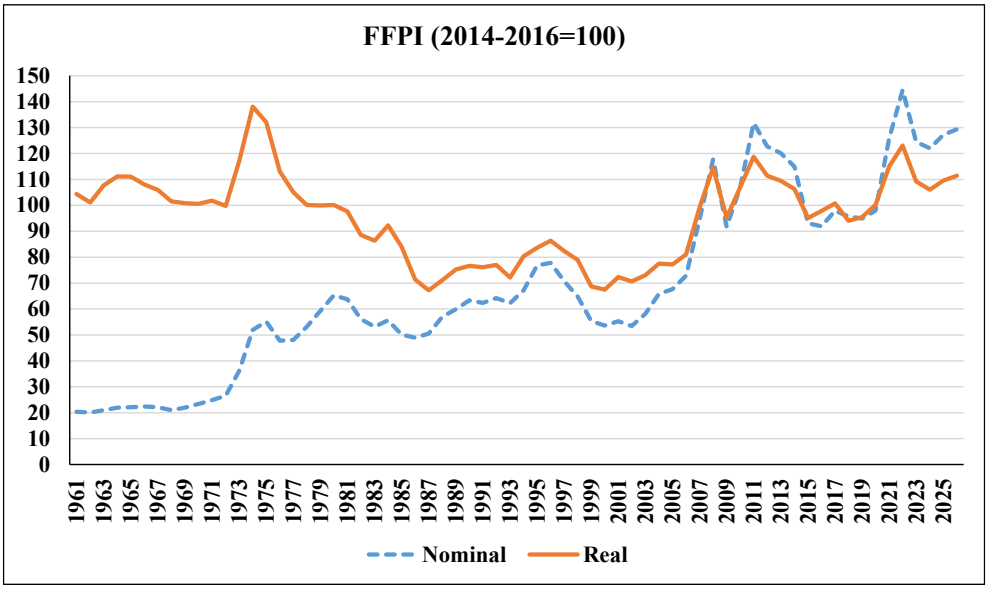
Key words: fertilisers production, consumption, prices, international trade.

JEL Classification: L65, Q13, Q16, Q17.

I. INTRODUCTION

Many scientific and technological innovations helped boosting crop productivity particularly in the second half of the 20th century: mechanical innovation, chemicals, irrigation techniques, genetic applications. Among the most significant scientific and industrial developments were fertilisers that increased significantly crop yields and pesticides helping farmers fighting pests and diseases. It started mid-19th century, with the discovery and studies on the nutritional needs of crops. Although the value and use of manures was known centuries before, the mineral fertilisers started being developed and used after 1880. Their use became a common practice after World War I (WWI) and adopted on larger scale after WWII, when also pesticides became of common use. After 1950, agricultural production expanded through intensification, a result of the combination of several

factors such as fertilisation, plant protection and irrigation. The addition of high-yielding plant and animal varieties resulted in the the so-called “green revolution”. Intensification resulted in higher efficiency which allowed expansion of agricultural land into areas previously considered as marginal and less productive. The overall result of several decades of development was a significant increase of the global agricultural production and a generally decreasing trend in global food prices (Figure 1).



Source: https://www.fao.org/worldfoodsituation/foodpricesindex/en/

Figure 1. FAO Food Price Index (2014–2016=100).

International crises reversed the downward trend and induced high peaks: the oil crisis in 1973–1974, the economic crisis in 2008–2010 and the start of the war in Ukraine in 2022.

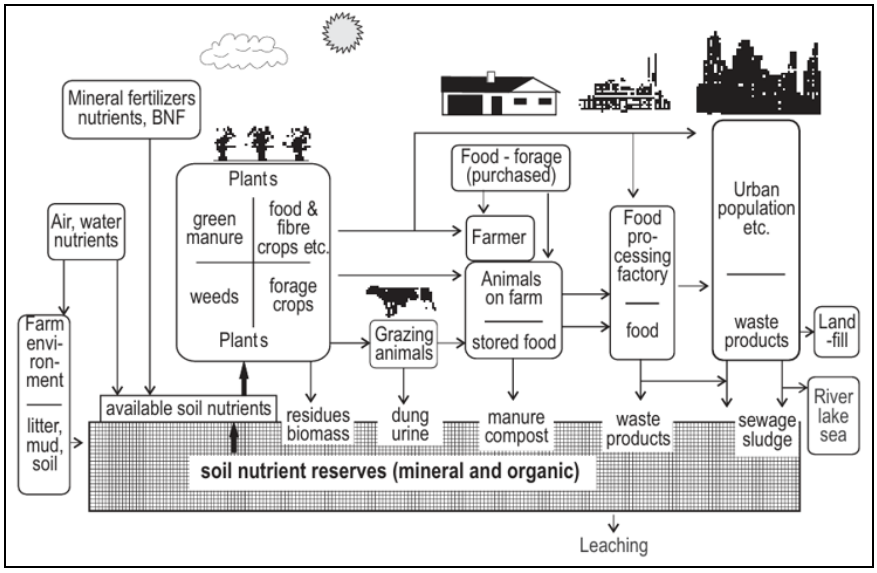
World population growth accelerated: it doubled in 40 years, from 3 billion in 1959 to 6 billion in 1999, and exceeded 8 billion in 2022. Therefore, the pressure for higher agri-food production is mounting. Nonetheless, agricultural intensivization and increased food production are generating harmful environmental side-effects: pollution with residual nitrates, nitrites and pesticides in soils, mineral depletion, higher water consumption, biodiversity reduction, higher GHG emissions, global warming.

