
The Impact of the EU-MERCOSUR Agreement on Soybean Meal and Corn Feed Markets in the EU and Poland

Submitted 21/07/25, 1st revision 06/08/25, 2nd revision 23/08/25, accepted 23/09/25

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Abstract:

Purpose: This paper concerns an analysis of the complex impact of the EU-MERCOSUR trade agreement on the EU and Polish feed raw materials market, with particular emphasis on imports of soybean meal and maize (corn) in the period 2015-2024.

Approach/Methodology/Design: A detailed analysis of the directions and scale of supplies from South American countries was carried out, while the degree of geographical concentration of imports was assessed using the Herfindahl-Hirschman Index (HHI). In addition, the volatility of CIF and FOB prices of these commodities was examined in the context of global market turbulence, including wars, logistical disruptions and exchange rate fluctuations.

Findings: The analysis highlights the European Union's increasing dependence on Brazil and Argentina as key suppliers of protein feed components and the associated risks of supply concentration and vulnerability to market and political disruptions. Of particular note in the article is an assessment of the impact of the war in Ukraine on the rescheduling of import origins and the growing importance of MERCOSUR countries. In addition, the importance of new EU environmental regulations, including the EUDR, which aims to reduce imports of raw materials linked to deforestation, is discussed, posing additional regulatory and operational challenges for the feed market.

Practical Implications: The paper presents scenarios for market and political developments following the ratification of the EU-MERCOSUR agreement, taking into account possible impacts on security of supply, competitiveness of local producers and compliance with sustainable development policies.

Originality/Value: The paper thus provides a multidimensional and up-to-date perspective on the complex trade relations and their consequences for the feed industry in Poland and Europe.

Keywords: EU-MERCOSUR deal, soybean meal, corn (maize), trade, agriculture, market concentration, environment, self-sufficiency.

JEL classification: F13, Q17, Q18.

Paper type: Research article.

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Funding: *The article processing charge (APC) was funded by the National Support Centre for Agriculture (KOWR) under contract No. CEN.BDG.WP.6515.2.2025.EJ.57.*

1. Introduction

In December 2024, the European Union (EU) and MERCOSUR member states Argentina, Brazil, Paraguay and Uruguay have signed a long-awaited trade agreement to create one of the largest free trade zones in the world, covering more than 700 million consumers.

The agreement, the culmination of more than two decades of negotiations, includes the elimination or reduction of tariff barriers for a range of industrial and agricultural goods, the harmonisation of technical regulations and a framework for cooperation in areas such as sanitary standards, environmental protection or intellectual property rights (European Commission, 2024).

Currently, imports of soybean meal and soybeans from MERCOSUR countries into the European Union are subject to a zero tariff rate and are not subject to tariff quotas - trade in these raw materials is already fully liberalised. For maize, the tariff rate is also 0%, although formally there is a reference price system and the possibility of levies.

The EU-MERCOSUR agreement introduces an annual duty-free quota of 1 million tonnes of maize (and sorghum), implemented gradually, but this does not represent a significant change from the status quo. Import patterns will be determined mainly by non-tariff factors - CIF prices, seasonality of supply, logistics and compliance with EUDR regulations.

Although the agreement was presented as a political success and an opportunity to strengthen the EU's position in the global market, it was highly controversial from the outset - especially in member countries with a large agri-food sector, such as France, Ireland and Poland.

Concerns included competition for European agricultural producers, differences in production standards and the potential impact of the agreement on the EU's climate and environmental goals (Sartor & Matthews, 2021; WWF, 2021; EEB, 2022).

From the point of view of the feed sector and animal production more broadly, the importance of the EU-MERCOSUR agreement is particular. Indeed, MERCOSUR is the dominant supplier of protein feed raw materials to Europe: in 2022, as much as 85% of the EU's soybean meal imports came from the region, with Brazil accounting for the largest share and Argentina and Paraguay also contributing significantly (FEFAC, 2023).

In addition, Argentina became one of the main suppliers of maize to the EU after 2022, as a result of disruptions in exports from Ukraine related to the war and logistical constraints (DG AGRI, 2023; USDA, 2024).

In Poland, which in recent years has consolidated its position as one of the leaders in EU poultry, pork and egg production, dependence on imported soybean meal and maize has steadily increased. In 2023, more than 70% of domestic soybean meal consumption was imported - mainly from Brazil - making Poland vulnerable to changes in trade, price and geopolitical conditions in the South American region (IERiGŻ, 2023).

