

ASPECTS AND TRENDS IN THE EUROPEAN UNION AND ROMANIA'S EGG MARKET

Agatha POPESCU

University of Agricultural Sciences and Veterinary Medicine Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest Romania, Phone: +40213182564, Fax: +40213182888, Email: agatha_popescu@yahoo.com

Corresponding author: agatha_popescu@yahoo.com

Abstract

The purpose of the paper was to analyze the main aspects and trends in the EU and Romania's egg market based on the Eurostat and National Institute of Statistics data. The dynamics of laying hens, egg production, consumption, price and trade have been the main indicators analyzed in this study pointing out the problems in the Romanian egg market and the differences compared to the EU market mainly regarding egg price. The EU egg market is facing with a relatively stable egg production, 90 % intra-EU export, 20 % extra-EU imports, a slight decline of the egg price, but large variations from a country to another. The egg sector is subsidized in almost all the EU countries, except Romania. This helps the breeders from the subsidized countries to have a smaller production cost and a high economic efficiency selling at a higher price. The EU egg trade balance is a positive one, the EU being one of the most important egg producer and exporter in the world. In Romania, the laying hen number and egg production declined because of high price for farm inputs, the movement from the cage system to the barn and free range systems. to reduce production cost. Egg price has increased, but it is not at the average EU level, being influenced by seasonality of production and offer/demand ratio. Egg price declines in the warm season when production is higher, and increases in the fall-winter season when production is lower but the demand is higher. The inflow of imports determine Romanian producers to reduce the selling price. Romania's egg trade balance is still a positive one, but the imports have an increasing trend. This situation imposes a new strategy at the EU level to assure a loyal competition among all the producers, and to export more eggs to the extra-EU countries and assure a better consumer protection. In Romania, the Government must allot subsidies to support the egg sector, and the breeders must pay attention to egg quality, production cost and intensify export.

Key words: eggs, production, consumption, price, export, import, EU, Romania

INTRODUCTION

The demographic evolution at the global level will increase the world protein requirements, and the expectations are that the world protein market will grow by about 50 % in the next decade, and 60 % of the world protein demand will be in the Asian area [18].

Egg is a exceptional food with a high nutritive value given by its content in protein (13%), fats (11%), minerals and vitamins and also with a good energetic value accounting for 155 kcal/ 100 g [27]. Also, its digestibility accounts for 97-100 % [17]. For this reason, the nutritionists recommend 3-4 eggs weekly in human diet [15].

The world statistics mention that egg consumption increased from 5.5 kg/person in 1980 to 9 kg/person in 2016 [13].

This was possible due to the continuous

growth of the world egg production which accounted for 7,742 thousand metric tonnes in 2016 and the forecast for the year 2025 is for 8,224 thousand metric tonnes [22]. The top egg producing countries in the world, in terms of billion kg eggs, are China (24.8), USA (5.6), India (3.8), Japan (2.52), Mexico (2.51), Brazil (2.2), Indonesia (1.22), Turkey (1.03), France (0.94), and Germany (0.89) [31].

The EU is one of the largest producers of agro-food products, with high self-sufficiency rates and trade. The increased demand at the world level have determined the creation of a new pole of production and trade, Asia, which have diminished the EU market share in the international trade with agro-food products. In the period 2014-2016, the EU market share in the world trade accounted for 11 % compared to 14.5 % in the period 2000-2002 [1].

In 2012, the egg sector contribution to the EU

agricultural production was 2.5 %, but among the EU member states there were differences, for instance: 1.5 % in Germany, 1.7 % in France, 2.4 % in the Netherlands, 2.9 % in Spain, 3 % in Italy and 6.1 % in Romania. In 2012, Romania came on the 9th position for egg production [14].

In 2016, of the Euro 400 billion EU output value, egg sector represented 2.2 % and the whole poultry sector accounted for 5.3 % [6].

In the same year, the EU-28 produced 7,742 thousand tonnes eggs by 11.28 % more than in 2007. Of this total production, the percentage of use accounted for 97.02 % in the year 2016, compared to 97.72 % in the year 2007. The egg consumption per EU inhabitant registered a slight increase from 12.4 kg eggs in 2007 to 12.9 eggs/capita in 2016. The surplus of production stimulated exports whose growth rate was 21.07 %, while the imports declined by 63.1 %. The forecast for the year 2030 is that the EU will produce 8,287 thousand tonnes eggs, the egg consumption will reach 13.5 kg/inhabitant, the export will account for 320 thousand tonnes and the import for 26 thousand tonnes [7].

