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CONSIDERATIONS ON THE ROLE OF ROMANIAN RICE PRODUCTION AND ITS INFLUENCE ON THE COMMERCIAL RELATIONSHIP OF THE PRODUCT

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ABSTRACT

Rice is distinguished by its multifaceted importance: food (high nutritive value of grains), medical (used in the manufacture of medicines or treatment of certain diseases), industrial (beer, alcohol, cosmetics, paper making, craft products), feed (the by-products can be used in the feeding of animal species), crop management (recovery of the soils). Rice can be considered a species with superior productive potential, placing immediately after maize from this point of view. In Romania, varieties with a short period of vegetation are grown, due to specific climatic conditions.

This paper seeks to present the evolution of rice production in Romania for the period 1989-2013, in terms of cultivated area, total production, average production, but also imports and exports of this product. For Romania, there has been a marked variation in the area (105-49,300 ha), the total production (253-70,200 t), the average production (1,263-5,426 kg/ha), the imported quantities (0-95,090 t) and exported quantities (0-48,363 t).

The analysis is carried out in the context of a very variable economic and social climate, at national level, taking into account the major changes of the Romanian society related to: the change of the organization form of the national economy (transition from the centralized economy to the market economy) and Romania's accession to the EU in 2007.

Romania is not an important producer of rice at European and world level, but on the basis of the existing potential for this culture, it is possible to reduce the imported quantities to cover the domestic consumption needs, as well as to better use the existing potential related to this crop.

Keywords: rice, surface, total production, yield, export, import.

INTRODUCTION

Rice is the main food for more than a third of the world's population. Over 90% of world rice production is produced and consumed in Asia and between 40 and 46% of all irrigated crops in Asia are dedicated to rice production (Horgana et al., 2016). Practicing rice culture is done in a vast geographical area, under various conditions (Kumar et al., 2013).

Rice cultivation can also have an impact on the quality of the environment. It is mentioned that rice production is responsible for about 13% of global methane emissions, especially in Asia, and methane is an active greenhouse gas, emissions that could increase with the expansion of the population (Chen et al., 2012). The evolution of rice production and consumption differ from one region to another. For example, between 1961 and 2006, rice consumption grew at a rate of 4.5% per year, while rice production increased by 3.2% per year (Seck et al., 2010).

Romania, is at the northern limit of rice cultivation in Europe (Roman et al., 2011).

The presentation of the situation of rice production at national level was made taking into account the change in the share of land ownership and means of production (after 1990, the share of private property to the detriment of state property increased - which led to difficulties in preserving the forms of organization of the territory, the way of managing and using the capital elements supporting the activity in the agricultural sector). At the same time, there were issues related to the management of the irrigated areas, their diminution, even if the surfaces for irrigation have not changed considerably -

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3,168.7 thousand ha in 1989 (National Commission of Statistics, 1990), 3,176.2 thousand ha for the year 2003 and 3,149.1 thousand ha in 2013 (http://statistici.insse.ro/shop/). It is possible to present Romania's accession to the EU as a factor of influence of the activity, which influenced: the way of granting subsidies for agricultural producers - the transition from the surface subsidy to the subsidy on the product, the appearance of the product quotas etc.

According to the data provided by the Romanian producers, the investment for one hectare of rice is currently euro 2,000 per hectare. In this sector, farmers are in a high percentage Italians who first cultivated rice in Romania in 2004. At first, the average yield per hectare of rice amounted to 3-3.5 t. At present, Italian producers get a production of between 5.5-6.0 t per hectare. This rice production made by Italian farmers in Romania is lower than that obtained in Italy (9 t per hectare) and Greece (12 t per hectare). In Romania, a specific feature of Romanian rice crop has been identified, namely that they are well suited for the production of most expensive rice. A suitable variety is "Arborio rice", which costs 700 € per ton, as opposed to 280 €/t as the cheaper rice is sold (Befu, 2011).

MATERIAL AND METHODS

For drawing up the paper, documentation was used (using statistical databases), after which correlations were made between different aspects of rice production. A dynamic series of 25 terms has been operated so as to avoid the short-term influences of phenomena (e.g. climatic factor) on the analysed aspects. The analysed indicators were: area (ha), total production (t), average yield (kg / ha), exports (t) and imports (t).