Increased availability of these raw materials after the trade agreement comes into force may improve cost conditions in the feed and livestock sector in the short term, but in the long term may undermine the development of local, sustainable sources of plant protein in the EU - such as legumes or rapeseed (Witzke *et al.*, 2020; Matthews, 2020).

Environmental and climate issues are no less important. Concerns about the negative impacts of intensifying agricultural exports from MERCOSUR on the Amazon, Cerrado and Gran Chaco rainforests are widely documented in the literature (Nepstad *et al.*, 2014; Henders *et al.*, 2015; Lambin *et al.*, 2018). Critics point out that the agreement in its current form does not contain sufficient mechanisms to verify the origin of raw materials and may undermine the effectiveness of new EU regulations, such as the EUDR, limiting market access for products linked to deforestation (European Commission, 2023; IPCC, 2022).

Therefore, the EU-MERCOSUR trade agreement is deeply ambivalent. On the one hand, it creates the potential for cost reductions in strategic segments of livestock production, which can increase the competitiveness of EU agriculture. On the other hand, it increases pressure on sustainable development systems, local sources of feed protein and the community's climate goals.

The aim of this article is to assess the impact of the EU-MERCOSUR trade agreement on the EU and Polish feed raw material markets - with a particular focus on soybean meal and maize imports. The analysis covers both the economic (trade, prices, competitiveness) and environmental (deforestation, ESG regulations) dimensions, based on statistical data, strategic documents and scientific literature. The article also presents scenarios for the impact of the agreement on the feed market and animal production in Poland in the context of the EU protein strategy and the Green Deal.

2. Literature Review

Research on trade in agricultural products between the European Union and MERCOSUR countries has a long tradition and includes both quantitative and

qualitative analyses. Since trade negotiations began in the 1990s, numerous studies have addressed the impact of liberalisation on EU agricultural policy, producer competitiveness and the trade-environment balance.

Early works such as (Cramon-Taubadel, 2005) and (Burrell, 2011) analysed the potential effects of market opening on EU agriculture - pointing to risks for sensitive sectors including livestock, sugar and feed grains. In the forage context, analyses of MERCOSUR's comparative advantage, due to low production costs, high land availability and favourable agro-climatic conditions, were crucial (Bustos *et al.*, 2016; OECD-FAO, 2023).

Many authors point out that Brazil and Argentina have achieved extremely high efficiency in soybean and maize production, with relatively low environmental costs locally but increasing globally (Cohn *et al.*, 2014; de Fraiture *et al.*, 2014). According to reports by the International Food Policy Research Institute (IFPRI, 2020) and the Inter-American Development Bank (IADB, 2022), the export expansion of MERCOSUR countries is supported by infrastructure investment and land market deregulation.

On the other hand, an important aspect of the analyses is the impact of increasing protein crop imports from South America on the EU's protein strategy. The literature (Witzke *et al.*, 2020; Matthews, 2020; IERiGŻ, 2023) notes that the EU's increased reliance on imported soybean meal could undermine local initiatives to support the cultivation of faba bean, lupin or non-GMO soybeans in Central and Northern Europe.

Environmental issues remain one of the most controversial aspects of the EU-MERCOSUR agreement. Work by (Nepstad *et al.*, 2014; Henders *et al.*, 2015; Lambin *et al.*, 2018) shows strong links between the expansion of soybean acreage and deforestation in the Amazon, Gran Chaco and Cerrado. Global Forest Watch analyses (GFW, 2023) and WWF reports (2021) indicate that the Brazilian states of Mato Grosso and Pará remain the main sources of deforestation linked to agricultural exports.

The European Court of Auditors (ECA, 2022) and the European (Parliament, 2021) highlight that the current design of the agreement does not provide effective mechanisms to enforce sustainability provisions. In turn, Voora *et al.*, 2020 in an IISD study suggest that even Round Table on Responsible Soy (RTRS) type certificates do not eliminate the risk of indirect environmental impacts.

Also relevant from a feed market perspective are industry data and reports - including (FEFAC, 2023), Oil (World, 2023), (USDA, 2024) and (Copa-Cogeca, 2022). These data show that MERCOSUR supplies more than 85% of soybean meal imports to the EU and more than 60% of maize imports during seasons disrupted by

the war in Ukraine. Especially after 2022, Argentina's role as an exporter of maize to the EU has increased (DG AGRI, 2023).

In the context of sustainable trade policy, work by Sartor and Matthews, (2021) and the European Environmental Bureau (EEB, 2022) highlights the conflict between the objectives of the European Green Deal and the actual environmental balance associated with imports. In this context, the need for additional ESG mechanisms, such as the (European Commission, 2023), to restrict the marketing of raw materials linked to deforestation, is pointed out.

