Journal of Agriculture and Rural Development Studies
Volume 2 – Issue 4 – 2025
ISSN Online 3061-2756
www.imadr.jards.ugal.ro

DOI https://doi.org/10.35219/jards.2025.4.09

Romania's Corn Trade in the Current Context

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ARTICLE INFO

Article history:
Received: September 25, 2025
Accepted: November 20, 2025
Published: December 15, 2025

Keywords:
Vegetal sector, Cultivated area, production, Yield

ABSTRACT

Globalization and the high level of digitalization draw important trade routes in most regions of the planet, thus ensuring the delivery of raw materials, components of any kind or finished products to consumers in the global market. Agriculture is a strategic area that will guarantee food security. Romania plays a very important role in European agriculture, having a dynamic market. In 2023, out of the total cultivated area in the country of 8,211.2 (thousand ha), with 5,168.5 (thousand ha) cultivated with cereals for grains, corn had a share of 26.74% and 42.48%, the area reaching 2,195.3 (thousand ha). In 2018, when the highest total production of corn grains was recorded for the period under analysis, total production increased almost 5 times compared to the reference year 2007, reaching 18,663.9 (thousand tons). Although we have large areas cultivated with corn, average yields (kg/ha) remain low. The highest Balassa Index value of 18.19 was recorded in 2021.

1. Introduction

Corn occupies one of the top positions in Romania's grain economy (Popescu et al., 2021). Corn is one of the most important crops grown worldwide and can be easily cultivated in various climatic conditions, offering many advantages: high yield, stability, high potential for yield growth, resistance to disruptive factors, a wide range of applications and high economic benefits (Dragomir et al., 2022).

It also plays an important role in human and animal nutrition and as a raw material for key products: starch, alcoholic beverages and fuels (Butnariu et al., 2014; Soare and Dobre, 2016; Chen et al., 2019; Dragomir et al., 2022).

Due to the increased use of corn in animal feed and its use as fuel in ethanol production, the market is expected to experience further growth during the 2023-2028 forecast period, with a Compound Annual Growth Rate (CAGR) of 1.1%. Whether it's a health or economic crisis, it can spread easily, and its impact can be felt around the world if coordinated and strong action isn't taken right from the start. Contradictory trends in international economic relations are reflected in a centripetal vector of movement that drives the process of globalization and a centrifugal vector that aims at regional integration and rapprochement between neighbouring countries.

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Globalization, a current trend and complex phenomenon (Gianetto, 2013), drives networks and activities that transcend economic, social, and geographic boundaries (Anderson and Babinard, 2001), resulting in increased spatial integration of agricultural commodity markets (Hamulczuk et al., 2019). The dynamics of the global commodities market reflect the state of the world economy, characterized by uncertainty and vulnerability: they cause a slowdown in economic activity in advanced countries and emerging economies (Cartas, 2015a) and mark a series of structural and cyclical changes (Cartas, 2015b). The analysis of foreign trade activity is important for establishing efficiency, identifying transactions and justifying decisions specific to this activity (Popescu et al., 2018). The main factors indicating a country's development are a positive foreign trade balance and increased foreign trade volume (Antoci, 2016). Food security is a constant challenge (Jambor and Babu, 2016) and agricultural competitiveness remains an elusive concept with many multidimensional facets that continues to attract the attention of policymakers and researchers in the context of free trade in agri-food products on global markets (Istudor et al., 2022).

2. Material and method

The research is based on data provided by the National Institute of Statistics, accessible via Tempo online, Ministry of Agriculture and Rural Development (MADR), and International Trade Center (INTRACEN) for the period 2007-2023. The indicators analysed in this study are:

(a) area cultivated with corn;

(b) total corn production and average production per hectare;

(c) degree of coverage of imports by exports, price dynamics (RON/kg), values of exports, imports and trade balance;

(d) Balassa index.

Methods used in data analysis:

The Fixed Base Index (FBI) was used to show the evolution of the analysed indicator over a period of time, each year of analysis being compared with the value recorded in the first year, taking 2007 as the reference year, the year Romania joined the European Union and calculated using the formula FBI = $\frac{X_n}{X_0}$x100;

Descriptive statistics: mean, standard deviation, coefficient of variation.

The correlation coefficient (r), designed to quantify the existence of a relationship between the indicators studied;

The regression equation (y=bx+a), to identify the extent to which corn production (y) is influenced by cultivated area (x);

The coefficient of determination (r^2), calculated to establish the extent to which the variation in the dependent variable (y) depends on the variation in the independent variable (x).