Correlation was computed between: (I) surface (x) and total rice production (y), (II) surface (x) and average yield (y); (III) average yield (x) and total rice production (y), (IV) total rice production (x) and exports (y), (V) total rice production (x) and imports(y), (VI) exports (x) and imports (y) at national level. The equation used for the correlation coefficient was:

$$r = \frac{\sum (x_i - \overline{X})(y_i - \overline{Y})}{\sqrt{\left(\sum (x_i - \overline{X})^2\right)\left(\sum (y_i - \overline{Y})^2\right)}},$$

where: $\overline{X}$ and $\overline{Y}$ - are the averages for samples, AVERAGE (matrix1) and AVERAGE (matrix2).

RESULTS AND DISCUSSION

The evolution of rice production was highlighted by the presentation of surface, total production and average production data (Table 1).

From the point of view of the surface, there was a period characterized by decreases from 49,300 to 4,638 ha (1989-1994), a period of some recovery (1995 and 1996 - 6,166 and 8,532 ha), followed by a further sharp fall in the indicator (1997-2003 – 3,986 to 105 ha), then a recovery from 2004 to 2009 (1,239-13,346 ha), after which up to 2013 there were some fluctuations, but the indicator did not fall below 11,000 ha (Figure 1).

Regarding total production, there was a period characterized by a sharp fall in the indicator (from 70,200 t in 1989 to 253 t in 2003), after which the indicator recovered (4,963 t in 2004 and 72,418 t in 2009 respectively) and, finally, total output decreased, but not below 50,000 t (Figure 1).

Rice yield depends upon not only the genetic characteristics, but also the agronomic practices (Zou et al., 2003). In Romania average yield per hectare of rice at macro-regional level recorded variations from year to year (Chiurciu et al., 2017). The average yield increased from 1989 to 1995 (1,424-3,903 kg/ha), then between 1996 and 2002 the indicator evolved downwards (2,708-1,284 kg/ha). From 2004 to 2013, average production fluctuated but did not fall below 3,200 kg/ha (Figure 2).

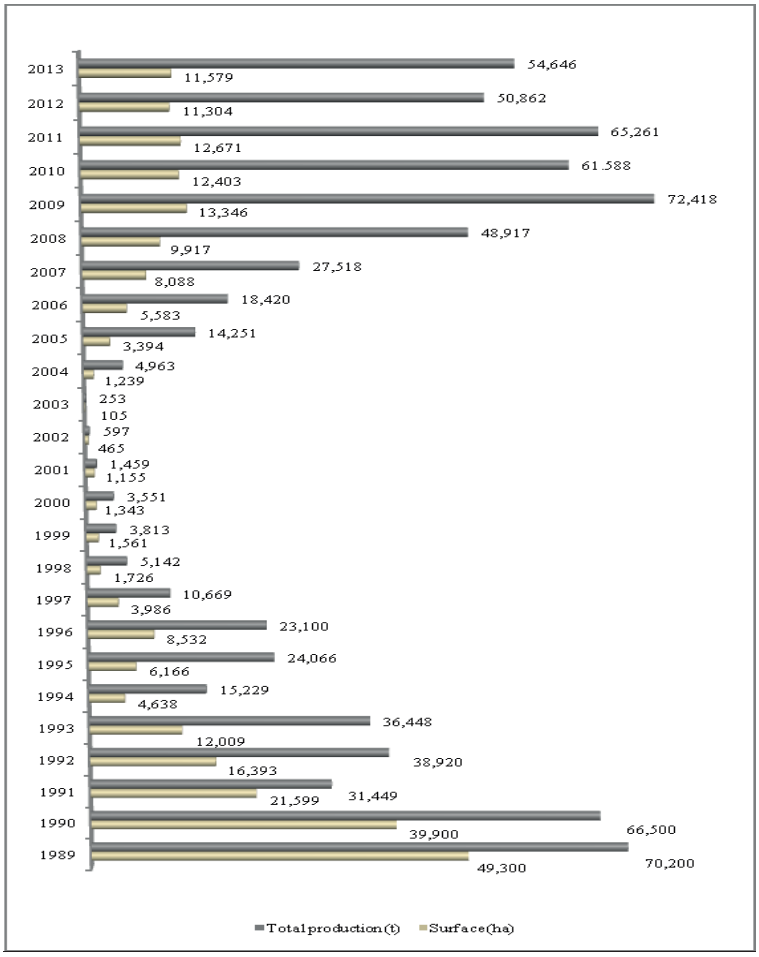


Figure 1. Dynamics of surface and total production (1989-2013)