The literature review indicates that the impact of the EU-MERCOSUR agreement is strongly ambivalent. On the one hand, it allows access to low-cost protein components, while on the other hand, it may exacerbate the EU's dependence on imports and hinder the achievement of EU climate and environmental goals. Analyses suggest that the effects of the agreement will strongly depend on the safeguards adopted, including ESG requirements and production certification.

3. Materials and Methods

A quantitative and qualitative approach was used to conduct a comprehensive and up-to-date analysis of the impact of the EU-MERCOSUR trade agreement on the European and Polish feed raw material markets - with a focus on soybean meal and maize.

An analysis of the latest trade and statistical data was combined with a critical review of policy documents and industry and environmental reports. The main objective was to capture current volume and price developments in imports, as well as to identify regulatory, environmental and structural risks that affect security of supply and feed market stability.

The quantitative analysis is based on data from a wide range of recognised international and domestic sources, updated to 2024. The primary source of statistical information on foreign trade is the Eurostat - COMEXT system, from which data on the volume and value of soybean meal and maize imports to the EU and Poland between 2015 and 2024 were obtained.

These data were supplemented with information from UN COMTRADE and FAOSTAT, which allowed an assessment of the geographical structure of supply and international trade trends. Detailed industry data published by Oil World and the European Feed Manufacturers Federation (FEFAC) on the production, prices and origin of feed raw materials in Europe were also used.

In the national part, data from the Central Statistical Office (CSO), the Ministry of Agriculture and Rural Development (MARD) and the Institute of Agricultural and Food Economics (IERiGŻ PIB) were taken into account, which include imports,

CIF/FOB prices, feed consumption and the structure of feed protein consumption. In addition, forecasts published by the European Commission's Directorate-General for Agriculture (DG AGRI) and the US Department of Agriculture (USDA) were used in the scenario analysis.

An important methodological aspect is the inclusion of the conversion of soybean into its equivalent in the form of soybean meal using a coefficient of 0.79. This allows for a more accurate assessment of import volumes and their interpretation, particularly in relation to the European Union as a whole. In the case of Poland, the impact of this conversion is minimal, but nevertheless remains important in comparative analyses and in the interpretation of aggregated data.

As part of the quantitative analysis, trends in the volume of imports of soybean meal (including soybean equivalents) and maize from MERCOSUR countries to the European Union and Poland between 2015 and 2024 were examined in detail. The volatility of import prices relating to soybean meal and maize only, both on world markets and in imports to the EU and Poland, was also analysed.

This enabled an assessment of the supply and demand dynamics, as well as price and logistical risks associated with these feedstuffs. The analysis allowed the identification of the impact of key global and regional factors, such as exchange rate fluctuations, logistics disruptions or changes in trade policy.

The Herfindahl-Hirschman Index (HHI) was used to assess the degree of market concentration and import risk. This is a measure of market concentration, calculated as the sum of the squares of the market shares of individual suppliers in a given market:

$$HHI = \sum_{i=1}^n s_i^2$$

where s_i is the percentage share of the i -th supplier (expressed as a percentage, e. g. 25 means 25%). The value of the HHI can range from 0 (completely dispersed market) to 10,000 (monopoly). In the analysis of the feedstock market, this indicator is used to assess the degree of dependence on specific suppliers, which makes it possible to determine the risks associated with import concentration. In the following analysis, the HHI was used to interpret the level of market concentration and the potential effects of trade liberalisation on security of supply.

As part of the scenario analysis, three options for developments were developed. The first, the reference scenario, assumes the status quo, i. e. no full implementation of the EU-MERCOSUR agreement. The second option is the liberalisation scenario, which envisages full implementation of the agreement together with tariff preferences, which could significantly affect the feedstock market. The third scenario considers the implementation of the agreement with the simultaneous

application of new environmental requirements, such as the EUDR deforestation regulation or carbon footprint reporting obligations.

The qualitative part of the analysis was based on a review of documents from European institutions, including the European Commission, the European Parliament and the Council of the EU, which relate to trade with MERCOSUR countries and sustainable development policies. Also taken into account were the export strategies of MERCOSUR countries in the agricultural products sector, particularly soya and maize, which are an important element of trade negotiations.