The EU egg market will continue to develop to satisfy better consumer preference by extending laying hens growing in free range and organic, and at the same time keeping barn system as the basic technological standard [18].

Romania is an egg producing, exporting and importing country. After 1989, the laying poultry stock and the production of eggs were in decline. Romania's entry into the EU has offered new opportunities for the development of the egg sector, but egg production is not yet at the level of expectations taking into account the efforts done by breeders and the strong competition in the EU egg market. At present just 216 producers are dealing with the egg production at industrial scale, but there are also the peasant households which are able to produce a very important amount of eggs. Egg demand is relatively stable, but much higher in the period of legal holidays. Production covers consumption and the surplus is subject of export. Egg price has registered a continuous increase but is much less than in other EU countries [20].

In 2016, the output value achieved by Romania in the egg sector was Euro 729.42 million, representing 18.8 % of the animal production output in Romania and 8.4 % of the animal production output in the EU-28 [25].

In this context, the present paper had two objectives: (i) to analyze the main aspects and trends in the EU egg market during the last years pointing out the situation of holdings and laying hens by way of keeping, egg production at the EU and also the main producers, egg consumption, self-sufficiency, egg price, egg intra and extra-EU trade, the main EU exporting and importing countries and the main EU beneficiaries and suppliers of eggs, and (ii) to analyze the similar main aspects and trends in Romania in the period 2007-2016 emphasizing the egg market problems and the most important factors which have negatively affected the laying poultry stock, production, price and trade of this country with a long experience and high potential for producing eggs.

MATERIALS AND METHODS

The paper is based on the study of various important reports and other written materials with new information on the topic provided by FAO, Eurostat, National Institute of Statistics, articles published in various international and national journals.

The empirical data were mainly supplied by Eurostat Statistics Explained and the National Institute of Statistics, Tempo online Data base for the period 2007-2016.

The main indicators analyzed in this study were the following ones: the number of holdings raising laying hens, the number of laying hens, the egg production, egg production per inhabitant, egg consumption per inhabitant, the self-sufficiency rate, egg price, egg export, import and trade balance, the export/import ratio.

These aspects were approached both on the European market as well as in Romania, pointing out the situation in Romania during the last decade and the main problems this country is facing in the egg market.

Also, it was studied the correlation between

consumption and production, and the regression of consumption as a dependent variable on egg production as an independent variable trying to find out if there is any important relationship between these two indicators.

The analysis was based on various methods such as:

-*The fixed index method*, utilized to characterize the evolution of the variables in the analyzed period compared to the 2007 level considered as term of reference, according to the formula: $I_{FB} = (X_n/X_0) * 100$.

-*The linear regression model*, $Y = bx + a$, where Y is de dependent variable and X is the independent variable, used to analyze the relationship of determination between egg production and consumption.

-*The Pearson correlation coefficient and the determination coefficient*, used to assess the direction and intensity of the connection between these indicators.

The results were tabled and graphically illustrated and then correspondingly interpreted.

RESULTS AND DISCUSSIONS

(A)The EU egg market.

The EU is an important producer and trader of eggs in the world. The egg sector has been developing fast and has been continuously improved by the introduction of the Common Agricultural Policy destined to increase egg quality, to assure consumer's protection and to harmonize egg market [8, 24].

In 2016, in the EU-28, there were 384,067,572 **laying hens** grown in 4,396,308 **holdings**. Poultry farming for egg production has been developed rapidly in close relationship to the market demand so that the actual technologies are oriented in two directions: (i) enriched cage and (ii) production alternatives. About 90 % of the farmers growing laying hens are practicing enriched cage, while 10 % prefer production alternatives, of which barn 9.63 %, free range 0.27 %, and organic 0.11 %.

The distribution of the laying hens by way of keeping is the following one: enriched cage 55.56 % and production alternatives 44.4 %, of which: free range 14.14 %, barn 25.65 % and organic 4.61 % (Table 1).