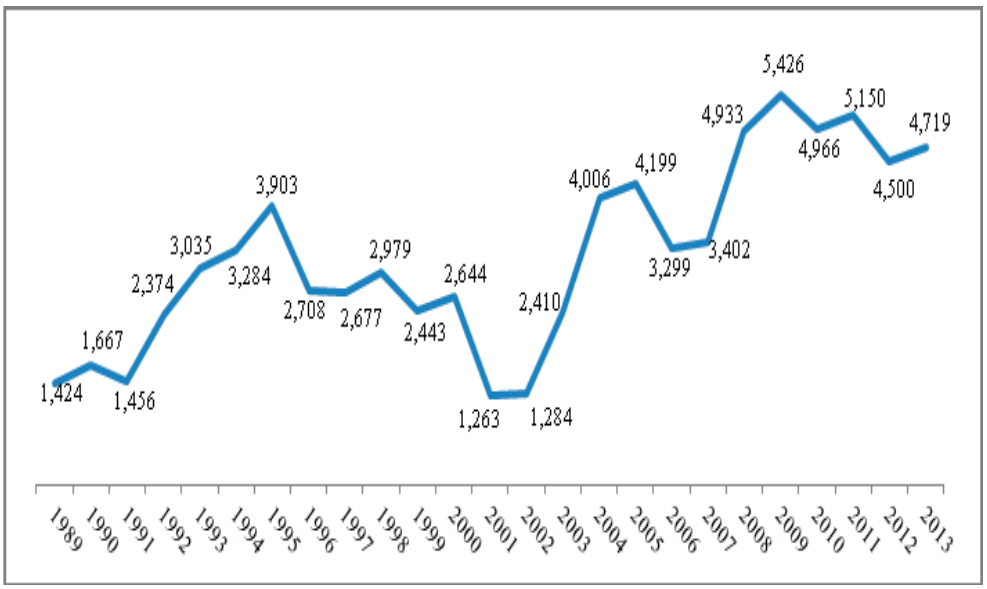


Figure 2. Dynamics of the average yield kg/ha (1989-2013)

Table 1. Coordinates of rice production in Romania

Year	Surface* (ha)	Total production* (t)	Average yield* (kg/ha)
1989	49,300	70,200	1,424
1990	39,900	66,500	1,667
1991	21,599	31,449	1,456
1992	16,393	38,920	2,374
1993	12,009	36,448	3,035
1994	4,638	15,229	3,284
1995	6,166	24,066	3,903
1996	8,532	23,100	2,708
1997	3,986	10,669	2,677
1998	1,726	5,142	2,979
1999	1,561	3,813	2,443
2000	1,343	3,551	2,644
2001	1,155	1,459	1,263
2002	465	597	1,284
2003	105	253	2,410
2004	1,239	4,963	4,006
2005	3,394	14,251	4,199
2006	5,583	18,420	3,299
2007	8,088	27,518	3,402
2008	9,917	48,917	4,933
2009	13,346	72,418	5,426
2010	12,403	61,588	4,966
2011	12,671	65,261	5,150
2012	11,304	50,862	4,500
2013	11,579	54,646	4,719

*http://www.fao.org/faostat/fr/#data/TP (30.01.2018)

The correlations between the area, total production and average yield are shown in Table 2 and Figures 3 and 4.

Between the surface and the total production there was a direct correlation, which results from the values of r (0.742751) and R^2 for the linear function and the 2, 3, 4 and 5 grade polynomial function (0.5517, 0.7657, 0.8137, 0.8185 and 0.9083 respectively), as evidenced by Figures 3 a, b and Figure 4. Starting with grade 3 polynomial function, it can be considered that there is an increasing correlation between the two aspects.