In addition, reports from NGOs such as Greenpeace, WWF and Global Forest Watch, which highlight the problem of deforestation in South America and its links to soy production, were analysed. The study also drew on the positions of industry organisations such as FEFAC and Copa-Cogeca, as well as scientific literature on CO₂ emissions, sustainable agriculture and agricultural trade.

The analysis was comparative and included both economic and environmental and political variables. Particular attention was paid to the specifics of the feed market in Poland, including the structure of feed protein consumption, the role of domestic sources of plant protein such as rapeseed meal and cost pressures in the poultry and pig sectors. This made it possible to identify potential risks and opportunities associated with the implementation of the EU-MERCOSUR agreement, both in the national and EU context.

4. Research Results and Discussion

Statistical data from 2015-2024 clearly confirm the dominant role of MERCOSUR countries as suppliers of feed raw materials to the European Union, especially in the soybean meal segment. During the period analysed, total imports of soybean meal into the EU averaged over 27 million tonnes per year, the vast majority of which - in the range of 17 to over 22 million tonnes - came from MERCOSUR countries.

The share of these countries in total imports remained above 70%, peaking in 2015. (22. 1 million tonnes, i. e. about 76%) and a minimum in 2023 (17. 3 million tonnes, i. e. about 67%). In 2024, imports from this direction increase again to 21. 5 million tonnes, stabilising at a high level. This strong presence of Brazil, Argentina and Paraguay in EU soybean meal supplies is due to both their price competitiveness and export predictability. However, the volatility of shares has been influenced by changes in trade policy and climatic constraints on production in South America. (Table 1).

For maize, the situation was more complex. Throughout the 2015-2024 period, maize imports into the EU were characterised by wide fluctuations: from around 11 million tonnes in 2015, through 23.7 million tonnes in 2022, to 19.9 million tonnes

in 2024. The share of MERCOSUR countries was much lower than for soybean meal, ranging from 1.3 to 7.7 million tonnes per year.

Table 1. Imports of soybean meal and maize into the EU and Poland (thousands of tonnes)

Item	EU				POLAND			
	soybean meal		maize		soybean meal		maize	
	total	Mercosur	total	Mercosur	total	Mercosur	total	Mercosur
2015	28 969	22 091	11 392	1 361	2 196	1 709	338	68
2016	28 135	21 496	11 876	1 418	2 330	1 991	283	66
2017	27 921	21 089	15 511	4 232	2 541	2 261	384	44
2018	27 926	18 609	20 688	4 795	2 595	2 123	256	35
2019	28 406	19 242	22 143	5 109	2 689	2 105	362	35
2020	28 088	20 767	15 689	4 301	2 717	2 359	381	50
2021	28 057	21 028	14 074	3 279	2 721	2 393	174	52
2022	27 765	20 690	23 698	7 749	2 805	2 400	1 977	71
2023	25 716	17 332	19 956	3 746	3 037	2 275	682	37
2024	30 234	21 532	19 974	1 760	3 625	3 016	125	66

Note : * of which soybean in soybean meal equivalent (conversion factor 0.79)

Source: Eurostat - COMEXT database, CSO.

The highest level of imports from the region was recorded in 2022 (7.7 million tonnes), which accounted for around 33% of total EU maize imports and was a direct consequence of the disruption to supplies from Ukraine following the outbreak of war and the exceptionally good harvests in Argentina and Paraguay.

There was a decline in subsequent years to 1.76 million tonnes in 2024, which should be linked to a partial normalisation of exports from Ukraine and crop volatility in South America. Despite this adjustment, Argentina has maintained its status as an important supplier thanks to its competitive logistical and pricing conditions, especially during periods of shortage in the EU.

