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STUDY ON THE TENDENCY OF TECHNICAL-ECONOMIC EVOLUTION OF VEGETAL AGRICULTURAL PRODUCTS

ANA URSU¹

Summary: *The aim of the paper is to investigate the evolution of agricultural production in rice, soybean and sugar beet crops, revealing their tendencies, as well as the main favorable or restrictive factors, the economic-social effects they generate and the formulation of possible solutions for production development. The study is based on the quantitative and qualitative analysis of the available statistical data series. The calculated indicators highlight the variability of the cultivated area, the yield per hectare, the prices, but also the trade balance. The place of each crop is examined from the point of view of the indicators studied and some conclusive remarks are made regarding the current state of economic development of the plant sector and of the studied plants.*

Keywords: *agricultural products, technical-economic indicators, economic-social effects*

JEL classification: *Q01, Q15, Q16.*

INTRODUCTION

The contribution of agriculture to development differs from country to country, depending on how agriculture is a source of growth and a tool to reduce poverty. (1) Studies show that EU agriculture benefits from the liberalization of international trade, because of a comparative advantage over other parts of the world, not only because of climate and soil fertility, or because it has a large and rich internal market, but also that possesses knowledge, accumulated over time, in response to the demand for high quality agricultural products at a relatively low price. Thus, the most important factors of production in the EU have become capital and knowledge, as opposed to the cheap labor and land on which the traditional theory of comparative advantage was based (and which also underlies the cost advantage attributed to developing countries today). (1) However, there are concerns regarding the variation of agricultural production depending on climate change, the volatility of agricultural prices under the pressure of seeking alternative energy resources (Von Braun, 2008, quoted by A. Dachin in 2011) and speculative actions (Zawojkska, 2010, quoted by A. Dachin in 2011). Also, within the European Union, the synchronization of the business cycle between the member countries is a necessary premise for the effective application of the common policies, but significant differences between the member countries, given the characteristics of the agriculture, reduce the degree of synchronization (Da-Rocha, 2006, quoted by A. Dachin in 2011).

MATERIAL AND METHOD

The present paper aims to find an answer to the question: How did the 3 agricultural products in Romania evolve compared to the main EU countries? This is achieved by analyzing the evolution of the following technical and economic indicators: the cultivated area, the obtained production, the price of capitalization as well as the commercial balance of the products. The study is carried out during the period 2007-2018. The research method consists in the empirical analysis of the available data. The motivation of the research consists in: the need to analyze the products as important products for the Romanian economy; awareness of the maintenance and extension of cultivated areas; the usefulness of knowing the evolution of the production of rice, soy and sugar beet in relation to the countries of the EU.

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In order to determine the differences existing between Romania and the main (competitive) countries of the European Union, producing rice, soy and sugar beet, the following statistical indicators were determined: average, standard deviation and coefficient of variation (CV%).

RESULTS AND DISCUSSIONS

In Romania, rice, soybean and sugar beet crops are supported by European funds (FEGA funding source) and Transitional National Aid (ANT) in order to achieve a high level of performance and stability. The purpose of this paper is to identify changes in the evolution of rice, soybean and sugar beet crops, compared with the main EU-27 cultivating countries, from the perspective of cultivated areas, yield per hectare, sales prices, imports and exports. For these crops, the agricultural policy measures in Romania aimed at expanding the cultivated areas and maintaining them in culture, as well as reducing imports. Starting with 2015, rice, soybean and sugar beet (SAPS + Redistributive Payment (PR) + Green payment (PI) + Transitional National Aid 1 (ANT 1 - for all crops) are among the crops that have benefited from coupled support. + Coupled Support (SC) + Transitional National Aid (ANT 6). According to Order no. 619/2015, art. no. 42, art. no. 47 and art. no. 50, coupled support was granted to rice, soybean and sugar beet growers - active farmers - who prove, based on a tax bill, the marketing of a minimum production of 4,500 kg / ha of rice, 1,300 kg of beans / ha on soy and 26,400 kg / ha for sugar beet, conditions that have been met.