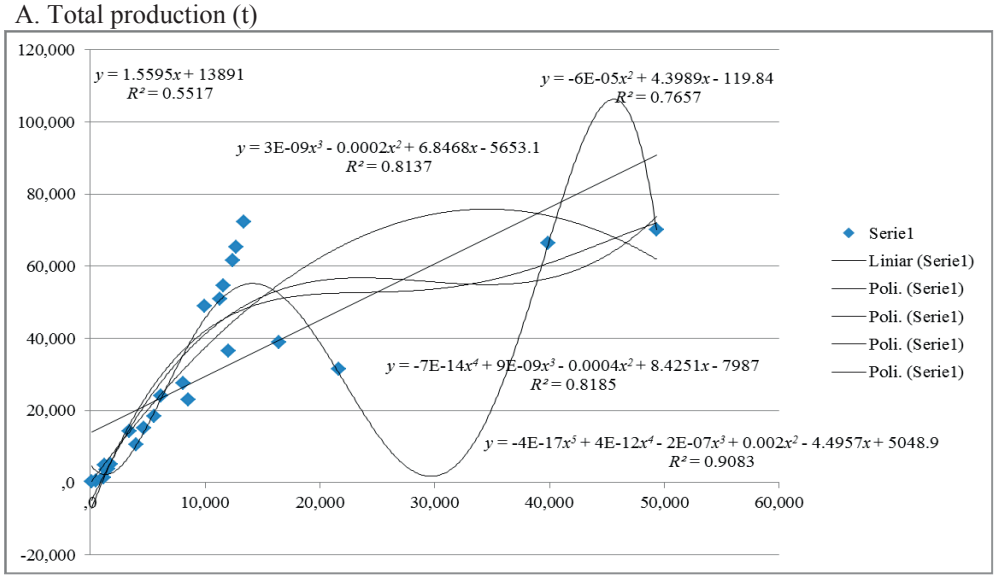
The correlation coefficient (r), established between the surface and the average yield, had a value of -0.21405, indicating a small inverse dependence between the two aspects. For the determination coefficient R^2, the values were: 0.0458, 0.3054, 0.4798, 0.5329 and 0.6026 for the polynomial functions of degree 2, 3, 4 and 5. As a result, no mathematical prognostic model can be recommended.

If we analyse the dependence between the average yield and the total production, we find the existence of a slightly significant positive correlation (r=0.422032). Based on the values of determination coefficient, it can be appreciated that no mathematical prognostic model can be recommended (values less than 0.7).

Table 2. Values of correlation coefficient (r) and determination coefficient (R^2) - for surface area, total production and average yield

Correlation	r	R^2 Linear function	R^2 Polynomial function degree 2	R^2 Polynomial function degree 3	R^2 Polynomial function degree 4	R^2 Polynomial function degree 5
Surface - total production	0.742751	0.5517	0.7657	0.8137	0.8185	0.9083
Surface - average yield	-0.214050	0.0458	0.3054	0.4798	0.5329	0.6026
Average yield - total production	0.422032	0.1781	0.4378	0.4651	0.5414	0.6144

A. Total production (t)



B. Average yield (kg/ha)

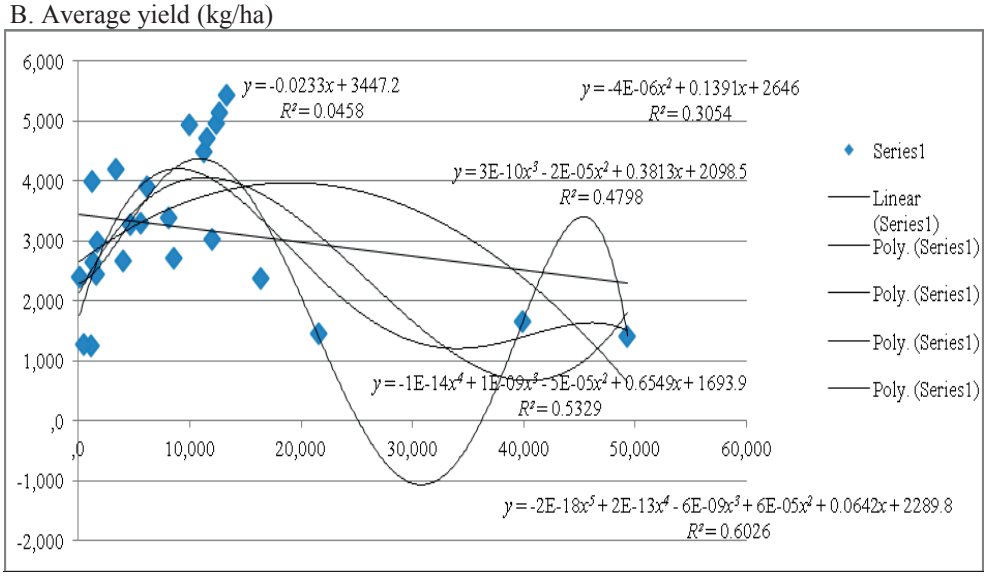


Figure 3. Correlation between surface (ha) and total production (A) and average yield (B)