2. STATE OF KNOWLEDGE

According to FAO (1995): "Sustainable agricultural development is the management of the natural resource base in such a manner as to ensure the attainment and continued satisfaction of material human needs for present and future generations. It conserves or increases land capacity to produce agricultural goods, water availability, plant genetic resources, is environmentally non degrading, technically appropriate, economically viable and socially acceptable."

Since the late 80's, FAO supported the introduction of an Integrated Plant Nutrition System (IPNS), an approach aiming at ensuring that plant nutrition be environmentally, socially and economically viable, adapted to locally available resources and characteristics, by increasing the efficiency of use of all nutrient sources, such as soil resources, mineral fertilisers, organic manures, recyclable wastes or biofertilisers (FAO, 1995). Transfer of nutrients with favorable effects can be achived as well by biofixation of nitrogen (through specific crops such as legumes), crop rotation, restitution of crop residues, but under intensive agricultural practices they prove insufficient. Therefore, supplementary fertilisation is needed, either organic or mineral.

Mineral fertilisers come in various forms: granulated products, powders, liquids, suspensions. Each type is tailored to meet specific crop and soil requirements, optimizing yields while supporting regenerative agriculture practices.



Source: Finck, 1992.

Figure 2. Plant nutrients in production and consumption cycles.

Crop products remove nutrients from soil, but are “exported” out of the production sites, moving along various food chains. They are partly transformed by plants, microbes, animals or humans, and eventually they reappear in waste materials, which can again serve as nutrient. These cycles (large or small) operate continuously at various levels; nutrients, either in organic or mineral forms enter and leave these cycles (Finck, 1992) (Figure 2).

3. MATERIAL AND METHOD

The present paper analyses fertiliser production, consumption and trade, looking as well as to the geographical orientation of the flows. The research methodology is primarily based on analysis of statistical data from Eurostat, Faostat, Trademap and Romanian National Institute of Statistics (Tempo-online), with focus on EU and Romania, accompanied by a large literature review of the most recent bibliographical sources. Publications from various academic sources – articles, books, analyses and studies, were consulted and referenced, along with articles from specialized press. In terms of public documents, official documents from different national and international bodies were used: EU Commission, FAO, Romanian Ministry of Agriculture and Rural Development,

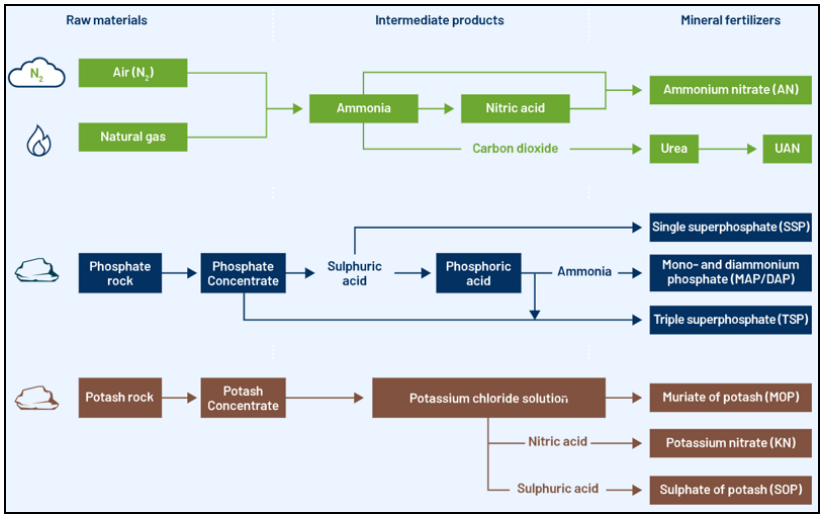
4. RESULTS AND DISCUSSIONS

4.1. PRODUCTION

Fertilisers production increased globally in the last half century. Nitrogen-based fertilisers are industrially produced from natural gas with use of massive amounts of energy. Phosphatic fertilisers are industrially produced based on phosphate rock, while potassic fertilisers are based on potash ore (Figure 3).