In 2019, MADR decided to transfer money from coupled support for soybean to coupled support for alfalfa. The measures also envisage increasing the amounts allocated for the payment of support coupled to sugar beet and rice. For sugar beet the payment amount increases from 18,459,000 euros to 19,208,700 euros. Rice, from 4,800,600 euros to 5,117,765 euros.

Area cultivated with rice: In the EU, the main rice-growing countries are Italy, Spain, Greece, Portugal, France, Bulgaria, Romania, which ranks 6th, after Bulgaria, as the cultivated area. The coefficient of variability (15%) is lower than in France (17%), but is almost 4 times higher than in Italy (3.9%). The averages of the cultivated areas Italy (231 thousand ha) and Spain (111 thousand ha) are representative, the mentioned countries also registering the lowest values of the coefficient of variability, of 3.9% (Italy) and 7.4% (Spain). The situation is different for areas cultivated in Greece, Romania and France. This is explained by the fluctuations in the cultivation of rice fields. Table no. 1.

Table no. 1: Area cultivated with rice 2007-2017 (1000 ha)

Nr. crt	Specification	Average 2007-2017 (1000 ha)	Standard deviation (1000 ha)	The coefficient of variability (%)	Minimum 1000 ha (year)	Maximum 1000 ha (year)
0	1	2	3	4	5	6
1	Italy	231	8.9	3.9	216 (2013)	247 (2011)
2	Spain	111	8.2	7.4	96 (2008)	122 (2011)
3	Greece	31	3.5	11.3	26 (2008)	37 (2017)
4	France	19	3.3	17.0	16 (2008)	24 (2010)
5	Romania	11	1.7	15.4	8 (2007)	13 (2014)

Source: own processing according to EUROSTAT data

Rice yield (tonne/ha): The big rice-growing countries of the EU-27 are Spain (with an average of 7,551 to/ha), Greece (7,145 to/ha) and Italy (6,601 to/ha), followed by France (5,228 to/ha) and Romania (4,579 to/ha). The deviations fluctuate within limits limited to the average (0.30 Italy and 0.65 Romania), and the coefficient of variability indicates that there are no significant deviations, in the 11 years of production, compared to the average calculated in the case of Spain (4.9 %) and Italy (4.6%). Greece, even though it has a yield per hectare of 7,145 to/ha, (average for 2007-2017), the dispersion of data around the average (1.18) is the highest, compared to the analyzed countries, and the coefficient of variability the highest (16%).

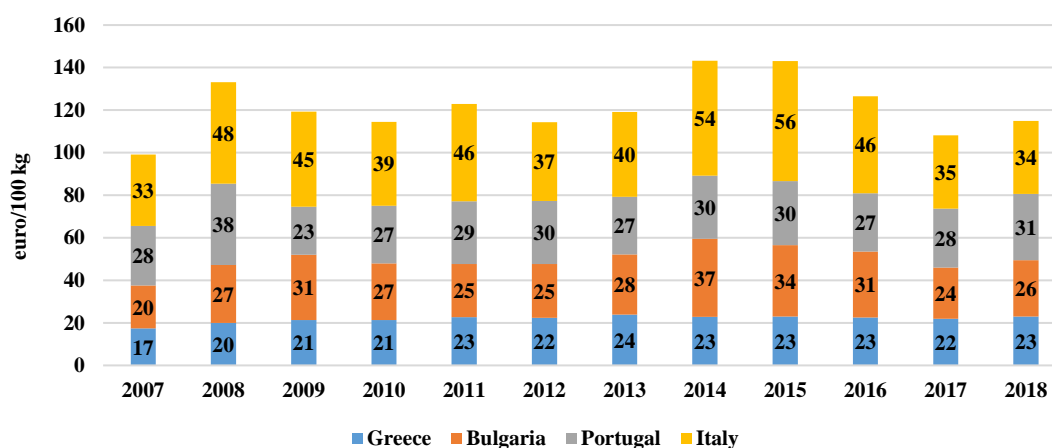
Table no. 2: Rice yield (tonne/ha) 2007-2017