Table 1. The number of holdings growing laying hens and the number of laying hens in the EU-28 in 2016 by way of keeping

Way of keeping	Holdings		Laying hens	
	Number	%	Number	%
Total EU-28, of which:	4,396,309	100.0	384,067,572	100.0
(a)Enriched cage	3,950,800	89.9	213,476,005	55.5
(b)Production alternatives, of which:	445,509	10.1	170,591,567	44.5
-Free range	-	0.3	-	14.1
-Barn	-	9.7	-	25.7
-Organic	-	0.1	-	4.7

Source: Own calculations based on the data provided by CIRCA,

U:\Aviculture\Normes oeufs (communications)\Number of laying hens by way of keeping_CIRCA.xlsx [3].

The number of laying hens by the top egg producers in the EU are the following in the decreasing order: Germany (52.5 million), France (48.5 million), Spain (43.6 million), Poland (43.4 million), United Kingdom (42.1 million), Italy 941.6 million), Romania (8.2 million), Portugal (8.1 million), Sweden (8 million) and Belgium (7.8 million), totalizing 390.7 million, representing 78 % of the total

EU-28 number of laying hens in the year 2016 (Fig.1).

Egg production has continuously increased in the EU-28, so that in 2016, it accounted for 7,702 thousand tonnes eggs in egg equivalent, being by 9.49 % higher than in the year 2010 (7,034 thousand tonnes) (Fig.2).

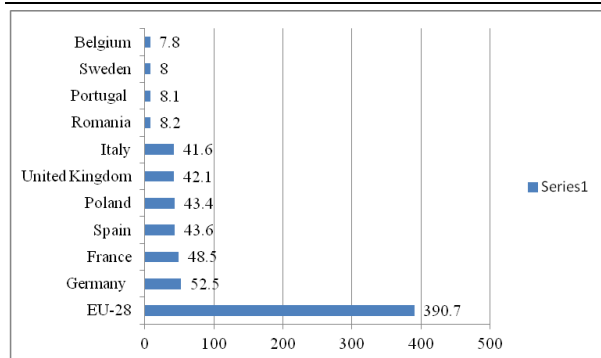


Fig.1. The number of the laying hens in the main EU countries in 2016 (million)

Source: Own designed based on Eurostat, Egg- Market situation, Dashboard, 2016 [9].

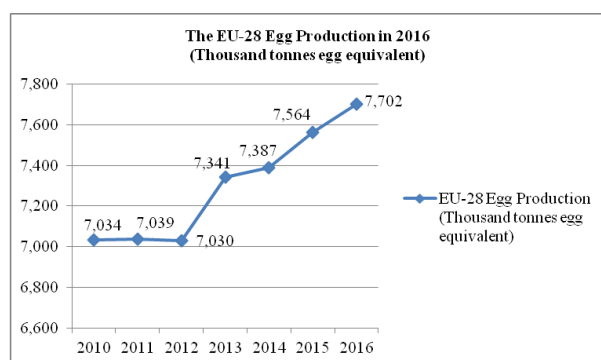


Fig.2. The dynamics of hen egg production in the EU-28, 2010-2016 (thousand tonnes egg equivalent)

Source: Own designed based on Eurostat, Egg- Market situation, Dashboard, 2016 [9].

The main egg producers in the EU are presented in Fig.3.

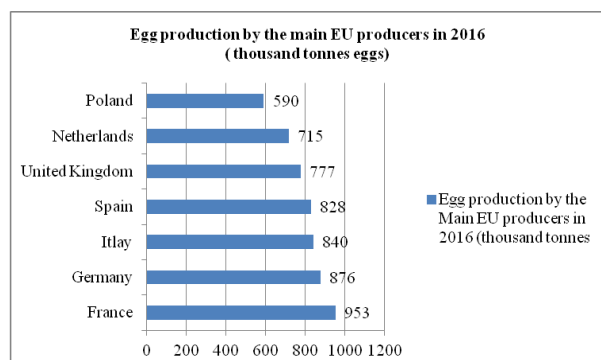


Fig.3. The egg production by EU main producers in 2016 (Thousand tonnes)

Source: Own designed based on Eurostat, Egg- Market situation, Dashboard, 2016 [9].

In the decreasing order, they are the following ones: France (953 thousand tonnes), Germany (876 thousand tonnes), Italy (840 thousand tonnes), Spain (828 thousand tonnes), United Kingdom (777 thousand tonnes), The Netherlands (715 thousand tonnes), and

Poland (590 thousand tonnes), all together totalizing 7,496 thousand tonnes eggs, representing 74 % of the EU egg production in the year 2016 (Fig.3).