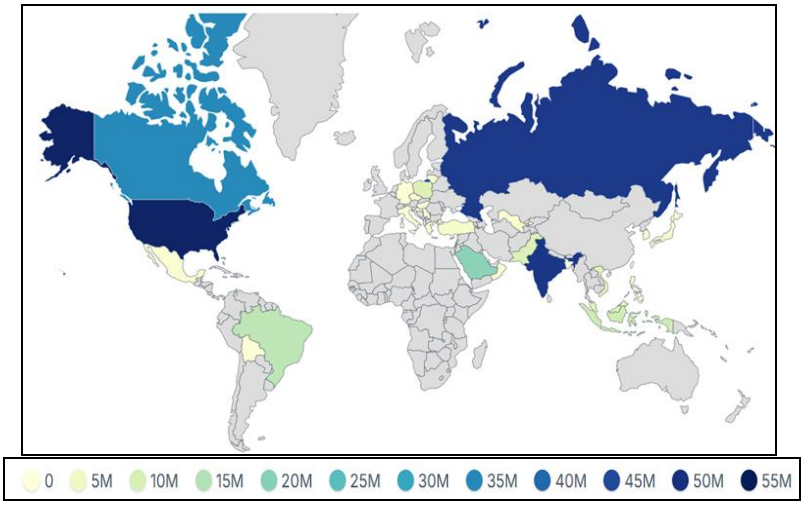
According to FAO data (latest available), the global fertiliser production in 2022 has been 289 million tonnes. The top producers were: USA (53 million tonnes) India (48.7 mill. t), Russia (48.1 mill. t), Canada (34.9 mill. t), Saudi Arabia (19.3 mill. t), Brazil (13.6 mill. t), Indonesia (11.1 mill. t), Pakistan (9.1 mill. t) (Figure 4).

In Europe, in 2022, Poland produced 8.9 million tonnes, followed by Turkey (2.6 mill. t), Lithuania (2.4 mill. t), Greece (1.3 mill. t), Italy (1.1 mill. t), Germany (660.6 thousand t), Hungary (640.2 thousand t), Serbia (618.8 thousand t) and Croatia (261.8 thousand t) (FAO data).



Source: FertilizersEurope (https://www.fertilizer.org/about-fertilizers/nitrogen-phosphorus-potassium)

Figure 3. Production of main fertiliser products



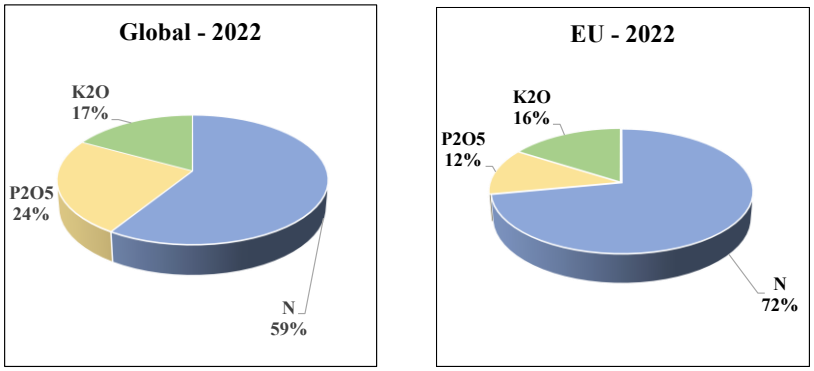
Source: https://worldpopulationreview.com/country-rankings/fertilizer-production-by-country

Figure 4. Fertiliser production by country 2025.

Romania had a rather low fertiliser production (mostly nitrogen-based), but the last two companies (Azomureș and Năvodari) closed in 2024, due to losses generated by the rising gas prices and environmental issues. In 2026, Romgaz (the Romanian largest producer and main supplier narural gas company) took over Azomureș. It will resume fertiliser production, based on domestic gas coming from both mainland and Neptune Deep offshore platform in the Black Sea.

The structure of production (by nutrients) is different in EU and at global level: in the EU, the largest part of production (72%) is nitrogen fertilisers (based on imported natural gas) (Figure 5), while the share of phosphatic fertilisers in production is half (12%) of the global share, mostly because phosphatic rock reserves are located outside the EU – largest reserves are located in North Africa (Morocco, Egypt, Tunisia), China, Russian Federation, and Brazil.

Same goes with potash ore, for which the main reserves are located outside the EU as well: in Canada, Laos, Russian Federation and Belarus. Israel and Jordan recover potash from potassium chloride reserves contained in the Dead Sea.



Source: Fertilisers Europe.

Figure 5. Composition of fertiliser production by nutrient.

It is rather important, since lack of P_2O_5 and K_2O in the presence of nitrogen results in important nutritional disbalances for crops, affecting yields and depleting soils.

One should mention that the degree of mining and processing in marketable forms differes, therefore the countries holding the largest reserves are not necessarily the largest producers.

Top potash ore suppliers are Canada, Russia, China and Belarus. Germany and Spain rank 5th and 11th among the top twelve world producers (Table 1).