Nr. crt	Specification	Average 2007-2017 (to/ha)	Standard deviation (to/ha)	The coefficient of variability (%)	Minimum to/ha (year)	Maximum to/ha (year)
0	1	2	3	4	5	6
1	Spain	7.551	0.37	4.9	6.657 (2008)	7.974 (2012)
2	Greece	7.145	1.18	16.5	4.888 (2016)	8.230 (2013)
3	Italy	6.601	0.30	4.6	6.072 (2011)	7.011 (2010)
4	France	5.228	0.64	12.2	3.904 (2013)	6.341 (2008)
5	Romania	4.579	0.65	14.2	3.265 (2007)	5.425 (2009)

Source: own processing according to EUROSTAT data

Romania ranks after France as a calculated average of yield and between France (12.2%) and Greece (16.5%) in terms of variability, from the perspective of production compared to the calculated average. The values of the coefficient of variability for the countries analyzed are below 20%, which means that the dispersion of the data around the average is relatively homogeneous, and the sample of the 11 years is statistically representative. Table no. 2.

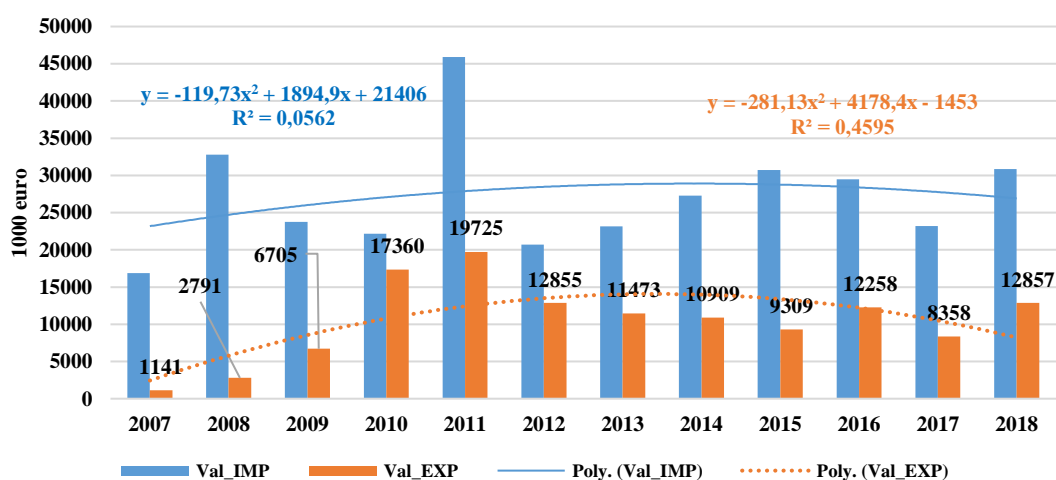
Chart no. 1: The dynamics of prices for rice (euro/100 kg)



Source: EUROSTAT data

Italy has the highest recovery prices for rice, with a minimum of 33 euros / 100 kg, in 2007, and a maximum of 56 euros/100 kg in 2015. Overall, the trend of recovery prices is in decrease. Chart no. 1.

Chart no. 2: The trade enters and outside the community of rice during 2007-2018 (1000 euro)



Source: processing after <https://www.madr.ro>

The contribution of the rice product, in the period 2007-2018, to the Romanian exports was increasing, both quantitatively (+11,016 to/year) and value (+4,178.4 thousand euros/year). Imports of rice, quantitative were, on average, (+2,623.7 to/year), and value (+1,894.9 thousand euros/year). Chart no. 2

Area cultivated with soybean: Italy has the largest area cultivated with soybeans (with an average for the period 2007-2017 of 199 thousand hectares), followed by Romania (with an average of 91 thousand ha), France (68 thousand ha) and Hungary (with an average of 46 thousand ha). The coefficient of variability, calculated as a ratio between the standard and average deviation, defines the threshold for the sample of the areas cultivated with soy in the 11 years of production, as heterogeneous (CV > 35%) heterogeneous (the cultivated areas differ from year to year), for all the countries studied. Table no. 3