The market share in egg production of these producers is the following one: France 13 %, Germany 12 %, Italy 11 %, Spain 11 %, United Kingdom 10 %, Netherlands 9 % and Poland 8 %.

Egg production contributed by 2.3 % to the output of the agricultural industry of the EU-28 [10].

Egg consumption in the EU has continuously increased reaching 7,339 thousand tonnes in 2016, being by 6.59 % higher than in 2010, when it accounted for 6,885 thousand tonnes (Fig.4.).

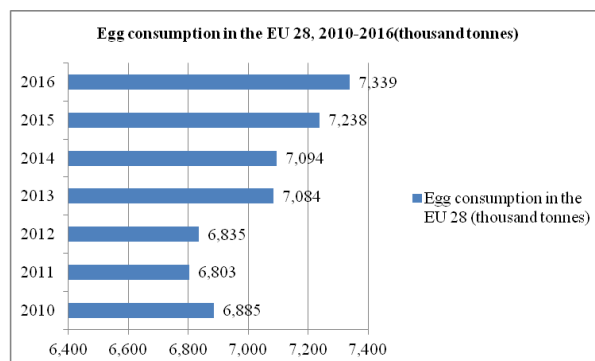


Fig.4. The egg consumption in EU-28, 2010-2016 (Thousand tonnes)

Source: Own designed based on Eurostat, Egg- Market situation, Dashboard, 2016 [9].

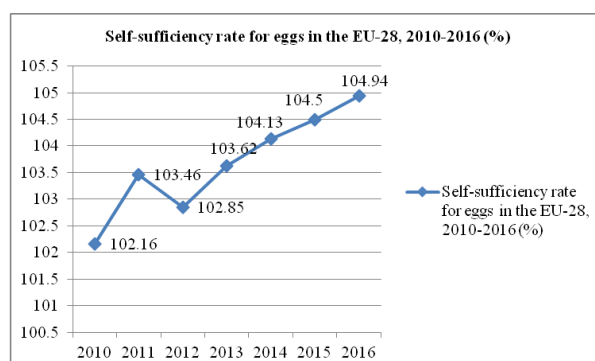


Fig.5. The egg self-sufficiency rate in EU-28, 2010-2016 (Thousand tonnes)

Source: Own designed based on Eurostat, Egg- Market situation, Dashboard, 2016 [9].

Making a comparison between production and consumption, one can easily notice that **the self-sufficiency rate** was ranging between 102.16 % in 2010 and 104.94 % in the year

2016, As a consequence, the surplus of eggs was available for export. (Fig.5) [16].

Egg consumption per inhabitant in the EU, increased by 4.03 % in the period 2007-2016, from 12.4 kg/capita in 2007 to 12.9 kg/capita in 2016 [7].

The annual egg market price in the EU-28 has recorded a relatively general decreasing trend from Euro 115.06/100 kg eggs in 2011 to Euro 113.71/100 kg eggs in 2016 (Fig.6).

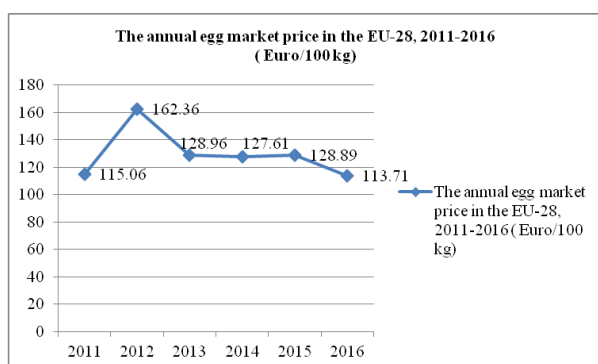


Fig.6. The annual egg market price in the EU-28, 2011-2016 (Euro/100kg)

Source: Own designed based on Eurostat, Egg- Market situation, Dashboard, 2016 [9].

Egg price is influenced by supply/demand ratio, but there are important differences among the EU countries. The highest egg price is in Sweden, Denmark and Austria and the lowest one in Spain and Czech Republic.

The egg price is also influenced by seasonality and during the year 2017 by the shortage posed by Fipronil [16].