Table 1

Top world producers of nitrogen, phosphate and potash fertilisers

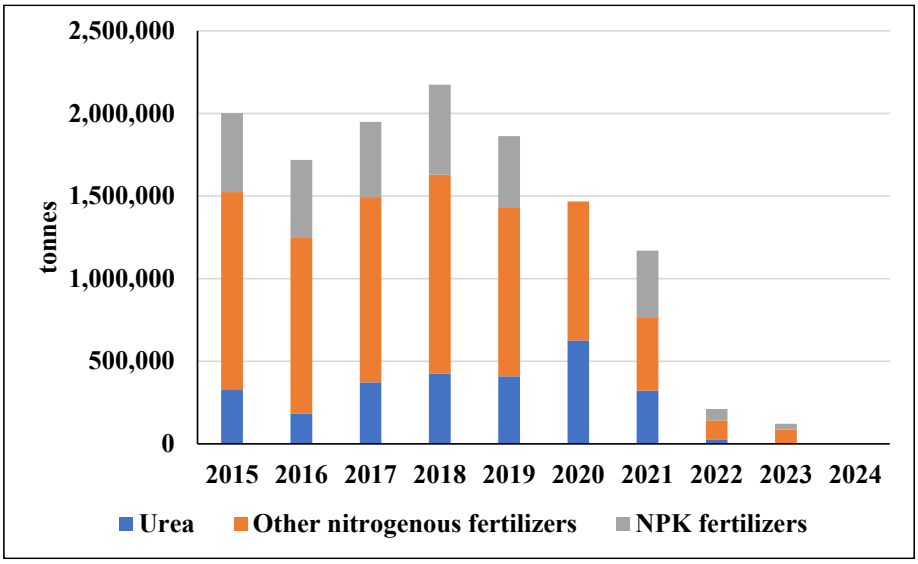
Rank	Nitrogen ferilizers		Phosphat rock		Potash (K_2O equivalent)	
	Country	Production (2019, million tonnes)[1]	Country	Production (2025, million tonnes)[2]	Country	Production (2025, million tonnes)[3]
1	China	31.0	China	110.0	Canada	15.0
2	India	13.6	Morocco	36.0	Russian Fed.	10.0
3	USA	11.2	USA	20.0	China	6.3
4	Russian Fed.	10.6	Russian Fed.	14.0	Belarus	6.0
5	Indonezia	4.0	Jordan	12.0	Germany	3.0

Rank	Nitrogen ferilizers		Phosphat rock		Potash (K_2O equivalent)	
	Country	Production (2019, million tonnes)[1]	Country	Production (2025, million tonnes)[2]	Country	Production (2025, million tonnes)[3]
6	Canada	3.9	Saudi Arabia	10.0	Laos	2.4
7	Egypt	3.4	Egypt	5.5	Israel	2.0
8	Pakistan	3.1	Brazil	5.0	Jordan	1.8
9	Qatar	3.0	Peru	4.8	Chile	0.6
10	Saudi Arabia	2.6	Tunisia	3.3	USA	0.5
11	Netherlands	2.2	Vietnam	3.0	Spain	0.45
12	Poland	1.9	Senegal	2.8	Brazil	0.3

Sources: 1. https://www.nationmaster.com/nmx/ranking/nitrogen-fertilizer-production
2. https://investingnews.com/daily/resource-investing/agriculture-investing/phosphate-investing/top-phosphate-countries-by-production/
3. https://investingnews.com/daily/resource-investing/agriculture-investing/potash-investing/top-potash-countries-by-production/

It is rather difficult to find consistent data on fertiliser production, since in the databases consulted for the present paper (Eurostat, Faostat, Tempo-online) data for certain years and products are often not available or marked as "confidential". Another difficulty resides in the units: some databases show quantities of commercial product, other quantities in equivalent active substance.

For Romania, the available data in Faostat show a steep decrease in fertiliser production (nitrogenous and complex fertilisers only), to stop completely in 2024 (Figure 6). In the last decade, only nitrogenous and complex fertilisers were produced. Production of nitrogenous fertilisers is expected to resume in 2027.

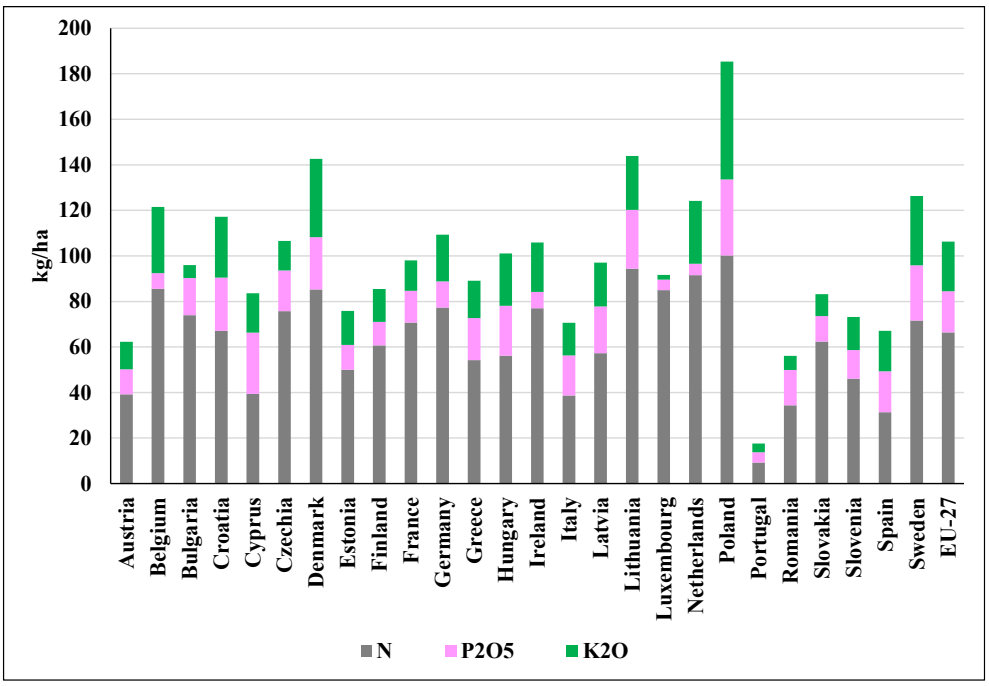


Source: Processed data from Faostat.