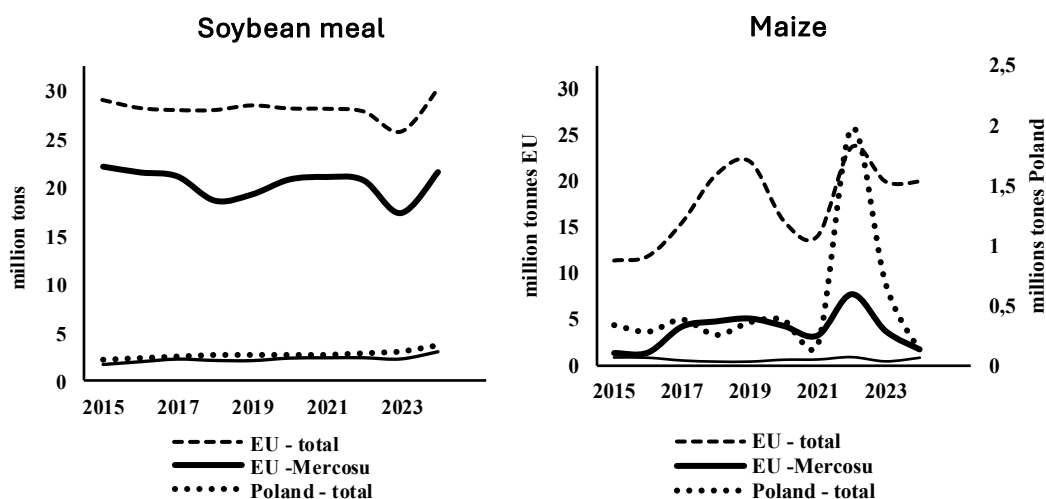
Poland, as one of the main importers of soybean meal in the EU, also shows a strong link with MERCOSUR markets. During the analysed period, the volume of soybean meal imports from the region increased from 1.71 million tonnes in 2015 to 3.02 million tonnes in 2024, an increase of more than 75% over the decade. The highest volumes were recorded in 2020 and 2022 (2.36 and 2.40 million tonnes respectively), followed by a further increase in 2024, to a record high.

Such high levels of imports from South America account for more than 80% of Poland's total soybean meal supply, confirming the strong dependence on external sources of feed protein and the sensitivity of the market to regulatory changes and supply disruptions. Imports of soybean meal in traditional form dominate the import structure - converted soybean imports (soybean meal equivalent at a coefficient of 0.79) are of marginal importance.

In the case of maize, Poland's situation is different. Imports from MERCOSUR countries during the analysed period were irregular and relatively small, varying from 35 to 71 thousand tonnes per year, and still account for a small share of the national maize balance. Poland, thanks to its developed domestic production, remains more self-sufficient in this respect. Nevertheless, seasonal shortages, the growing needs of the poultry sector and the variability of yields - resulting, among other things, from droughts and extreme weather events - lead to occasional purchases from overseas, especially during periods of competitive FOB prices and high demand.

Figure 1 below illustrates the dynamics of soybean meal and maize imports from MERCOSUR countries to the EU and Poland from 2015 to 2024, confirming a gradual increase in dependence, especially in the maize segment (Figure 1).

Figure 1. Polish and EU imports of soybean meal and maize



Source: COMTRADE, Eurostat, own calculations.

The data presented in the table indicate an increasing geographical concentration of the supply of feed raw materials, especially soybean meal, to the EU and Poland. Analysis of the Herfindahl-Hirschman Index (HHI), which measures the degree of market concentration, reveals a high level of concentration of soybean meal imports to the EU and Poland.

The HHI exceeded the 4500-5000 level, indicating a significant dominance of a few major suppliers - Brazil, Argentina and Paraguay - with marginal importance of the others. This level of concentration implies a high risk of supply disruptions due to climatic, political and logistical factors.

For maize, the HHI fluctuates around a value of 2500-3000, indicating a moderate level of concentration. The increase in Argentina's share after 2022, at the expense of Ukraine, has increased the risk of market dependence on a single supplier. Poland, thanks to its expanding domestic maize production, maintains a lower level of concentration, which translates into greater flexibility and a lower risk of disruption.

Prices for imported feedstocks such as soybean meal and maize were characterised by high volatility from 2015 to 2024, reflecting global supply and demand trends and geopolitical factors. The analysis includes prices for total imports and imports from MERCOSUR countries, split between the European Union and Poland.

In soybean meal imports to the European Union, a clear downward trend in prices can be observed in the first half of the analysed period, with total prices falling from EUR 378/t in 2015 to around EUR 330/t in 2017. This period was characterised by relative stability in supply from MERCOSUR countries, as well as moderate demand on global markets.

After 2017, there was a gradual increase in prices, which accelerated sharply in 2021-2022, when prices reached a record high of around EUR 522/t. This price increase was driven by production constraints in South America, particularly droughts in Brazil and Argentina, as well as significant logistical and market perturbations resulting from the war in Ukraine.

This period also saw changes in the supply structure, with MERCOSUR countries increasing their share, but increasing requirements for sustainability and environmental certification began to affect export costs.

As a result, soybean meal prices from the region often approached or exceeded the average price for imports overall, reflecting increased production costs and compliance with ESG standards.

The price peak in 2022 was followed by a marked reduction to around EUR 420/t in 2024, linked to improved weather conditions in South America, the stabilisation of global markets and the partial lifting of logistical disruptions. Despite this decline, prices still remained relatively high compared to pre-pandemic years, indicating continuing supply tensions and rising production costs.