The main indicators used in this analysis were processed using the formulas (Iosifescu et al., 1985):

Average (A): $A = \frac{X_1+X_2+X_3+\ldots\ldots Xn}{n}$, calculates the average level of indicators present in a dynamic series of time intervals.

Annual average growth rate (%): $R = \left(\sqrt[N-1]{\frac{X_n}{X_0}} - 1\right) \times 100$.

Degree of coverage of imports by exports (%): DC $= \frac{E}{I}$x100, where E is the value of exports and I is the value of imports. To measure the degree of specialization of Romania's export products (Balassa index), the Balassa index [SS1]was used and calculated using the formula (Balassa, 1965):

$$Bl_j^A = \frac{\text{hare of industry j in country A's exports}}{\text{share of industry j in the reference country's exports}}$$

The results were summarized in tables and graphs were drawn up.

3. Results and discussions

Although we have the largest area cultivated with corn in the EU, the yield per hectare is half that of France or Belgium (Petcu and Martura, 2018) and an important opportunity for the Romanian market, in addition to increasing the yield per hectare, is the expansion of the organic sector, which has great potential in our country due to the characteristics of the soil (Popovici et al., 2018). The largest import markets for Romanian corn harvests between 2016 and 2020 were Spain, the Netherlands, Egypt, Turkey, and Italy (Dragomir et al., 2022). In 2007, Romania cultivated 7,777.2 (thousand ha), of which 2,524.7 (thousand ha) was corn, accounting for 32.46% of the total area cultivated with cereals for grain, accounting for 49.22%. Over time, the areas have fluctuated and in 2023, of the total cultivated area of 8,211.2 (thousand ha) in the country, with 5,168.5 (thousand ha) cultivated with cereals for grain, with corn accounting for 26.74% and 42.48%, respectively, reaching an area of 2,195.3 (thousand ha) (Table 1).

Table 1. Area cultivated with corn in the period 2007-2023 (000 ha) in Romania

	2007	2018	2019	2020	2021	2022	2023
Cultivated area – total of which:	7,777.2	8,466.7	8,737.3	8,263.7	8,263.8	8,005.9	8,211.2
Cereals for grain, of which:	5,129.2	5,257.2	5,569.1	5,338.1	5,351.5	5,183.8	5,168.5
Corn kernels	2,524.7	2,439.8	2,678.5	2,537.1	2,549.3	2,431.1	2,195.3
% of cultivated area – total	32.46%	28.82%	30.66%	30.70%	30.85%	30.36%	26.74%
% of area under grain crops	49.22%	46.41%	48.10%	47.53%	47.64%	46.90%	42.48%

Source: Authors, based on NIS (2025)

Regarding the dynamics of corn cultivation areas for the period analysed, the trend was fluctuating (Figure 1.).

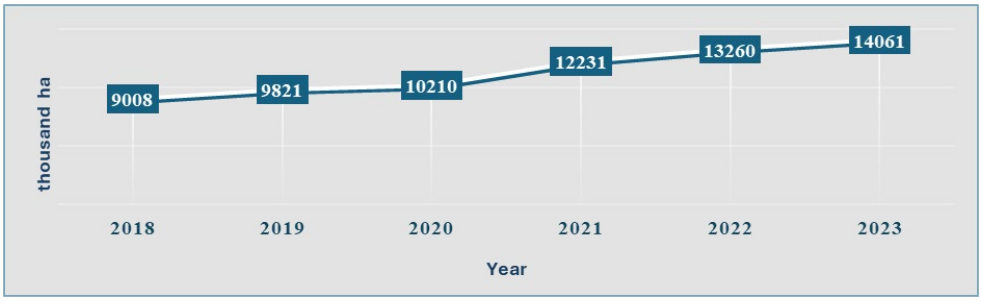

Figure 1. Dynamics of areas cultivated with grain corn ('000 ha) in Romania between 2018 and 2023 (FBI reference year 2007)

Source: Authors, based on NIS (2025)

Analysing the total production ('000 tons) of corn (Table 2.), with fluctuating dynamics (Figure 2.) for the period under review, it can be seen that in 2007, out of a total of 7,414.8 ('000 tons) total

production, with a production of 3,853.9 (‘000 tons), corn accounted for 49.32%. In 2018, total corn production increased almost fivefold compared to the reference year 2007, to 18,663.9 (‘000 tons).