Because egg offer exceeds demand in the EU, egg price has registered a declining trend in general, affecting producers who were obliged to sell eggs at prices lower than production cost sometimes.

The decline of egg price varied from country to another. The highest price decline was recorded in the countries from the Euro-zone, where egg producers were advantaged by the European Central Bank which launched a high amount of money in the economy. Producing at lower prices compared to the producers from the countries belonging to the non Euro-zone and exporting eggs in this non Euro-area, the selling price has also decreased in the non Euro-zone, leading to a high deflation which has deeply affected the local

producers [4].

The EU is one of the main egg and egg products traders in the world, commercializing mainly hen eggs.

In 2016, the EU-28 egg export value accounted for Euro 960 million, of which 90 % intra-EU export. The market share of the main EU egg exporting countries was the following one: the Netherlands 40 %, Poland 21 %, Germany 16 %, and Belgium 6 %.

In the same year, the market share of the main EU importing countries was the following one: Germany 43 %, the Netherlands 20 %, Belgium 7 %, United Kingdom 4 %, Italy 3 %, France 3 %, totalizing 80 % of the total EU-28 import value [2].

About 10 % of the export value represents the extra-EU export and about 20 % of the import value is represented by the extra-EU countries.

In the period 2007-2016, the exported amounts of eggs by the EU-28 increased by 47.9 % from 167 thousand tonnes egg equivalent in 2007 to 247 thousand tonnes in 2016 (Fig.7).

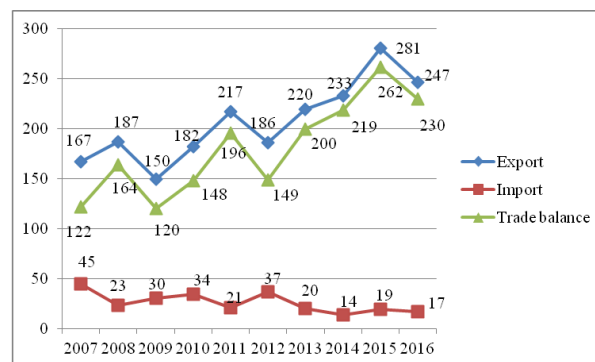


Fig.7. The extra-EU egg export amounts in the period 2007-2016 (Tonnes egg equivalent)

Source: Own designed based on Eurostat, Comext, Eggs, Tonnes egg equivalent, 2017 [11].

At the same time, the EU imports of eggs decreased by 37.77 % from 45 thousand tonnes in 2007 to 17 thousand tonnes in 2016. This decline of egg imports was justified by the surplus of production existing on the EU market.

Therefore, the EU egg trade balance was a positive one in the period 2007-2016, reflecting that the EU is a net exporter of eggs to the non-EU countries [8].

The main beneficiaries of the EU-28 eggs are Japan, Switzerland, Israel, Thailand, Arab United Emirates, South Korea and other countries, totalizing 206,583 tonnes egg equivalent.

The main egg suppliers for the EU-28 are Ukraine, Argentina, USA, Albania,

Switzerland, Norway and others. The imported amount of eggs is definitely very small accounting for 14,807 tonnes egg equivalent in 2016, being 13.95 times smaller compared to egg exported quantities (Table 2).

Table 2. The extra-EU exported and imported amounts of eggs by trade partners in 2016 (tonnes egg equivalent)

Exports			Imports		
Country	Amount (tonnes)	Market share (%)	Country	Amount (tonnes)	Market share (%)
EU-28	206,593	100.00	EU-28	14,807	100.00
Japan	37,429	18.11	Ukraine	7,209	48.68
Switzerland	33,455	16.19	USA	2,201	14.86
Arab United Emirates	14,867	7.19	Argentina	1,844	12.46
Israel	11,950	5.79	Norway	1,142	7.72
Taiwan	5,626	2.73	Albania	820	5.54
Thailand	4,997	2.42	Switzerland	337	2.28
South Korea	4,285	2.08	Other	1,254	8.46
Other	93,984	45.49	-	-	-

Source: Own calculations. based on Eurostat, Egg- Market situation, Dashboard, 2016 [9].

Regarding *the export/import ratio* reflected by the extra-EU egg trade balance, one can say that it has registered a continuous increasing trend from 3.71 % in 2010 to 14.52 % in 2016 (Fig.8).