Table no. 3: Area cultivated with soybean 2007-2017

Nr. crt	Specification	Average 2007-2017 (1000 ha)	Standard deviation (1000 ha)	The coefficient of variability (%)	Minimum (year)	Maximum (year)
0	1	2	3	4	5	6
1	Italy	199	76.5	38.5	108 (2008)	322 (2017)
2	Romania	91	36.7	40.3	49 (2009)	151 (2017)
3	France	68	44.4	65.5	22 (2008)	141 (2017)
4	Hungary	46	16.4	35.5	29 (2008)	77 (2017)

Source: own processing according to EUROSTAT data

Soybean yield (tonne/ha): Italy has the best yield per hectare (3,398 t / ha), followed by France (2,740 to/ha), Hungary (2,219 to/ha) and Romania (1,953 to/ha). In general, the standard deviation fluctuates within limits limited to the average (0.18 France and 0.46 Romania), and the coefficient of variability indicates that there are no significant variations in the 11 years of production, compared to the calculated average.

The determined values of the coefficient of variation, in the case of France, Italy and Hungary are below the value of 20%, thus concluding that the sample of the 11 years analyzed is a relatively homogeneous one from the point of view of the variability of soybean yield per hectare, (the average yields have small variations of from year to year) and at the same time it turns out that the average of the productions is also representative. Table no. 4.

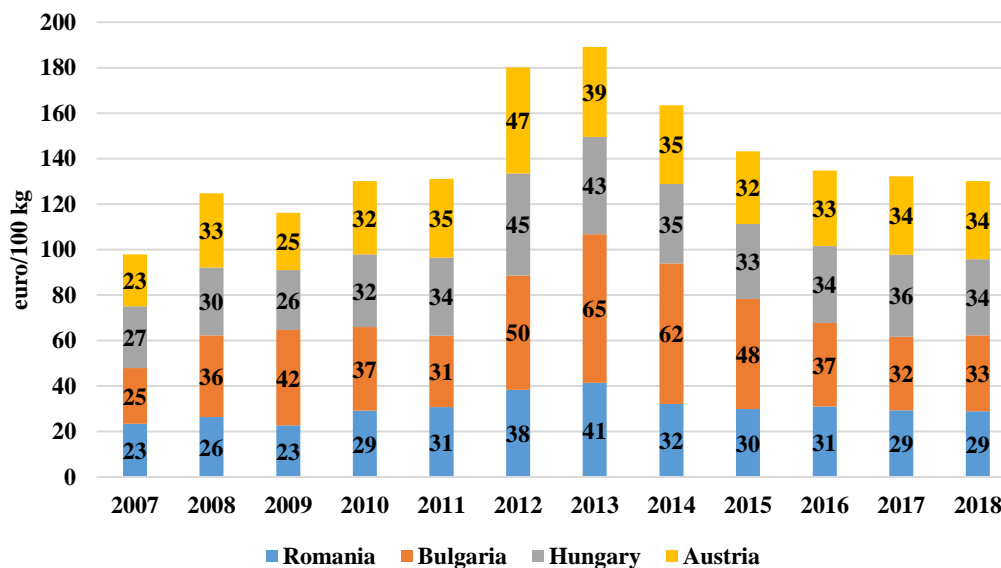
Table no. 4: Soybean yield (tonne/ha) 2007-2017

Nr. crt	Specification	Average 2007-2017 (to/ha)	Standard deviation (to/ha)	The coefficient of variability (%)	Minimum (year)	Maximum (year)
0	1	2	3	4	5	6
1	Italy	3.398	0.34	9.9	2.759 (2012)	4.007 (2014)
2	France	2.740	0.18	6.4	2.484 (2016)	2.947 (2011)
3	Hungary	2.219	0.43	19.3	1.641 (2007)	3.027 (2016)
4	Romania	1.953	0.46	23.8	1.021 (2007)	2.539 (2014)

Source: own processing according to EUROSTAT data

The exception is Romania, which has a coefficient of variability between 20% and 30%, which shows that the sample analyzed from the perspective of the average production variable is relatively heterogeneous.

