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Conference Paper

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Provided in Cooperation with:

The Research Institute for Agriculture Economy and Rural Development (ICEADR), Bucharest

Suggested Citation: Bădan, Daniela Nicoleta (2018) : The evolution of the technical and economic indicators for crop rice in Romania period 2006-2016, In: Agrarian Economy and Rural Development - Realities and Perspectives for Romania. 9th Edition of the International Symposium, November 2018, Bucharest, The Research Institute for Agricultural Economy and Rural Development (ICEADR), Bucharest, pp. 175-180

This Version is available at:

<https://hdl.handle.net/10419/205104>

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THE EVOLUTION OF THE TECHNICAL AND ECONOMIC INDICATORS FOR CROP RICE IN ROMANIA PERIOD 2006-2016

BĂDAN DANIELA NICOLETA¹

Abstract: *Romania has been particularly interested in rice culture since the 1930s through culture and biology technology, which has made it possible to capitalize less productive land productivity on other crops. In the present study we will analyze the technical indicators of the cultivated area and the production averages, as well as the economic indicators represented by the prices, the subsidies granted / ha and the trade balance. The research method used will be the quantitative and qualitative analysis of the statistical data series from 2006 to 2016. The aim of the study is to highlight the technical and economic aspects of the studied culture, their dynamics and the importance of rice culture that reflects on the demand of the national market.*

Keywords: *indicators, areas, average output, price*

JEL Classification: *Q10, Q11, Q18*

INTRODUCTION

Rice, wheat and corn are the main cultures in the world that can provide food; together supply more than 50% of all the calories consumed by the entire human population. Rice is part of the main food group of humans, having a wide use in food and in the preparation of medicines. Rice culture occupies the world's second largest area, after wheat, and second in the average yield of corn.

In Europe, the area cultivated with rice is about 580,000 hectares, a small area compared to Asia. The traditional European rice producing countries are Italy, Greece, France, Bulgaria, Hungary, Ukraine and Romania.

Our country is located at the northern limit of culture, it allows the cultivation of rice only in favorable areas such as the South-East, in the South-West of the country, Timiș county and in the vicinity of the Danube, requiring abundant water and wet soil.

MATERIALS AND METHODS

The study aims to highlight the importance of rice culture by analyzing qualitatively and quantitatively the evolution of technical and economic indicators during 2006-2017. The statistical data used in the paper was provided by the National Institute of Statistics of Romania, Eurostat, Faostat, MADR, as well as information taken from specialized papers.

The study runs for a period of 10 years, so it is necessary to analyze the areas and total crop yields by processing chronological data series using absolute, relative and average indicators. A chronological series is represented by a series of systematized values, of a characteristic made at successive time intervals, in this case the unit of time being the year. The chronological series of the paper consists of two parallel data strings (surface and production), one stating the variation of the characteristic over time, and the other the variation of the studied feature.

Due to the fact that it will be analyzed over a period of a decade, the comparative method will be used, showing the evolution of the surfaces and productions of this culture by processing chronological series requiring absolute, relative and average indicators.

Absolute indicators indicate the decrease or increase over time (absolute changes).

Absolute changes can be: fixed base ($\Delta/t-1=yt-y_1$) and with mobile base ($\Delta/t-1=yt-y_{t-1}$).

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Relative indicators indicate the dynamics index that shows how many times the variable (area or production) increases or decreases from one unit to the next. They can be: with fixed base ($I_t = y_t / y_1$) or with a base in the chain ($I_{t/t-1} = y_t / y_{t-1}$).

Dynamic rhythm represents the percentage that the recorded level of the analyzed feature has changed over a period of time compared to the base period of comparison. It can be: fixed base ($R_t = I_t * 100 - 100$) or with a base in the chain ($R_{t/t-1} = I_{t/t-1} * 100 - 100$).

The absolute value of 1% of the growth rate shows how many units return to 1% increase or decrease, and the even distribution of the absolute change on percentages, the relative change rate. It can be fixed base ($A_{t/1} = y_t / 100$) and in the chain ($A_{t/t-1} = y_t - y_{t-1} / 100$).