Table 2. Total corn grain production (‘000 tons) in Romania between 2007 and 2023

	2007	2018	2019	2020	2021	2022	2023
Grain production - total, of which:	7,814.8	31,553.3	30,412.4	18,153.7	27,791.3	18,860.7	20,784.66
Corn kernels	3,853.9	18,663.9	17,432.2	10,096.7	14,820.7	8,037.1	8,744.0
% of Grain production - total	49.32%	59.15%	57.32%	55.62%	53.33%	42.61%	42.07

Source: Authors, based on NIS (2025)

There was a decrease in total grain corn production in 2022 of 8,037.1 (thousand tons), the lowest value for the period analysed. In 2023, total grain corn production was only 8,744 (000 tons), accounting for 42.07% of total grain cereal production. The highest total production of grain corn (thousand tons) for the period analysed was recorded in 2018, accounting for 59.15% of total grain production. Trade between countries has facilitated the development of agricultural production by providing access to the most advanced resources, technologies and equipment, other goods and services for agriculture, as well as related fields of activity (Tremblay, 1990; Kjeldsen-Kragh, 2001; Popescu, 2022). Recent climatic conditions have influenced total corn grain production, with fluctuating dynamics and the lowest values recorded in 2020, 2022 and 2023 (Figure 2.).

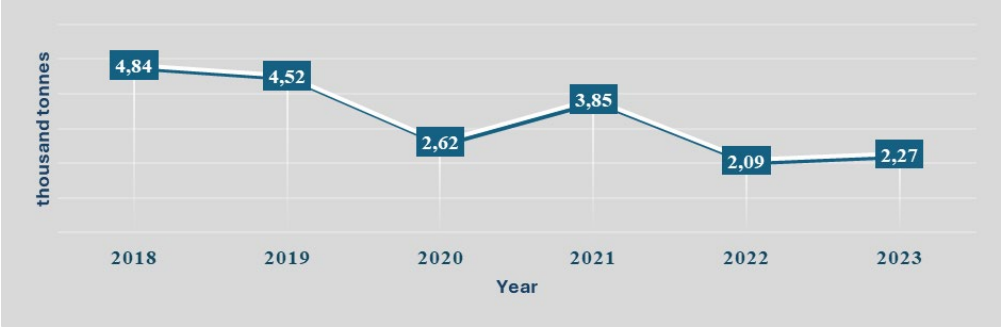

Figure 2. Dynamics of total grain corn production (‘000 tons) in Romania between 2018 and 2023 (FBI reference year 2007)

Source: Authors, based on NIS (2025)

In terms of average yields (kg/ha), the trend has been fluctuating (Figure 3).

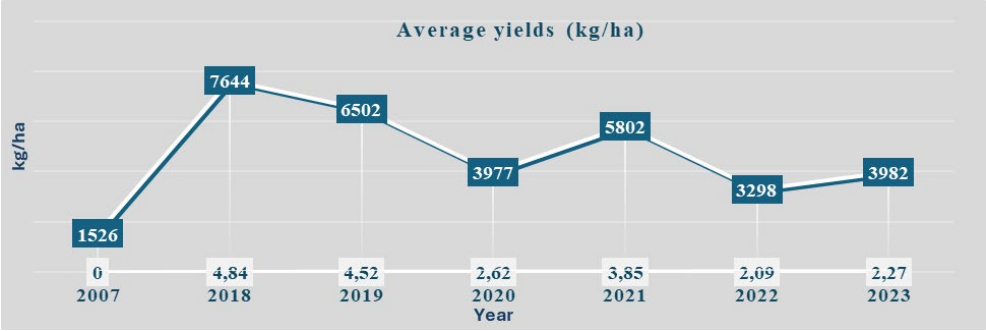

Figure 3. Average yields (kg/ha) and dynamics of grain corn production in Romania between 2007 and 2023 (FBI reference year 2007)

Source: Authors, based on NIS (2025)

While in 2007, the average yield for grain corn in Romania was 1,526 kg/ha, in 2018, when the highest yield for the period analyzed was recorded, the average yield rise to 7,644 kg/ha. The lowest average yield was recorded in 2022, at 3,298 kg/ha, because of adverse weather conditions, an agricultural year characterized as being dry.