In Poland, soybean meal import prices followed a similar trajectory, with a level of EUR 379/t in 2015, rising to EUR 532/t in 2022 and falling to EUR 415/t in 2024. Prices from MERCOSUR tended to be slightly lower here, confirming the competitiveness of South American raw materials (Table 2).

Maize import prices to the EU increased from EUR 171/t in 2015 to EUR 294/t in 2022, before falling to EUR 207/t in 2024. Maize imports from MERCOSUR have

been characterised by similar or slightly higher prices in recent years, especially during the period of supply disruptions from Ukraine.

In Poland, maize prices were generally higher than in the EU, reaching 248 EUR/t in 2022 and 352 EUR/t in 2024, with prices from MERCOSUR even higher.

Table 2. *Prices of soybean meal and maize imports to the EU and Poland (EUR/t)*

Item	In imports to the EU				In imports to Poland			
	soybean meal		maize		soya meal		maize	
	Total	Mercosur	Total	Mercosur	Total	Mercosur	Total	Mercosur
2015	378	373	171	180	379	376	172	228
2016	344	339	166	171	346	342	170	228
2017	330	323	166	155	330	326	159	246
2018	349	343	165	162	352	349	169	231
2019	328	321	168	165	322	317	168	248
2020	332	323	169	161	337	330	168	247
2021	405	392	219	214	418	404	238	315
2022	522	510	294	308	532	528	248	411
2023	505	501	257	258	499	507	232	490
2024	420	408	207	211	415	410	352	333

Source: Eurostat - COMEXT database, CSO, own calculations.

An additional source of analysis is the world prices of feed raw materials, including soybean meal from Argentina (CIF Rotterdam), soybeans from the USA (CIF Rotterdam) and maize (FOB, Black Sea region). The 2015-2024 data clearly shows high price volatility, with a marked increase in 2021-2022, followed by a decrease in 2023 and 2024.

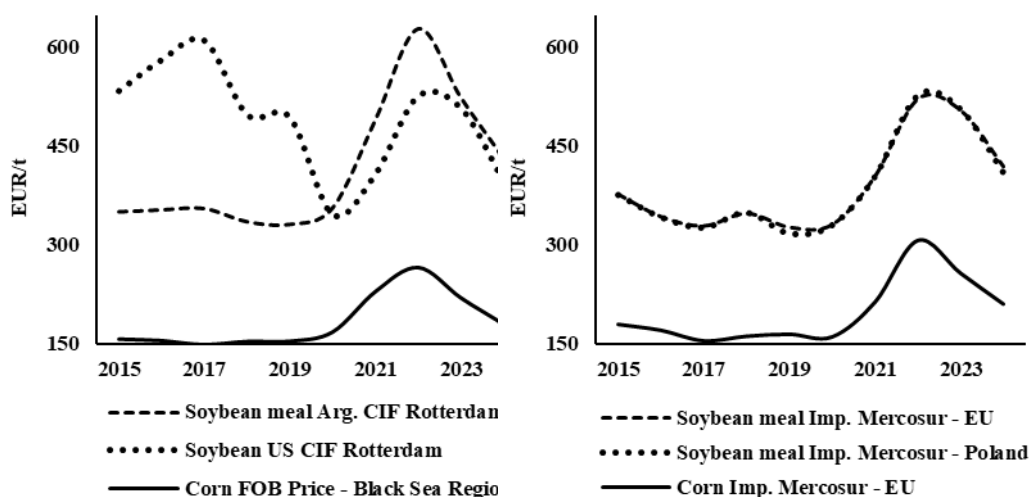
For soybean meal from Argentina, prices remained relatively stable between 2015 and 2020, ranging between EUR 332 and EUR 357/t. From 2021 onwards, however, there was a sharp increase - to EUR 490/t in 2021 and EUR 628/t in 2022. This was the result of global supply tensions, increasing demand for feed protein and international logistics constraints. In the following years, prices corrected: to EUR 524/t in 2023 and EUR 432/t in 2024, linked to improved harvests in South America and greater stability in global trade.

A similar trend affected US soybeans, with CIF Rotterdam prices rising from EUR 408/t in 2021 to EUR 526/t in 2022, before falling to EUR 508/t in 2023 and EUR 398/t in 2024. In earlier years (2015-2020), US soybeans were noticeably more expensive than meal from Argentina - even reaching EUR 610/t in 2017, indicating the limited competitiveness of this commodity against products from MERCOSUR countries.