Chart no. 3: The dynamics of sales prices for soybean (euro/100 kg)

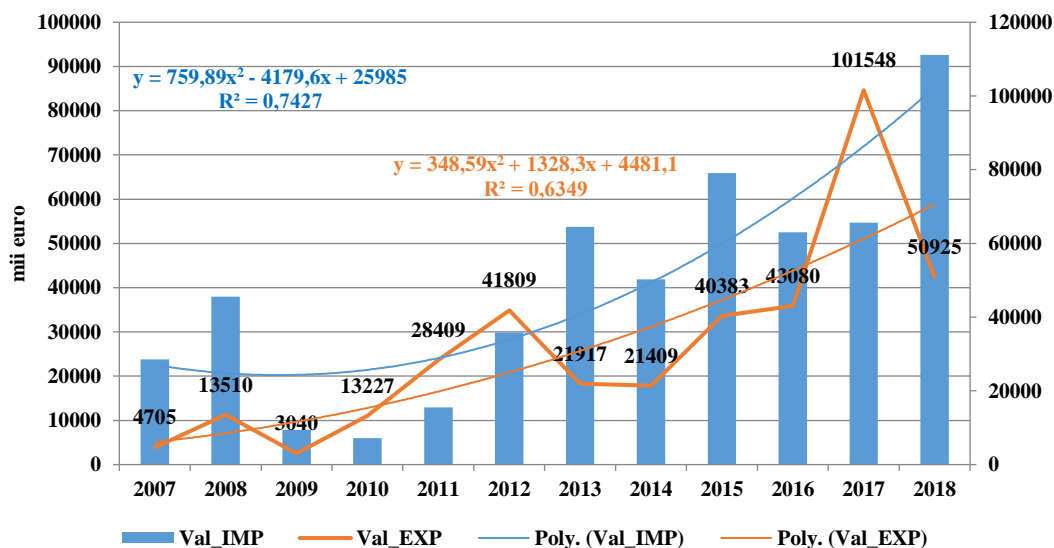


Source: EUROSTAT data

Bulgaria recorded the highest recovery prices for soybean crops, with a minimum of 25 euros/100 kg, in 2007, and a maximum of 65 euros/100 kg in 2013. Overall, the trend of recovery prices is in decline, and Romania sold soybeans at the lowest prices compared to the countries studied. Chart no. 3.

In Romania, soybean imports, on the period 2007-2018, decreased, on average, both quantitatively (-19,590 to/year) and in value (-4,179.6 thousand euros/year). Soybean exports decreased quantitatively by 7,445 tonnes/year and increased in value by an average of 1,328 thousand euros/year. Chart no. 4.

Chart no. 4: Soybean trade enters and outside the Community (1000 euro)



Source: processing after <https://www.madr.ro>

Area cultivated with sugar beet: France has the largest area cultivated with sugar beet (with an average, for the period 2007-2017, of 395 thousand hectares), followed by Germany (with an average of 373 thousand ha), Poland (205 thousand ha), Spain (with an average of 43 thousand ha) and Romania (with an average of 25 thousand ha). The coefficient of variability, calculated as a ratio

between standard and average deviation, defines the threshold for the sample of sugar beet surfaces during the 11 years of production, as being relatively homogeneous ($CV < 20\%$) for all the studied countries, except for Spain which has a coefficient of variability of 24.3%, indicating the data series as relatively heterogeneous ($20\% < CV < 30\%$).