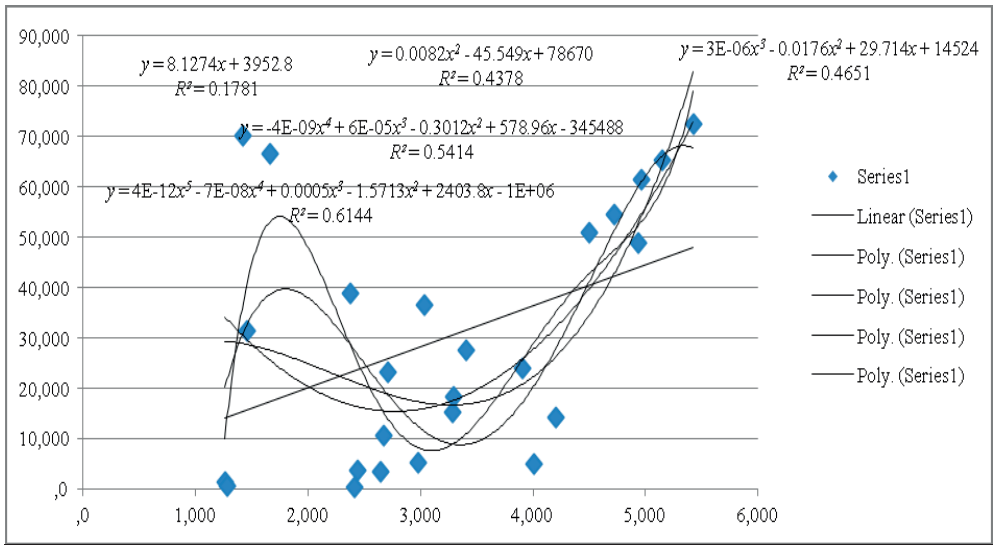


Figure 4. Correlation between average yield (kg/ha) and total production (t)

Rice is the basic food for almost half of the world's population. International trade in rice is low compared to total production, with only around 5% to 7% of total world production being traded globally (Razzaque and Laurent, 2006). Rice is a major food product throughout the world, and consumers in many countries rely on imported rice to meet their daily needs (Chen and Saghaian, 2016).

In order to be able to discuss the situation of the Romanian exports and imports of rice, it should be noted that before 1990, Romania's economic policy aimed to cover the consumption needs by its own production, and the surplus quantities were exported, on the basis of export quotas. Export quotas also existed between 1990 and 2007, but they were issued by law enforcement agencies under light conditions. After 2007, with the liberalization of the markets (the moment of joining E.U.), the Romanian producers were able to penetrate on different pricing paths according to the opportunities existing on the market. This phenomenon is not a particular one for Romania or Europe. In this respect, it is worth mentioning that even in other regions (Vietnam) officially in 2001 the export quotas previously implemented have since all been eliminated, and all companies holding a general trade license for the marketing of agricultural products have been authorized to export (Luckmann et al., 2015). Integration of a country or region into the world rice market is variable, and with particular effects. It is mentioned that for West Africa increased integration in international rice markets in recent decades has increased the region's global exposure to shocks and the increasing volatility of agricultural prices (Kouyaté et al., 2016).

Exports and imports of rice are presented in Figure 5. There was a fluctuating trend in rice exports, with clear growth trends after 2006 (the 50,000 t threshold was not exceeded in any year, we talk about the absence of exports in 1989 and 1990, as well as small quantities - in generally below 4,000 t for 20 of the 25 years presented).

From the import point of view, it may be appreciated that for some markets the imported rice is different from the domestic rice in terms of quality (Ito et al., 2017).

Imports were lost in 1989 due to the above-mentioned aspects, and then they were at levels exceeding 30,000 t (from 36,684 t in 1995 to 95,090 t in 2004).

Correlations between total output, exports and imports are shown in Table 3 and Figures 6 and 7.