Maize prices (FOB, Black Sea region) in 2015-2019 remained within a narrow range of EUR 149-158/t, indicating stable market conditions. The increase started in 2020. (EUR 168/t) and culminated in 2021-2022 with EUR 230/t and EUR 266/t

respectively. This was a direct result of the war in Ukraine, the disruption of exports via the Black Sea and the increase in energy and input prices. In 2023-2024, prices fell sharply - to EUR 220/t and then EUR 180/t - as a result of the partial restoration of exports from Ukraine, increasing transit through Romania and record harvests in exporting countries.

Figure 2. World prices of maize, soybean and soybean meal and imports to Poland and the EU from Mercosur



Note: "Corn" refers to maize (U.S. terminology used in market quotations).

Source: Eurostat - COMEXT database, Oil World, IGC, CSO, own calculations.

The juxtaposition of these three indicators confirms that 2022 was the peak year for feed market prices, followed by a moderate stabilisation in 2023-2024. Despite the correction, price levels in 2024 were still higher than in the pre-pandemic years, reflecting continued cost pressures and structural changes in global feed commodity supply chains.

The war in Ukraine has had a fundamental impact on the EU feed market as it has reduced the availability of cheap maize and rapeseed meal from the east, disrupted logistics in the Black Sea region, including the blockade of the ports of Odesa and Nikolaev, increased freight and marine insurance costs, and forced the EU to redistribute import destinations, thereby increasing dependence on MERCOSUR countries, especially Argentina.

Increased dependence on South America, while providing temporary stability of supply, entails increasing logistical, environmental and price risks - especially in the context of global climatic disruptions such as El Niño or La Niña droughts and limited port capacity.

Price volatility was also influenced by exchange rate fluctuations, with a strong USD in 2022-2023 making commodities priced in USD more expensive, local export bans, for example in Argentina being introduced as temporary restrictions on grain and meal exports in 2021-2022, and changes in EU trade policy, such as the introduction of ESG and deforestation risk controls (EUDR).

5. Scenarios for the Impact of the EU-MERCOSUR Agreement on the Feed Sector in the EU and Poland

To better understand the potential impact of the implementation of the EU-MERCOSUR trade agreement on the feed market in the European Union and Poland, a scenario analysis was conducted. It was based on trade data for 2015-2024 (Eurostat, UN COMTRADE), industry reports (FEFAC, Oil World), European Commission policy documents and price and structural forecasts. Experiences from previous trade agreements (e. g. CETA, EU-Ukraine) were also taken into account, which showed both the opportunities of trade liberalisation and the challenges of its social and environmental consequences.

Scenario 1: Status quo, assumes that the EU-MERCOSUR agreement is not implemented or its implementation is significantly delayed. Existing tariffs, sanitary standards and environmental requirements then apply. The EU maintains a strong dependence on imports of feed protein from MERCOSUR countries, primarily Brazil, which remains the main supplier.

Such a scenario guarantees relative stability and predictability for the feed market, but at the same time limits the possibility to diversify raw material sources and hampers the development of domestic protein crops. The lack of change also means that geopolitical risks remain, related to political instability or extreme climatic conditions in South America, which could disrupt supply chains. The sector remains vulnerable to external shocks and cost pressures from global markets do not ease.

Scenario 2: With full trade liberalisation (agreement implemented without additional ESG conditions), there is formal facilitation of soybean meal and maize imports from MERCOSUR countries. Although tariffs on these commodities are already 0%, the agreement may reduce non-tariff trade barriers (e.g., quotas, phytosanitary certification, unstable administrative practices), resulting in greater predictability and availability of supply.

This liberalisation may lead to a moderate decrease in the price of feed components in the EU - estimated at 1-3% - which directly reduces the production costs of poultry meat, pigs and cattle. For livestock producers, this means improved competitiveness and margins. At the same time, this scenario runs the risk of further concentrating import sources and deepening dependence on MERCOSUR countries. This could weaken the position of local producers of protein crops (e.g., non-GMO

soybeans, faba beans, peas) and increase the strategic vulnerability of the market to external disruptions.

Scenario 3: Trade agreement + implementation of EU environmental regulations - EUDR, carbon footprint, assumes that the liberalisation of tariffs takes place in parallel with the implementation of stringent environmental standards and sustainability requirements, such as the EUDR regulation and the obligation to report the carbon footprint of production. In practice, this means that preferential terms will only be available to those MERCOSUR exporters that meet strict environmental criteria, including reducing deforestation and introducing certifications to prove the sustainability of production.