Average indicators will indicate the average level ($Y = \sum y_t / n$) and absolute changes.

$$\bar{\Delta} = (\sum \Delta t / t - 1) / n - 1 = y_n - y_1 / n - 1$$

The average dynamic index is calculated according to the formula:

$$I = \sqrt[n]{\prod I_{t/t-1}} = \sqrt[n]{y_n / y_1}$$

Average Dynamic Rhythm:

$R = I * 100 - 100$ expresses how many percent the phenomenon analyzed has changed on average from time to time.

RESULTS AND DISCUSSIONS

Using the data of Table no.1 during the period 2006-2016, the calculation methods mentioned above can be applied.

Table no.1 Evolution of rice areas and production

Specifications	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Surface (ha)	5643	8434	9917	13346	12403	12674	11304	11930	12719	11106	9435
Total production (tons)	18420	27518	48917	72418	61588	65261	50862	54646	45159	49773	43635
Average production (kg/ha)	3264	3263	4933	5426	4966	5149	4499	4581	3551	4482	4625

Source :INSSE

From the data analyzed in table no.1 it was found that the evolution of the rice-growing areas followed an increasing trend during the period 2006 – 2009 (5.6 thousand ha and 13.3 thousand ha), and by 2016 they will decrease by 29% of 2009. In table no.2 the surface changes can be observed both from one year to the next and compared to the base year (2006).

Regarding the average yield of rice, the maximum value of this period was 5426 kg / ha in 2009, 18.9% higher than in 2016 (4400 kg / ha).

Absolut indicators

Table 2 Absolute changes of the rice surface

Year	Surface (hectares)	Absolute changes (hectares)	
		Whit fixed base	Whit chain base
		$\Delta t / t - 1 = y_t - y_1$	$\Delta t / t - 1 = y_t - y_{t-1}$
2006	5643	-	-
2007	8434	-2791	2791
2008	9917	-4274	1483
2009	13346	-7703	3429
2010	12403	-6760	-943
2011	12674	-7031	271
2012	11304	-5661	-1370
2013	11930	-6287	626

Table no.3 Absolute changes in rice production

Year	Production (tons)	Absolute changes (ton)	
		Whit fixed base	Whit chain base
		$\Delta t / t - 1 = y_t - y_1$	$\Delta t / t - 1 = y_t - y_{t-1}$
2006	18420	-	-
2007	27518	-9098	9098
2008	48917	-30497	21399
2009	72418	-53998	23501
2010	61588	-43168	-10830
2011	65261	-46841	3673
2012	50862	-32442	-14399
2013	54646	-36226	3784

2014	12719	-7076	789
2015	11106	-5463	-1613
2016	9435	-3792	-1671

Source: Data processing based on statistical data

2014	45159	-26739	-9487
2015	49773	-31353	4614
2016	43635	-25215	-6138

Source: Data processing based on statistical data

Analyzing the average dynamics (Table no. 4), a significant change in rice-growing area can be observed, with a sharp drop in the chain in 2015 and 2016 (-12.68% and 15.05%). The absolute value of 1% of the rhythm of the rice surface area compared to 2006 equals an absolute equivalent of 56.43 hectares and the absolute value of 1% of the rhythm with mobile base is a growing amount.

Table no.4 Relative changes of the rice surface

Year	Surface (hectares)	Dynamics index		Dynamic Rhythm (%)		The absolute value of a percentage of the dynamics (hectares)	
		Whit fixed base $It/1=yt1/y1$	Whit chain base $It/t-1=yt1/yt-1$	Whit fixed base $Rt=It1*100-100$	Whit chain base $Rt/t-1=It/t-1*100-100$	Whit fixed base $At/1=y1/100$	Whit chain base $At/t-1=yt-1/100$
2006	5643	-	-	-	-		56.43
2007	8434	1.49	1.49	49.46	49.46		84.34
2008	9917	1.76	1.18	75.74	17.58		99.17
2009	13346	2.37	1.35	136.51	34.58		133.46
2010	12403	2.20	0.93	119.79	-7.07		124.03
2011	12674	2.25	1.02	124.60	2.18	56.43	126.74
2012	11304	2.00	0.89	100.32	-10.81		113.04
2013	11930	2.11	1.06	111.41	5.54		119.30
2014	12719	2.25	1.07	125.39	6.61		127.19
2015	11106	1.97	0.87	96.81	-12.68		111.06
2016	9435	1.67	0.85	67.20	-15.05		94.35

Source: Data processing based on statistical data

In the case of rice production, according to the average dynamics, it can be seen in Table no. 5 a significant decrease (of 22.06%) of the value of production in 2012 compared to 2011. In the case of the absolute value of a percentage of the dynamics, it shows us that by analyzing with a fixed base the size of a percentage of rice production of any year compared to the base year is equal to an absolute increase of 184.20 tons, and the absolute value of one percent of chain dynamics is a magnitude that has successive different values.