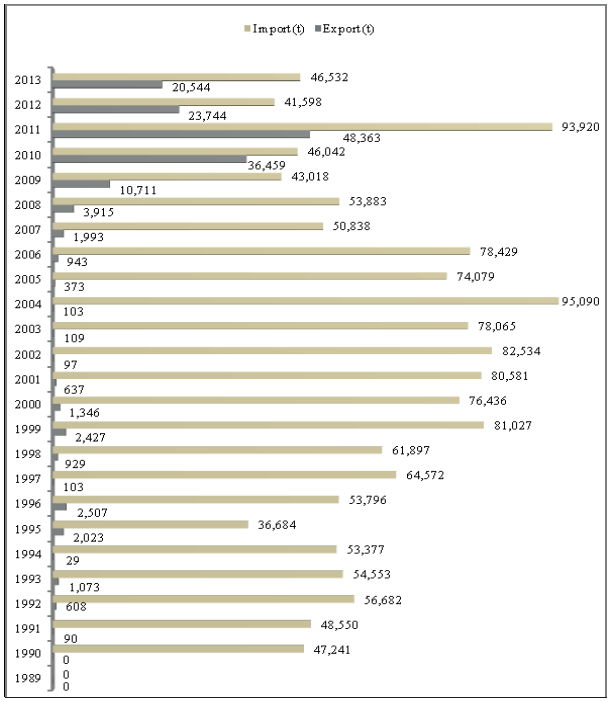


Figure 5. Evolution of exports and imports of rice (1989-2013) according to http://www.fao.org/faostat/fr/#data/TP (30.01.2018)

Table 3. Values of correlation coefficient (r) and determination coefficient (R^2) of total production, exports and imports

Correlation	r	R^2 Linear function	R^2 Polynomial function Degree 2	R^2 Polynomial function Degree 3	R^2 Polynomial function Degree 4	R^2 Polynomial function Degree 5
Total production - export (t)	0.560226	0.3139	0.3205	0.4227	0.5584	0.5840
Total production - import (t)	-0.613490	0.3764	0.4114	0.454	0.4916	0.4953
Export (t) - Import (t)	0.038557	0.0015	0.1878	0.1998	0.2017	0.2114

Between total output and export, a direct correlation was established, which is not very significant (r=0.560226). No mathematical model of prognosis (linear function, grade 2, 3, 4, and 5 polynomial functions) could describe a very significant relationship between phenomena.

The correlation coefficient between total production and imports revealed a quite important inverse dependence between phenomena (r=-0.61349). By calculating the correlation coefficients, no mathematical predictive model can be recommended for use.

The link between exports and imports was quite small (r=0.038557). As in the two above-mentioned situations, a mathematical model cannot be recommended to highlight a strong relationship between phenomena.