Figure 6. Romanian fertilisers production (commercial product).

4.2. CONSUMPTION

In EU, consumption is rather high (16 million tonnes in 2022), and not covered by supply, therefore it is net importer of fertilisers. The use of fertilisers (kg active substance /ha) is different among the Member Countries (Figure 7).



Source: Processed data from Eurostat.

Figure7. Average per hectare use of mineral fertilisers use (2024).

By far, the nitrogenous fertlizers are the most intensively used in all countries; the highest consumption seems to be in Poland (100 kg/ha), Lithuania (94 kg/ha), Netherlands (92 kg/ha), followed by Begium and Denmark (85 kg/ha each). The average EU consumption is 66 kg/ha. Romania uses about half of the EU's average nitrogenous fertilisers consumption.

The use of phosphatic fertilisers is far lower, EU average is 18 kg/ha, and the highest consumption is 33 kg/ha (in Poland again). Romania is close to the EU average (16 kg/ha).

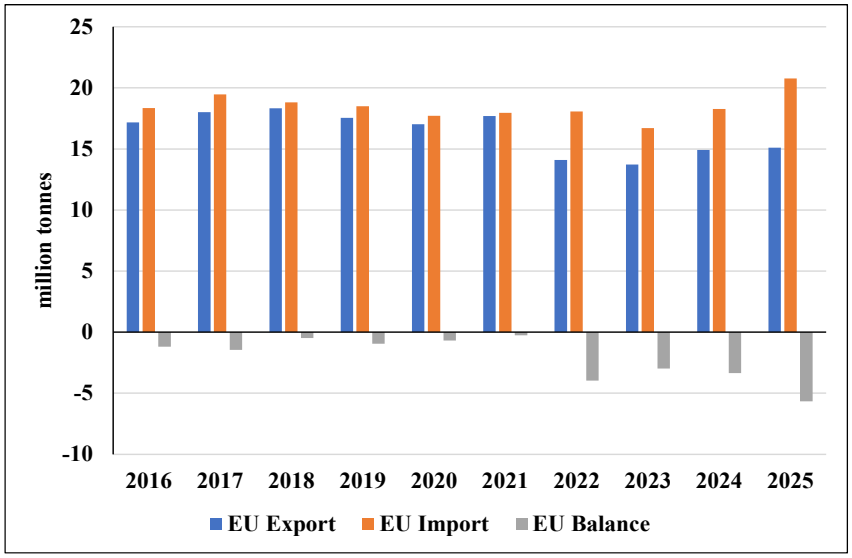
The use of potassic fertilisers is mostly higher than the phosphatic ones, but still significantly lower than the nitrogenous fertilisers. Romania uses about 6 kg/ha of potassic fertilisers (among the bottom four Member States), while the average EU consumption is about 18 kg/ha. Nevertheless, these figures provide us

with a general image of the fertilisers use in EU; the numbers should be taken with caution, since not all MS report them on a regular basis.

Romania used important quantities of natural fertilisers (manure), but on a decreasing trend, from 19 million tonnes in 2020 down to 16 tonnes in 2024. A possible explanation could be the downward number of animals, but also the rise in transportation and application costs due to high and volatile fuel prices.

4.3. TRADE

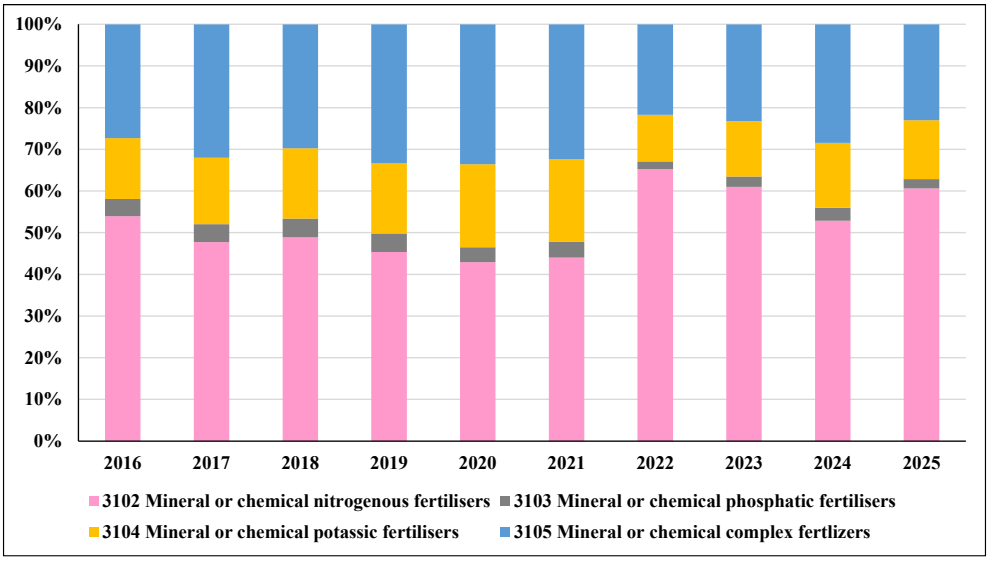
Almost all EU Member Countries (with just few exceptions: Estonia, Latvia and Sweden) have on their territory fertiliser producing factories. Despite that presence, the EU industry production is not able to meet the demand for fertilisers, and imports are needed. In the last decade, EU fertilisers trade balance has been overall negative, only slightly until 2021; after 2022, imports increased to the highest value in 2025 (21 million tonnes), and the deficit reached 6 million tonnes (Figure 8). There are some reasons for that: EU relies heavily on imported raw materials (gas, phosphatic rock and potash ore). Since the war against Ukraine started in 2022, EU imposed sanctions against Russian Federation, and gradually reduced its imports of fertilisers, gas and oil from them. The current war against Iran led to spikes and high volatility of the prices of oil and gas and the blockage of the Hormuz strait, which used to be the main sea way for transportation of about 30% of the global nitrogenous exported fertilisers.