Table 5. Relative changes in rice production

Year	Production (tons)	Dynamics index		Dynamic Rhythm (%)		The absolute value of a percentage of the dynamics (tons)	
		Whit fixed base $It/1=yt1/y1$	Whit chain base $It/t-1=yt1/yt-1$	Whit fixed base $Rt=It1*100-100$	Whit chain base $Rt/t-1=It/t-1*100-100$	Whit fixed base $At/1=y1/100$	Whit chain base $At/t-1=yt-1/100$
2006	18420						184.20
2007	27518	1.49	1.49	49.39	49.39		275.18
2008	48917	2.66	1.78	165.56	77.76		489.17
2009	72418	3.93	1.48	293.15	48.04		724.18
2010	61588	3.34	0.85	234.35	-14.95	184.20	615.88
2011	65261	3.54	1.06	254.29	5.96		652.61
2012	50862	2.76	0.78	176.12	-22.06		508.62
2013	54646	2.97	1.07	196.67	7.44		546.46

2014	45159	2.45	0.83	145.16	-17.36	451.59
2015	49773	2.70	1.10	170.21	10.22	497.73
2016	43635	2.37	0.88	136.89	-12.33	436.35

Source: Data processing based on statistical data

Average indicators

For the period 2006-2016, the average surface area was 10810.1 hectares and the area of rice increased annually for the analysis period by 2295.759 hectares.

On average, the areas increased by 0.52 times during the period 2006-2016 and the average dynamics indicates that the areas have changed on average by 5.27% annually.

The average production level for the analyzed period was 48927 tonnes and the rice production increased annually by 15643.9 tonnes per year. On average, production increased by 9 percent annually.

Table no. 6 Economic indicators of the rice crop

Specifications	UM	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Average production	Kg/ha	3263	4933	5426	4966	5149	4499	4500	3551	4300	4400
Average purchase price	lei/kg	0.8	1	0.7	0.8	1.2	1.1	1.2	1.1	0.9	1
Income / ha without subsidies	lei/ha	2610.4	4933	3798.2	3972.8	6178.8	4948.9	5400	3906.1	3870	4400
Income / ha whit subsidies	lei/ha	2936.6	5335	4286.5	4532.4	6758.7	7012.3	7453.3	6008.4	6578	7219.1
Production cost / ha	lei/ha	2600	4850	3700	3900	6100	5900	5800	4400	5100	5500
Profit without subsidy	lei/ha	10.4	83	98.2	72.8	78.8	-951.1	-400	-493.9	-1230	-1100
Grant benefit	lei/ha	336.6	485	586.5	632.4	658.7	1112.3	1653.3	1608.4	1478	1719.1
Profit rate without subsidies	%	0.4	1.7	2.7	1.9	1.3	-16.1	-6.9	-11.2	-24.1	-20
Profit rate + Subsidies	%	12.9	10	15.9	16.2	10.8	18.9	28.5	36.6	29	31.3
Subsidies	lei	326.2	402	488.3	559.6	579.9	2063.4	2053.3	2102.3	2708	2819.1

Source: ICEADR ("Impact on Financing of the Agricultural Sector through Support Schemes established on the basis of European Regulations on CAP and Funding of Support Schemes from the National Budget")

Regarding the rice crop economic indicators, according to the study conducted by ICEADR, the average purchase prices ranged between 0.8 lei / kg (in 2007) and 1.2 lei / kg (in 2013), which was influenced by the cultivated area and the yield obtained.

The highest prices were in the years 2011 and 2013 of 1.2 lei per kg, 33.3% more than in 2010, while the average purchase price registered in 2016 is by 16.6% lower than in the years when the maximum value was recorded.

Subsidies per hectare for rice crops increased from one year to another, so in 2016 the amount of the subsidy granted was 2819,1 lei / ha, being 8.46 times higher than in 2007, when the subsidy was of only 326.2 lei / ha.