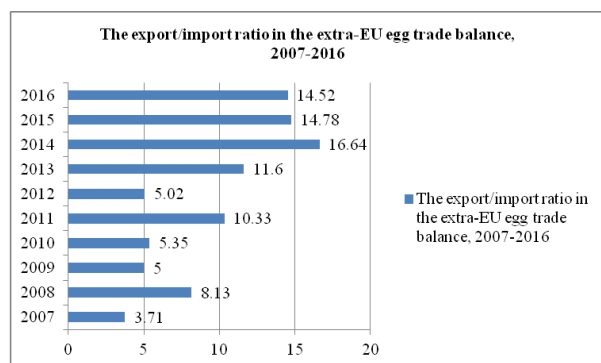


Fig.8. The dynamics of export/import ratio in the extra-EU egg trade balance, 2007-2016

Source: Own design based on the data provided by Eurostat Egg- Market situation, Dashboard, 2016 [9].

The EU-28 exports and imports the following egg and egg products:

(a) *Shell eggs*, being exported mainly to Japan and Switzerland, and imported especially from Argentina, USA and India. The main EU-exporting countries of shell eggs are the Netherlands (exporting mainly to Germany), Poland (exporting to Germany, Netherlands, Czech Republic and Slovakia) and Germany

(exporting to Netherlands). The main EU importers of shell eggs are Germany, Netherlands and Belgium.

(b) *Dried eggs products*. The EU is the main exporter of dried eggs in Europe with 90 % market share. The main exporting countries of this product category are the Netherlands, Germany and Belgium. The main importers of dried eggs in the EU are Germany, United Kingdom, Netherlands, Denmark and Spain.

(c) *Liquid egg products*. About 87 % of the global export with this egg products is performed by Europe, and 99 % of Europe export is made by the EU-28. The main EU exporting countries of liquid egg products are Netherlands (50%), Spain, Belgium, Germany and France. The main importing countries of liquid egg products are Germany, France, United Kingdom, Belgium, Spain and Netherlands [12].

The EU egg market is characterized by the over production on the common market and the slight decline in egg price, by the change in the way of keeping the laying hens to the alternative systems of production to adapt much better to the consumer needs, by the differences regarding the egg production and price in various countries.

(B) Romania's egg market

Romania has a long tradition in poultry farming and after its entry in the EU, it succeeded to align very fast and well to all the EU regulations regarding the technological aspects in poultry farming, both in egg and

meat sector.

In 2016, *the number of holdings* accounted for 216 units where 8,209,254 laying hens were raised (Table 3).

Table 3. The number of holdings growing laying hens and the number of laying hens by way of keeping in Romania, in 2016

Way of keeping	Holdings		Laying hens	
	Number	%	Number	%
Total Romania, of which:	216	100.0	8,209,254	100.0
(a)Enriched cage	98	45.3	5,102,322	62.15
(b)Production alternatives, of which:	118	54.7	3,106,932	37.85
-Free range	16	7.4	119,741	1.45
-Barn	98	45.3	2,940,698	35.82
-Organic	4	2	46,493	0.58

Source: Own calculations based on the data provided by CIRCA,

U:\Aviculture\Normes oeufs (communications)\Number of laying hens by way of keeping_CIRCA.xlsx [3].

According to National Institute of Statistics, Romania registered 40,833.1 thousand laying adult poultry, in 2016, by about 10 % less than in 2007 (Fig.9).

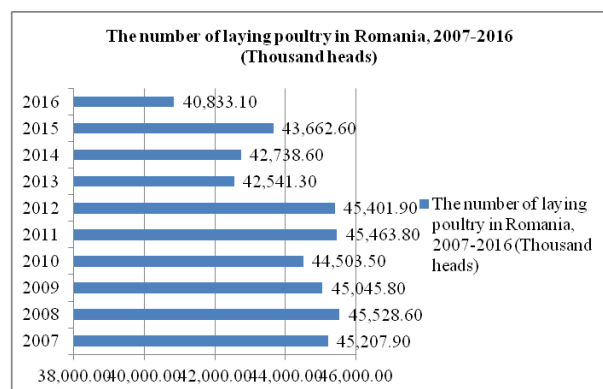


Fig.9.The dynamics of laying adult poultry in Romania, 2007-2016 (Thousand heads)

Source: Own design based on the data provided by National Institute of Statistics, Tempo online Data base, 2017 [19].