Table no. 5: Area cultivated with sugar beet 2007-2017

Nr. crt	Specification	Average 2007-2017 (1000 ha)	Standard deviation (1000 ha)	The coefficient of variability (%)	Minimum area (year)	Maximum area (year)
0	1	2	3	4	5	6
1	France	395	34.0	8.6	349.3 (2008)	486.2 (2017)
2	Germany	373	30.1	8.1	312.8 (2015)	406.7 (2017)
3	Poland	205	18.2	8.9	187.5 (2008)	247.4 (2017)
4	Spain	43	10.5	24.3	32.1 (2007)	68.2 (2007)
5	Romania	25	4.0	15.8	20.5 (2008)	31.3 (2014)

Source: own processing according to EUROSTAT data

In Romania, the area allocated to sugar beet cultivation has reduced considerably, as a result of high production costs and low prices offered to producers. Table no. 5.

Sugar beet yield per hectare: Comparing the average production of sugar beet crop with the main cultivating countries, France has the best yield per hectare (88,909 t / ha), followed by Spain (87,109 t / ha), Germany (70,514 t / ha), Poland (56,695 t / ha) and Romania (36,383 t / ha). The determined values of the coefficient of variation, for all the countries analyzed, France (5.5%), Spain (9.5%), Germany (10.4%), Poland (12.5%), Romania (15.8 %) are found below the value of 20%, thus concluding that the sample of the 11 years analyzed is a relatively homogeneous one from the perspective of the variable sugar beet yield per hectare, (the average productions have small variations from one year to another) and at the same time it turns out that and the average of the productions is statistically representative.

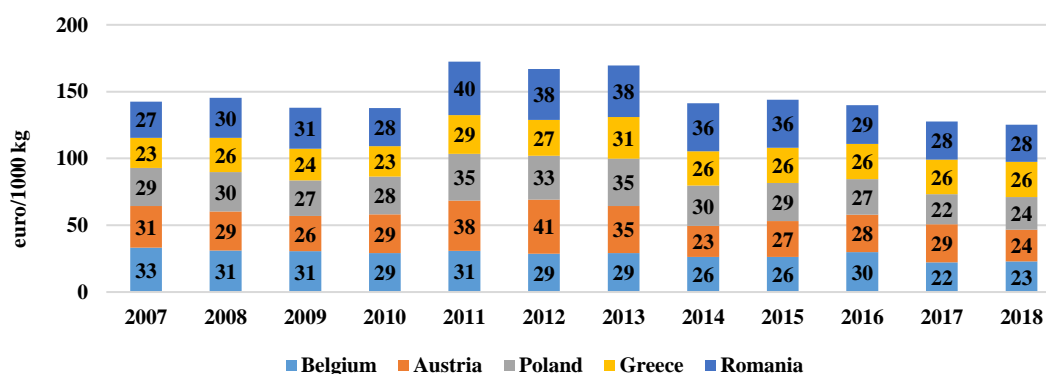
Table no. 6: Sugar beet yield per hectare 2007-2017

Nr. crt	Specification	Average 2007-2017 (to/ha)	Standard deviation (to/ha)	The coefficient of variability (%)	Minimum to/ha (year)	Maximum to/ha (year)
0	1	2	3	4	5	6
1	France	88.909	4.87	5.5	83.060 (2010)	96.999 (2011)
2	Spain	87.109	8.29	9.5	71.994 (2007)	96.936 (2014)
3	Germany	70.514	7.34	10.4	62.287 (2008)	83.747 (2017)
4	Poland	56.695	7.11	12.5	46.481 (2008)	68.250 (2014)
5	Romania	36.383	5.76	15.8	26.065 (2007)	44.711 (2014)