From Table no. 6 it can be noticed that by capitalizing the rice yields at the farm price, the farmers do not make profit without the subsidies granted. The value of the profit with subsidies increases with the value of the support, from 336.6 lei / ha to 1719.1 lei / ha, so the profit rate is higher (31.3% in 2016).

If we look closely at the 2007-2016 profit-free period, we can see that without the support, the profit is insignificant, in 2007 being 10.4 lei / ha or even negative, in 2016 reaching -1100 lei / ha, transforming this crop into an unprofitable one, which also led to the reduction of rice-growing areas, registering a profit rate of -20% in the last year of study.

Rice is a basic food in people's diet so we can also take into account its per capita consumption, thus determining its importance at national and European level by highlighting rice imports and exports.

Table 7. List of countries importing Romanian rice (tonnes)

Importers	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total	1024	1995	3774	12654	49402	54613	28727	24727	15925	11958	14861	9242
Italy	788	642	197	5899	14217	1868	10222	9365	5626	4101	5914	5845
Republic of Moldova	-	29	62	221	2220	1133	647	1054	1611	1441	1188	1724
Czech Republic	-		38	253	483	56	457	1758	1330	1564	650	627
Slovakia	0	0	2	84	226	137	593	767	226	1313	248	402
Bulgaria	40	572	2431	5143	6264	2656	3172	1178	942	595	4502	170
Hungary	0	25	67	760	730	325	2173	24	49	3	4	4
Turkey	0		1	0	23363	46126	5178	4585	846	0	0	0

Source: Trade statistics for international business development –Trade map

According to data provided by Trade Map (table no. 7, table no. 8), Romania imported 4 times more rice than it exported (2017).

The quantity of imported rice decreased from year to year in 2017 to decrease by 53.94% compared to 2006.

The quantities of rice exported by Romania during the analyzed period range from 1024 tonnes in 2006 to a maximum of 54613 tonnes in 2011. The main importing countries are Italy, the Republic of Moldova, the Czech Republic, Slovakia and Bulgaria.

Table no.8 List of countries exporting rice to Romania (tonnes)

Exporters	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
World	80780	53962	57789	45636	49638	114721	43358	47480	54241	57533	54598	43575
Bulgaria	596	5145	16135	26526	18719	24015	21338	19057	27567	21986	28971	23320
Myanmar	-	-	120	-	-	-	-	-	25	1527	600	5625
Greece	176	2789	5314	3800	11203	17665	9485	9977	13555	13811	7272	4298
Spain	178	116	1075	52	2500	500	225	1138	321	1301	2814	2910
Italy	1515	2913	11341	3766	9766	7733	2706	5169	7722	2865	3051	2550
Hungary	13	41	670	480	1202	1008	899	940	1404	1467	1417	2419
Egypt	70610	33591	11182	5116	2874	-	500	3534	299	3044	1948	-

Source: Trade statistics for international business development –Trade map

Regarding rice imports, it can be seen that the largest quantity of rice was imported in 2011 of 114.72 thousand tons, the main supplier of Romania being Bulgaria. In 2006, the main rice supplier was Egypt; over the period under review it followed a downward trend.

Following the analysis of imports and exports of rice, we can deduce that this crop is of particular importance at national level due to the quantities imported annually. Thus, it can be argued that domestic demand can not be sustained by its own production, with the need to resort to rice imports to meet demand in the domestic market.

CONCLUSIONS

In the paper were highlighted the technical indicators of the rice crop, the surfaces and the productions obtained in Romania, showing their evolution with absolute, relative and average static indicators.

As can be seen from the average dynamics indicators, the rice areas have undergone an annual change of 5.27% on average and the rice yields increased by an average of 9%, all due to investments made in this culture.

Through the economic indicators of this crop, the average purchase price, the production cost, the subsidies, the income obtained per hectare with subsidies and without the profit of the crop, we could demonstrate that the rice crop is profitable only if the farmers benefit from subsidies granted by the State.

Following the import and export analysis of rice, it can be noticed that Romania can not meet the requirements of the rice on the market being forced to import, although in recent years investments have been made allowing a rebirth of this culture by entering the Romanian market to foreign investors.

Cultivators are encouraged to produce rice by awarding higher grants, so they can also earn considerable gains.

The expansion of rice fields, in the current trend, falls into the category of modern solutions, which present both economic advantages and environmental protection aspects. By rehabilitating the right land for rice cultivation, our country could be among the main European rice producers.

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