Table 3. Mean, standard deviation, and variation of coefficients for cultivated area, total production, and average production (kg/ha) of grain maize in the period 2007–2023

	Mean	Standard deviation	Variation of coefficients (%)	Annual average growth rate (%)	2023 vs 2007 (%)
Total cultivated area (`000 hectares)					
Corn	2,479	150	6.0	-2.3	-1.8
Total production (`000 tons)					
Corn	11,664	5,437	46.6	218.5	202.7
Average yield (kg/ha)					
Corn	4,676	2,090	44.7	225.7	206.4

Source: Authors, based on NIS (2025)

For the total area cultivated with corn (Romania, 2007-2023), with a coefficient of variation of 6.0%, the average was 2,479 (`000 hectares) with a standard deviation of ± 150 (`000 hectares). For total production, with a coefficient of variation of 46.6% and a standard deviation of ± 5,437 (`000 tons), the average was 11,664 (`000 tons), and for average production 4,676 (kg/ha) ± 2,090 (kg/ha) and a coefficient of variation of 44.7%. Compared to 2007, the year Romania joined the European Union, the average annual growth rate for the area cultivated with corn (`000 hectares) was -1.8%, for total production (`000 tons) 202.7%, and average production (kg/ha) increased by 206.4% (Table 3.). In other words, although the area decreased, total production and average production per hectare increased.

Table 4. Regression equation and correlation coefficient between the three indicators characterizing corn grain production in Romania, 2007-2023

	Pair of indicators	Regression equation	Correlation coefficient (r)	Coefficient of determination (r^2)
1	Total production (Y) and total cultivated area (X)	$y = 3.111x + 2962.7$	0.1277	0.0163
2	Average production (Y) and total cultivated area (X)	$y = -0.3984x + 5294.6$	-0.0417	0.0017
3	Total production (Y) and Average production (X)	$y = 2.5124x - 138.34$	0.9846	0.9695
Regression equation where the dependent variable was corn grain production (Y) and the independent variable (X) was total cultivated area and average production.				

Source: Authors, based on NIS (2025)

According to the data provided in Table 4, a strong correlation (r= 0.9695) was established between total corn production and average production per cultivated hectare, and using the regression equation, it was established that an increase in average production of one ton/ha will lead to an increase in total production of 2.5124 units. Analysing the values of exports and imports (in thousands of euros) for corn (Table 5.), Romania's accession meant an increase in exports by an annual average of 1,833.9%, but also an increase in imports by 196.7%. The trade balance has been positive over the last six years, with exports covering imports. In 2023, exports covered imports by 432.2%. The degree of coverage of imports by exports recorded the highest values for the period analysed in 2018 and 2019.

Journal of Agriculture and Rural Development Studies
Volume 2 – Issue 4 – 2025
ISSN Online 3061-2756
www.imadr.jards.ugal.ro

Table 5. Values of exports, imports, trade balance, and import coverage by exports (%) for grain corn in Romania during 2007-2023 (in thousands of euros)

Year	Export ('000 euro)	Import ('000 euro)	Trade balance ('000 euro)	DC (%)
2007	75,256	129,438	-54,182	58.1
2018	869,278	123,267	746,011	705.2
2019	1,242,281	171,733	1,070,548	723.4
2020	1,073,952	318,882	755,070	336.8
2021	1,636,665	305,373	1,331,292	536.0
2022	1,905,745	503,713	1,402,032	378.3
2023	1,552,603	359,260	1,193,343	432.2
Average annual growth rate (%)	1,833.9	196.7		

Source: Trade Map. (2024). List of exporters for maize (corn); list of importers for maize (corn). International Trade Centre.

Figure 4. shows the dynamics of exports (million euros) and imports (million euros) after 2018 compared to 2007. The lowest values for exports were recorded in 2018 and 2020, and the highest in 2022. In the case of imports, the lowest values were recorded in 2018 and 2019. The Russian Ukrainian disagreements have strongly influenced the global economy and, implicitly, that of Romania, with dynamics fluctuating in recent years.

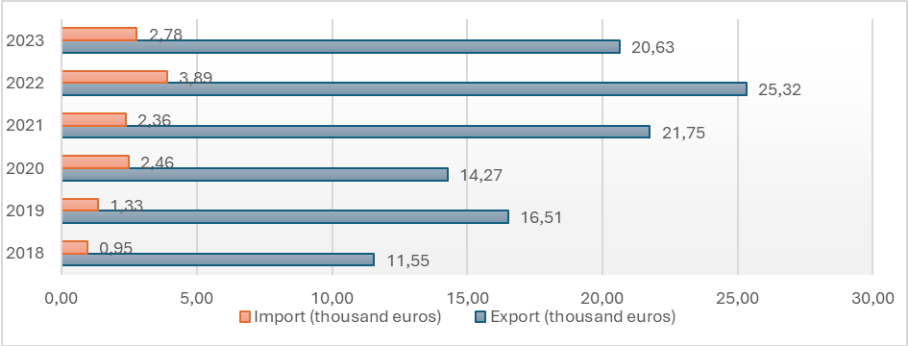

Figure 4. Dynamics of Romania's exports (EUR '000) and imports (EUR '000) between 2018 and 2023 (BFI reference year 2007) for grain corn

Source: Trade Map. (2024). List of exporters for maize (corn); list of importers for maize (corn). International Trade Centre.