Source: Processed data from Eurostat.

Figure 8. EU trade in fertilisers (quantities).

Nitrogenous fertilisers hold the largest share of EU imports (over 5% since 2022), followed by complex types (between 21–32%); potassic fertilisers (11–16%) and low shares of potassic fertilisers (3–4%) (Figure 9).



Source: Processed data from Eurostat.

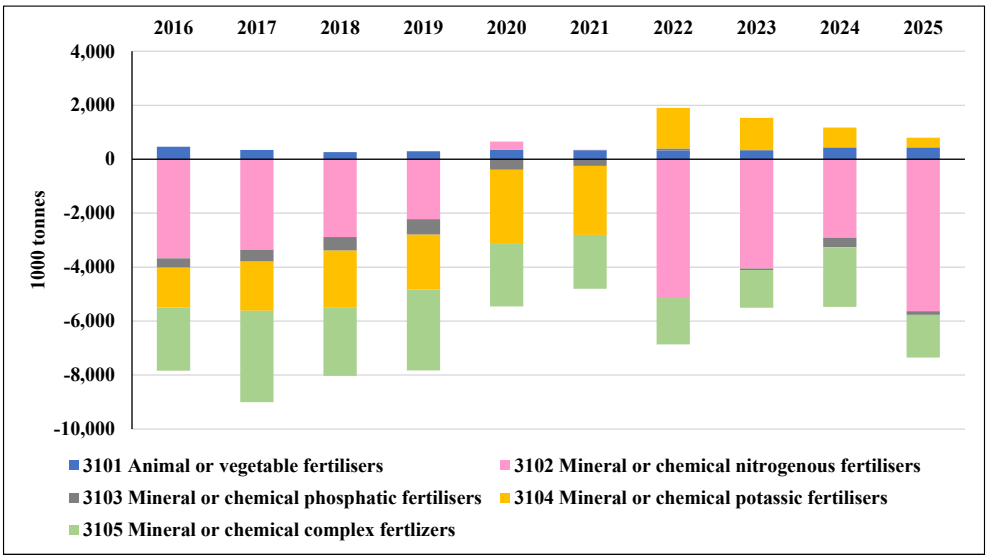
Figure 9. Share of different types of fertilisers in total EU quantity imports .

Germany and Spain, the main EU producers of potassic fertilisers intensified their production and exports, shifting the trade balance to positive since 2022 (Figure 10). Exports of animal and vegetable fertilisers increased in the last decade, maintaining their excedent of the quantitative trade balance. Only the balance for nitrogenous fertilisers remained heavily negative since 2022.

Nitrogenous fertilisers imported by EU originated in 2025 mainly from Egypt (14%), Russia (11%), China (6%), Algeria (5%), USA (2%).

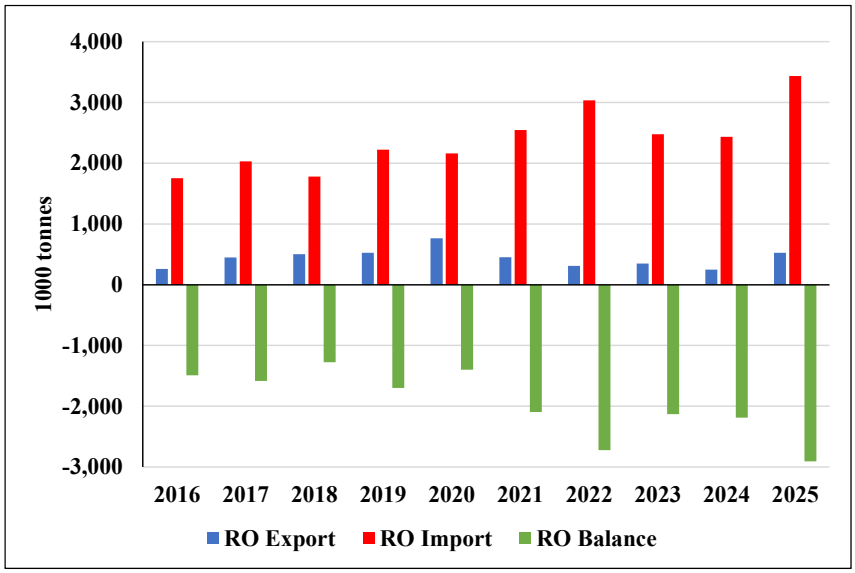
About 92% of phosphatic fertilisers EU imports originated in 2025 mainly from Mediterranean area (Marocco – 55%, Israel – 23%, Egypt – 15%), while 92% of the potassic fertilisers originated in 2025 mainly from Canada (39%), Russia (20%), UK (13%), Israel (12%) and Jordan (8%).