The reduction in the number of laying hens was determined by the changes in the way of keeping as a consequence of the high price for the enriched cage in order to assure a double space per bird. A part of the breeders considered that moving to barn technology or to free range technology, they are advantages in reducing production cost. In this way, the number of birds per holding was diminished and production performance as well.

Egg production declined by 5.22 % in the

analyzed period, from 6,522 million pieces in 2007 to 6,182 million pieces in 2016 and this was the result of the reduction of the adult laying poultry and also and of the change in technological was of keeping with a larger space per poultry (Fig.10).

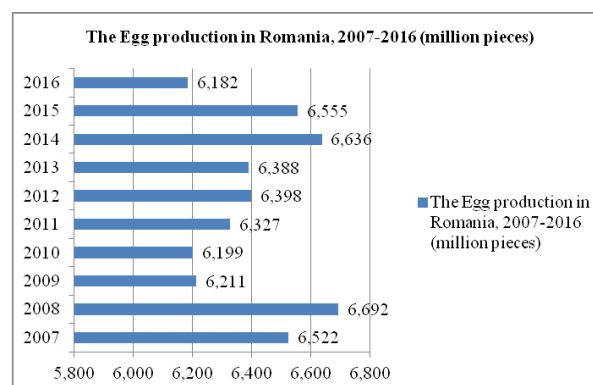


Fig.10.The dynamics of egg production in Romania, 2007-2016 (Million pieces)

Source: Own design based on the data provided by National Institute of Statistics, Tempo online Data base, 2017 [19].

At present, egg production achieved in Romania is much less than before 1989 [28]. Despite that, egg production increased in terms of deliveries, which reached 1,423.8 million eggs in 2015, according to the Union of Poultry Breeders in Romania, but egg production is still less than the provisions of the National Plan for Rural Development 2014-2020.

In addition, in Romania it is a strange situation of egg market. The best egg market is in the urban areas where the poultry companies are able to cover the most important part of the consumer's need (140-150 eggs/inhabitant). In the rural areas, self consumption comes on the first position because from the peasant households are produced about 4 billion eggs which can't be sold in the market, not meeting the EU standards. Also, a part of the urban consumers uses eggs produced in the rural households by their relatives and friends. This situation creates a huge discrepancy between the real egg production and consumption potential of Romania and the official statistical data, producing a distortion in the image of egg market [30].

Egg production per inhabitant recorded a different evolution depending of the laying poultry stock and the demographic dynamics in Romania and egg production per laying bird. In 2016, it was registered 314 eggs/capita by 0.64 % more than in 2007 (312 eggs)(Fig.11).

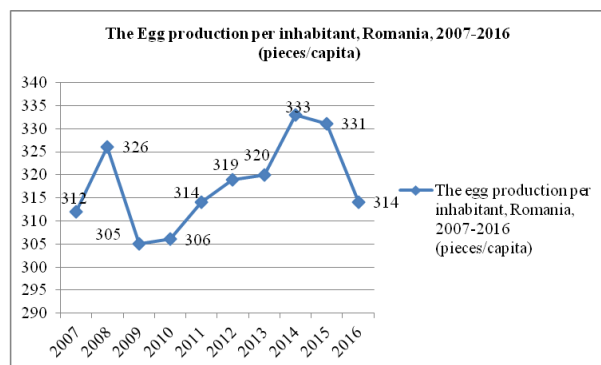


Fig.11. The dynamics of egg production/inhabitant in Romania, 2007-2016 (pieces/capita)

Source: Own design based on the data provided by National Institute of Statistics, Tempo online Data base, 2017 [19].

The value of egg production at producer's price (basic price) in current prices has increased by 34.95 % from RON 2,230.79 million in 2007 to RON 3,010.53 million in 2016. This was due, on one side, by the dynamics of egg production, and also by the producer price (egg price at the farm gate) which in Romania is similar with the basic price, as starting from 2011, poultry farming, including both meat and egg sectors has not

received any subsidies, situation which has deeply affected the producers (Fig.12).