Such a model allows imported feed to remain price competitive while promoting development and investment in certified, environmentally responsible farms and processing plants. From the perspective of the EU and Poland, this scenario is conducive to building resilience in the feed market by supporting the development of local protein sources and reducing the negative environmental impact of imports.

The model is consistent with the EU's farm-to-table strategy and climate goals, which can improve the EU's image as a global leader in sustainable agriculture.

Table 3. Comparison of the impacts of the three scenarios on the feed sector in the EU and Poland

Scenario	Feed price	Imports from MERCOSUR	Risk of dependency	Development of local sources
Status quo	Stable	High	High	Limited
Contract without ESG	Lower	Very high	Very high	Inhibited
Contract+ ESG	Moderate	Selective	Medium	Supported

Source: Eurostat (COMEXT), USDA (GATS), FEFAC, IERiGŻ-PIB and authors' scenario estimates based on 2015-2024 data.

The scenario analysis indicates that decisions on the implementation of the EU-MERCOSUR agreement will have a fundamental impact on the supply structure of feed raw materials and prices in the European and domestic markets. The scenario of full trade liberalisation without additional environmental requirements may bring short-term cost benefits, but at the expense of strategic security and sustainability of the sector.

The option including environmental regulations, on the other hand, represents a more sustainable model, allowing a combination of cost efficiency with environmental protection and support for the development of local plant protein production. The choice of this scenario can contribute to making the feed market more resilient and accountable to the challenges of the future. The choice of this model can provide a balance between cost-effectiveness and the resilience and environmental responsibility of the feed market.

6. Conclusions

The analysis of the impact of the implementation of the EU-MERCOSUR trade agreement indicates a number of important consequences for the feed market in the European Union and Poland. Both the EU and Poland remain heavily dependent on imports of soybean meal and maize from MERCOSUR countries, which is confirmed by high indicators of geographical concentration of supply. High values of the Herfindahl-Hirschman index (above 4500 in the case of soybean meal) signal limited diversification of sources and an increased risk of disruptions in supply chains due to both logistical, geopolitical and climatic factors. Such risks could translate into increased price volatility and instability in the overall feed market.

The implementation of a trade agreement without additional environmental and social regulations (ESG) could bring cost benefits in the short term, reducing feed purchase prices by up to 5-8%. Such a situation would be particularly beneficial for the livestock sector, including poultry and pigs, improving their competitiveness on domestic and international markets.

However, this scenario carries a serious risk of further deepening dependence on a narrow group of suppliers, which may result in limited flexibility to respond to possible supply disruptions. In addition, liberalisation without environmental safeguards risks exacerbating environmental pressures on exporting countries, including through further deforestation of the Amazon region and other environmentally sensitive areas.

The most sustainable and long-term beneficial solution seems to be the implementation of a trade agreement coupled with strict ESG mechanisms, such as mandatory environmental certification, carbon footprint reporting and compliance with the EUDR on deforestation-free products.

Such a model allows economic benefits to be reconciled with climate policy objectives and a farm-to-table strategy. At the same time, the introduction of environmental requirements can stimulate the development of the EU certified feed market, promote investment in sustainable production and enhance the positive image of the EU agri-food sector internationally.

The conclusions of the study also highlight the urgent need to accelerate the development of domestic feed protein production. Increased investment in the cultivation of non-GMO soybeans, faba bean, lupins and peas, as well as in the development of storage and processing infrastructure, is a key element in reducing the strategic risks associated with over-dependence on imports. Support from the Common Agricultural Policy (CAP) and rural development programmes should be geared towards increasing protein self-sufficiency in Europe, helping to strengthen the resilience of the feed sector to external shocks.

Ultimately, it will be crucial to maintain and develop flexible risk management tools, including systems to monitor prices, import structures and supplier behaviour. The experience of the war in Ukraine has highlighted how rapid changes can affect the EU's trade balance and the importance of diversifying raw material sources and food security. As one of the largest feed and livestock producers in the Union, Poland has the opportunity to play a leading role in the sector's transformation towards greater independence and environmental sustainability.

Furthermore, the role of technological innovation and scientific research cannot be underestimated, as they can significantly improve the efficiency of feed production and reduce its impact on the environment. The development of alternative sources of protein, such as insect proteins or fermentation feeds, can reduce the pressure on traditional raw materials imported from distant regions of the world in the future.

The cooperation of stakeholders - producers, scientists, policy makers and NGOs - will be essential to successfully meet the challenges and opportunities associated with the implementation of the EU-MERCOSUR agreement.

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