Complex fertilisers imported by EU originated in 2025 mainly from Russia (33%), Morocco (30%), Norway (12%), Serbia (5%) and Tunisia (4%), accounting together for 84% of the EU imports.



Source: Processed data from Eurostat.

Figure 10. EU quantity trade balance for fertilisers.



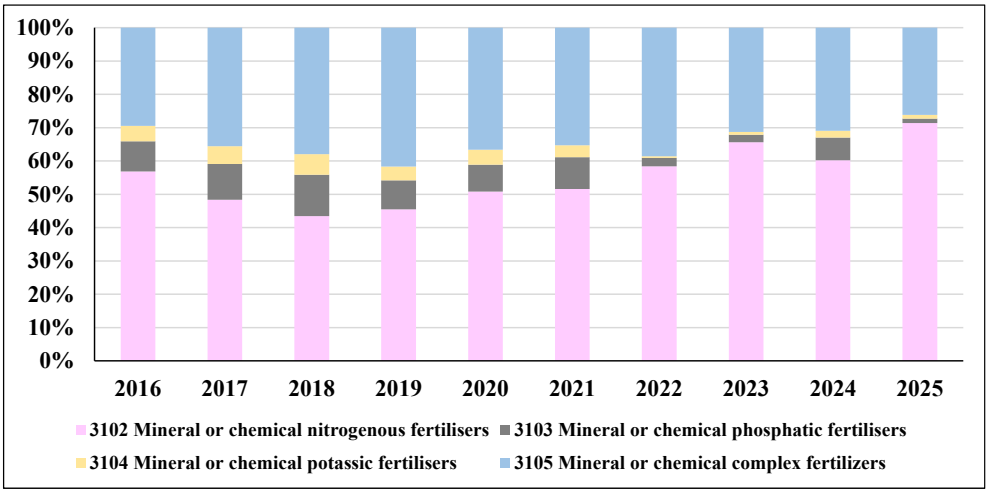
Source: Processed data from Eurostat.

Figure 11. Romanian quantity trade in fertilisers.

In the last decade, along with the decrease of domestic production, Romanian fertiliser imports increased gradually (Figure 11). Currently, Romania is also a net importer of fertilisers, with total imports of 3.43 million tonnes in 2025, of which

35% came from EU member states (Bulgaria, Austria, Greece, Hungary, Netherlands), and 65% from extra-EU countries (China, Egypt, Russia, Turkey). The trade deficit in fertilisers was worth 1.25 billion EUR in 2025.

In terms of composition by nutrient, the share of nitrogen-based fertilisers increased continuously since 2018 at the expense of the other types, to reach a maximum of 73%, while complex fertilisers (containing combinations of two or three nutrient elements) remained almost the same (about 20%) in the last three years.



Source: Processed data from Eurostat.

Figure 12. Composition of the Romanian fertiliser quantity imports by nutrient.

Nitrogenous fertilisers imported by Romania originated in 2025 mainly from China (28%), Egypt (26%), Turkmenistan (9%) and Georgia (6%), taking together three quarters of the total nitrogenous fertiliser imports.

The phosphatic fertilisers imported by Romania originated from three countries only: Egypt (63%), China (27%) and Morocco (9%). The potassic fertilisers imports showed the same high concentration: from Russia (81%), Laos (17%) and Israel (2%).

Alost half of the complex fertilisers imported by Romania in 2025 originated from Russia (47%), then from Turkey (18%), Morocco (15%) and Serbia (12%).

4.4. POLICIES

The crisis that started in February 2026 in Middle East pushed upwards the prices of fuel, gas and fertilisers. The EU fertiliser industry is producing mostly nitrogen fertilisers; the raw material is imported natural gas, which accounts for 70–80% of the costs. Moreover, EU is net importer of fertilisers. According to the Communication from the Commission – “Ensuring availability and affordability of

fertilisers" (EC, 2022), 25% to 30% of EU consumption of nitrogen fertilisers, around 35-45% of EU consumption of potash and around 70% of EU consumption of phosphatic fertilisers come from imports.

In April 2026 the overall nitrogen fertiliser prices in the EU increased further by 40% above the level of December 2025. Fertilisers are among the highest share in the cost for farmers, slightly more than 7% of input costs for the EU farming sector in 2024 and 2025 (EC, 2026a). According to the Farm Sustainability Data Network (FSDN), fertiliser accounted for cost 24% of intermediate inputs and 16% of total inputs in 2023 for arable crop farmers.