The average purchase price of corn (RON/kg-STAS) in Romania for the period 2007-2023 shows a coefficient of variation of 33.9% and an average of 0.83 (RON/kg) with a standard deviation of ± 0.28 (RON/kg) and an average annual growth rate of 52.9% compared to the reference year 2007 (Table 6.).

Table 6. Price evolution in Romania for corn (RON/kg) between 2007-2021

Year	Average purchase price (RON/kg - STAS)	Mean (RON/kg - STAS)	Standard deviation RON/kg)	Variation of coefficients (%)	Annual average growth rate (%)	2023 vs 2007 (%)
Achieved in 2007	*0.55*	0.83	0.28	33.9	52.9	50.6
2018	0.62					
2019	0.64					
2020	0.70					
2021	0.90					
2022	1.31					
2023	1.08					

Source: Authors, based on NIS (2025)

Analyzing the dynamics of Romania's average purchase price (RON/kg - STAS) between 2018 and 2023 for corn (Figure 5), an upward trend can be observed for the analyzed period compared to 2007.

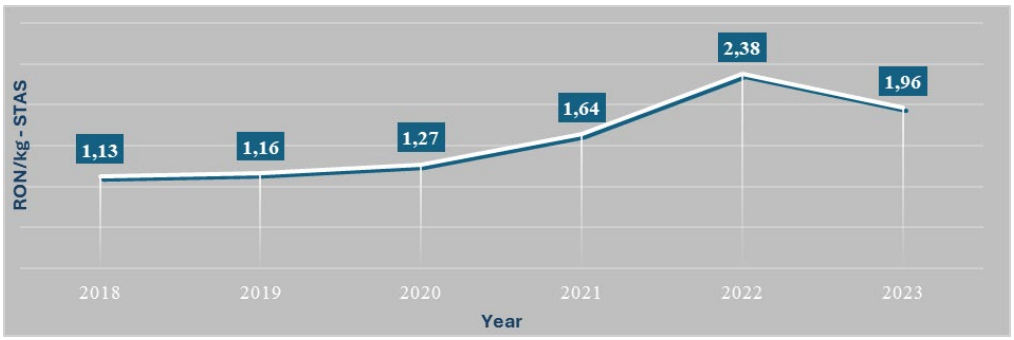

Figure 5. Romania's average purchase price (RON/kg - STAS) dynamics between 2018-2023 (BFI reference year 2007) for grain corn

Source: Authors, based on NIS (2025)

For the period analyzed, Romania recorded Balassa Index values greater than 1 (Table 7.). While in 2007 Romania's degree of specialization in corn trade was 3.50, after joining the EU in 2007, the index reached values six times higher. The highest value of the index was recorded in 2021, at 18.19.

Table 7. Balassa index applied to Romania's corn exports, 2007-2023

Mil. euro	2007	2018	2019	2020	2021	2022	2023
EpR	0.08	0.87	1.24	1.07	1.64	1.91	1.55
EtR	29.52	67.81	69.05	62.25	74.72	92.51	93.06
EpR/ EtR (%)	0.27%	1.28%	1.80%	1.72%	2.19%	2.06%	1.67%
EpUE-27	2.70	4.39	5.00	5.48	6.50	8.65	7.24
EtUE-27	3513.81	4932.42	5045.76	4648.84	5463.01	6.63	6434.38
EpUE-27/ EtUE-27 (%)	0.077%	0.090%	0.100%	0.119%	0.121%	0.132%	0.114%
Bl_j^A (*Balassa index*)	3.50	14.22	17.87	14.39	18.19	15.60	14.59

Note:
EpR - Romanian corn exports (million euros)
EtR – Total Romanian exports (million euros)
EpUE-27 – EU-27 corn exports (million euros)
EtUE-27 – Total EU-27 exports (million euros)

Source: Trade Map. (2024). List of exporters for maize (corn); list of products exported by the European Union (EU-27). International Trade Centre.

4. Conclusions

Romania, a country with a long agricultural tradition, is characterised by a dynamic market within Europe with corn, occupying a leading position in the cereal economy. Although we have large areas cultivated with corn, average yields (kg/ha) remain low. The trade balance over the last six years was positive, with exports covering imports. Agriculture remains a strong sector for Romania.

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