Source: own processing according to EUROSTAT data

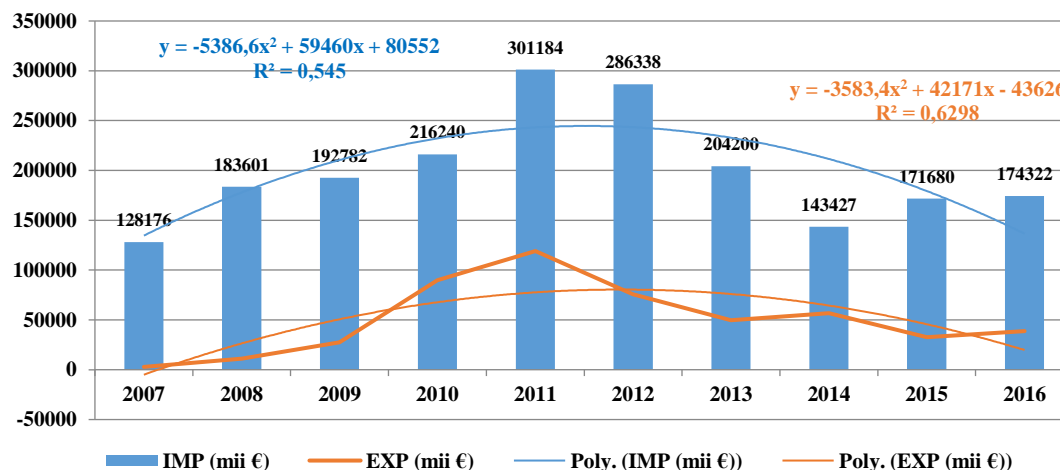
Although the dispersion of production yield (5.76 to/ha) compared to the average is low compared to Spain (8.29 to/ha), Germany (7.34 t / ha) and Poland (7.11 to/ha) , Romania records, after Poland (12.5%) the largest variability of average production, of 15.8%, compared to the countries analyzed. Table no. 6.

Chart no. 5: The dynamics of sale prices for sugar beet (euro/1000 kg)



Sales prices for sugar beet range from 22 euros/1000 kg to 41 euros/1000 kg. The maximum is reached in 2012 by Austria and the minimum in 2017 by Belgium and Poland. The disorganization of the sugar supply chain and the reduction of sugar beet production as a result of the advantageous import of raw sugar could not be offset by the increase in subsidies per hectare of cultivated beet. Chart no. 5.

Chart no. 6: Intra and extra-Community trade in cane sugar or sugar beet and pure sucrose



Source: processing after <https://www.madr.ro>

The foreign trade with sugar is characterized by the negative trade balance, as Romania is a net importer of raw sugar and white sugar. The agricultural policy measures have pursued and are aimed at expanding the areas cultivated with sugar beet, but it has not yet been possible to relaunch this crop. Between 2007 and 2016 Romania imports increased, on average, by 59,460 thousand euros/year and exports by about 42171 thousand euros /year. Chart no. 6.

CONCLUSIONS

The instability of the products generates the instability of the offers for the analyzed products, being at the origin of the price volatility. The situation can be overcome by implementing culture technologies appropriate to the climatic zones and by using large-scale irrigation and inputs carrying the technical progress (selected seeds, pesticide fertilizers).

Oscillations of average yields per hectare create market distortions and insecure incomes for farmers, which usually lose: in the case of under-production due to lack of quantity, and in the case of overproduction due to the low prices offered by the buyers, which does not cover the costs.

The evolution of foreign trade with the analyzed products, rice, soy, sugar beet, expresses the level of development of agriculture and the food industry, as well as the insufficiencies of the support granted to the agri-food sector.

Data on the evolution of foreign trade in rice, soy and sugar beet reveals the export and import ratio in favor of import. Their import, under the conditions of subsidizing their production, affects domestic production.

The coupled support scheme, applied in Romania since 2015, contributed to the increase of the degree of assurance of the raw material of local origin for the processing industry (an average increase of the total sugar beet production of 39,174 thousand to/year, in 2007 -2016), the reduction of imports of vegetable proteins and the provision of quality feeds for the zootechnical sector (the reduction of imports to soybeans, on average 19,590 to/year, between 2007-2018), while maintaining the cultivated areas (an average increase of the cultivated area with rice of 1,5678 thousand ha, in the period 2007-2018) in the case of the mentioned crops, affected by certain difficulties and which are considered important for Romania, for economic, social and environmental reasons, etc.

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