Increased prices of fertilisers result in increased costs for farmers, with two potential consequences: higher prices of agri-food products, or reduced use of fertilisers, meaning lower volumes and lower quality of agricultural products. Either way, it affects food security and diminishes the competitiveness of EU farmers.

The Fertiliser Action Plan launched by the EC in May 2026 (EC, 2026b) aims at ensuring food security by supporting farmers and improving their access to fertilisers. The highlights of nthe Action Plan are:

(a) provide immediate exceptional financial support (through METSAF);
(b) provide stronger incentives for more efficient farming practices;
(c) support farmers in achieving better nutrient management;
(d) propose clear measures to facilitate the use of digestates, ie. the nutrient-rich material left over by organic waste (like food scraps or manure) with lower carbon footprint, thus improving circularity;
(e) long-term actions for strengthening the EU domestic fertiliser supply.

In April 2026, The Middle East crisis Temporary State aid Framework (METSAF) was adopted. It is a new and temporary aid (until the end of 2026) enabling the Member States to address the effects of the crisis on the most affected sectors – agriculture, transport and fishery (EC, 2026a). Eligible beneficiary companies can receive support covering up to 70% of additional costs linked to price increases.

Out of an initial €540 million total buget for supporting farmers affected by rising fertiliser prices, Romania should receive the sixth largest amount (€29.9 million), after other Member States with more developed agricultural sectors: France (€107 million, Poland €66 million, Germany €60 million, Spain €50 de million), Italy €45 million). This allocation may be increased by 200% from national funds, to reach a total of €89.7 million. Recently, the EC approved for Romania an €11 million scheme for pig farmers affected by rising fuel and fertiliser costs, with grants of up to €50,000. A similar scheme, worth €52 million for cattle farmers facing increased fuel and fertilisers prices was approved as well (EC, 2026a).

CBAM (Carbon Border Adjustment Mechanism) is an EU regulation addressing greenhouse gas emissions embedded in imported goods from third-country producers. It has a double objective: preventing carbon leakage and encouraging emissions reductions by non-EU exporting countries of products from

carbon-intensive sectors (fertilisers, aluminium, cement, electricity, hydrogen, iron and steel).

The price of the CBAM certificate is paid by the importer, and reflects the average price of EU Emissions Trading System (EU ETS) allowances. The Commission is calculating the price of CBAM certificates as the weighted average of the auction clearing prices of the auctioned EU ETS allowances. In 2026, the Commission is calculating and publishing four quarterly prices (€75.36/ tonne CO_2 for Q1 2026 and €75.28 for Q2 2026). From 2027 onwards, the Commission will calculate and publish weekly prices. All CBAM certificates will be purchased on the common central platform from February 2027 onwards. EU sets a maximum total volume of emissions for the sectors covered, and that volume is divided into EUA-s (Emissions Unit Allowances; 1 EUA = 1 tonne of CO_2). Some are distributed free of charge to the exposed industry, the rest are auctioned. Companies with emissions below the allocation sell the surplus; those exceeding the it, buy. The price is formed freely on European stock exchanges. The mechanism went through a transition period (2023–2025) and was fully enforced since January 2026.

Although fertiliser importers pay first the CBAM certificates, the price is ultimately paid by the farmers, which has negative impacts on the costs of agricultural products and the efficiency of the farms.

5. CONCLUSIONS

Fertilisers are essential inputs for agriculture and food production. It is estimated that in the last century, they contributed to increase several times the production of basic agricultural products.

The global production is dominated by USA, India, Russia and Canada, due to their domestic availability of raw materials (natural gas, phosphatic rock and potash ore).

EU, despite the presence of an internal fertilisers producing industry, is not able to cover its fertilisers consumption (rather high due to highly-intensive agricultural practices), therefore the gap is covered by imports originating mostly from Middle-East and Mediterranean countries. Consequently, the tensions in those regions are likely to affect supply and use of those inputs.

Romania discontinued its fertiliser production (mainly nitrogenous-based) due to high prices of gas (partially imported). It will resume in 2027, when the gas supply will become cheaper once the marine platform Neptune Deep starts its gas production.

The EU fertiliser imports were dominated by nitrogenous fertilisers in the last decade, followed by complex fertilisers. The trade balance has been negative in the last decade, and the deficit increased since the war in Ukraine.

Romanian fertiliser imports increased almost continuously in the last ten years, and the deficit of the trade balance increased as well, to reach the highest values in 2025. Two thirds of the import volumes are originating outside the EU.

To counteract the consequences of EU's mentioned vulnerabilities, the EC adopted in April and May 2026 important initiatives: the Fertilisers Action Plan and the Middle East crisis Temporary State aid Framework (METSAF). The latter will provide funds for partly compensating the increase in prices for fuel and fertilisers for the start of the autumn agricultural campaign.

In the current geo-political conditions, with natural gas and energy prices surges and high volatility due to military conflicts, together with the blockage of some essential maritime routes (such as the bab-el-Mandeb and especially the Ormuz strait (which normally channels 30% of the global fertiliser trade), the diminishment of supply, transport and trade, agriculture and food production is in jeopardy. For Romanian farmers, further rise in prices due to diminished supply topped by the CBAM will have severe implications on the profitability of Romanian farms.

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