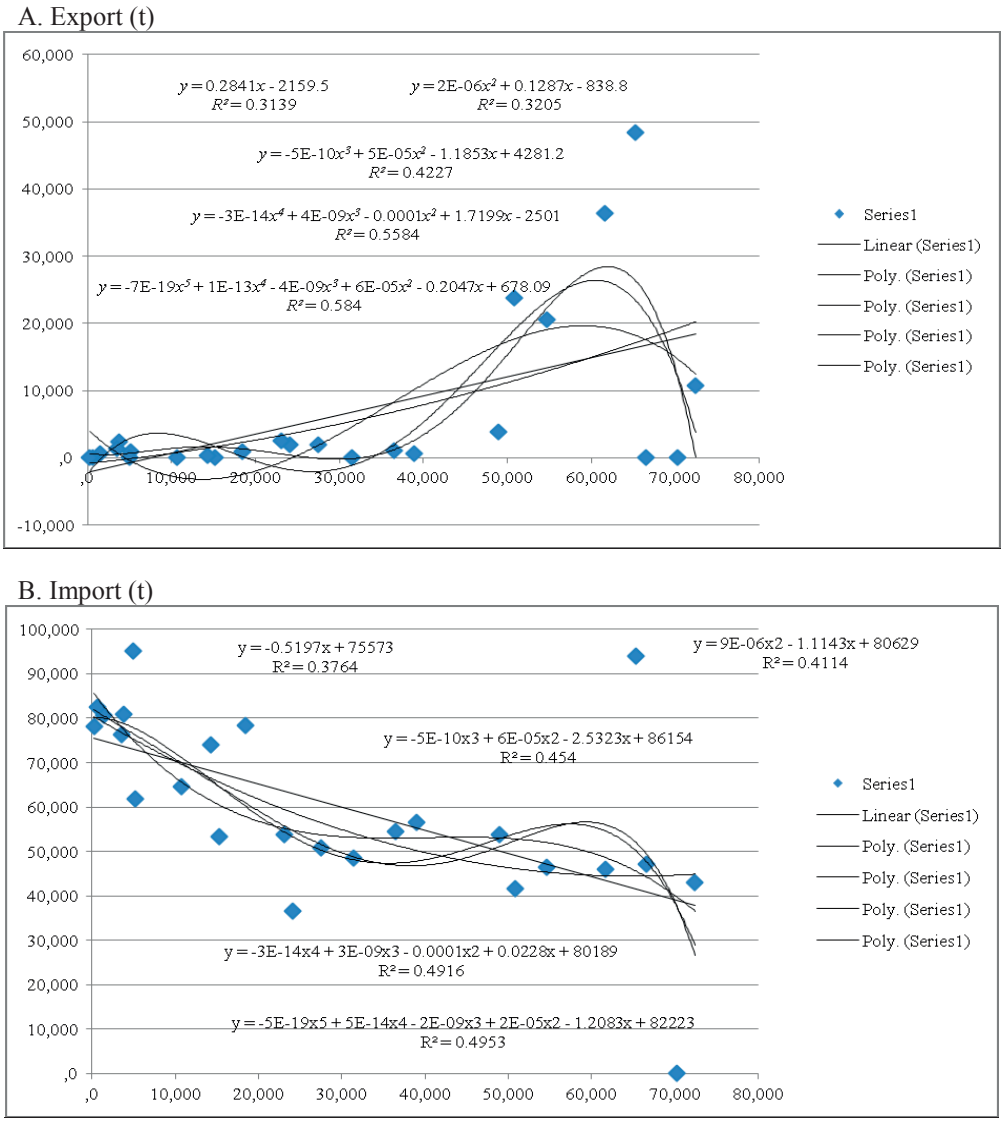


Figure 6. Correlation between total production (t) and export (A) and import (B)

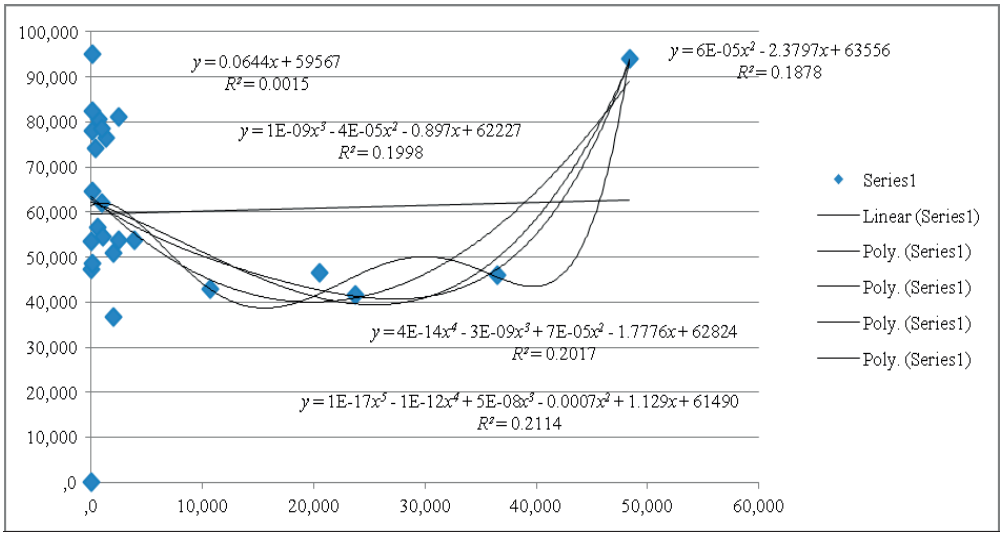


Figure 7. Correlation between export (t) and import (t)

CONCLUSIONS

The rice crop has undergone profound changes at national level between 1990 and 2013. These have been manifested especially for the cultivated area and total production.

After 2004 there was a revival of the situation, related to the emergence of foreign investors, with the process of refurbishment, based on the attraction of European funds.

There were direct correlations between cultivated area and total production, between average yield and total production (little significant) and an inverse correlation between cultivated area and average yield.

There was a direct correlation between total production and export, which was not significant, and there was a negative correlation between total production and imports, while between export and import the correlation was quite low.

Romania may, to a certain extent, re-launch rice production with the granting of facilities to producers, which may contribute to improving the national trade balance of the product.

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