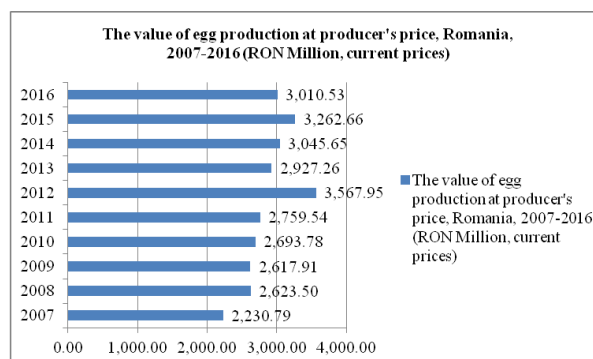


Fig.12. The dynamics of the value of egg production in Romania, 2007-2016 (RON Million, current prices)

Source: Own design based on the data provided by National Institute of Statistics, Tempo online Data base, 2017 [19].

The slight egg price increase was beneficial for egg producers and had a positive influence of the growth of the egg production value.

The egg price varied from a year to another having in general an increasing trend. In 2016, egg price accounted for RON 0.49/egg or RON 486/tonne, being by 44.11 % higher than in 2007, when it was RON 0.34/egg or RON 342/tonne (Fig.13).

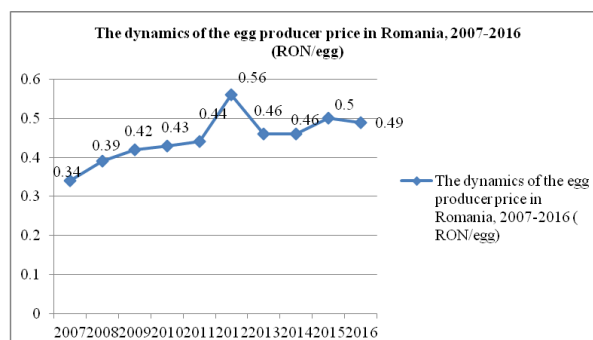


Fig.13. The dynamics of the egg producer's price in Romania, 2007-2016 (RON/egg)

Source: Own design based on the data provided by National Institute of Statistics, Tempo online Data base, 2017 [19].

The hen egg price in the agro-food markets increased by 54.76 % from RON 0.42/egg in 2007 to RON 0.65/egg in 2016 (Fig.14).

Even though, egg price increased in Romania, it is still at a very low level compared to the EU average and the egg price level in other EU countries.

Taking into account the Eurostat Data, in

Romania the egg price declined by 5.61 % from Eurocents 6.78/egg in 2007 to Eurocents 6.40/egg in 2015 for eggs of consumption.

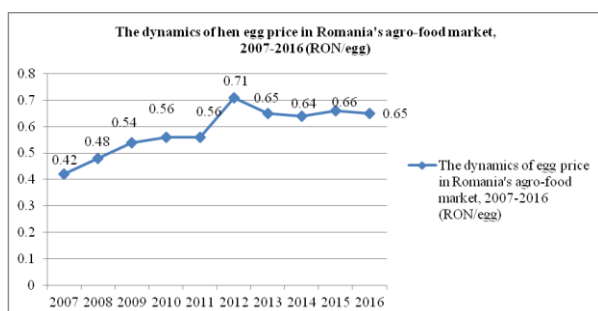


Fig.14. The dynamics of the hen egg price in Romania, 2007-2016 (RON/egg)

Source: Own design based on the data provided by National Institute of Statistics, Tempo online Data base, 2017 [19].

In 2007, the egg price in Romania was closer to the EU average price (Eurocents 6.90/egg). But, from a year to another, the egg price in the EU increased so that in 2015 it accounted

for Eurocents 8.15/egg, being by 18.11 % higher than in 2007.

Therefore, if in 2007, the egg price in Romania represented 98.26 % of the EU egg price, in 2015, the egg price in Romania represented 78.52 % of the EU price (Table 4).

The gap regarding the egg price in Romania has many causes, among which the main important ones are: the general trend of decline of egg price in the world and in the EU markets, the egg imports on the Romanian market coming from countries with subsidized egg production and especially from the Euro zone where production costs are lower, the disloyal competition practiced by a few countries such as Poland which exported eggs at high prices in Romania and commercialized then by means of its own retail net, obliging the Romanian producers to reduce egg price.

Table 4. The dynamics of egg price for consumption egg in Romania and the EU 28, 2007-2015 (Eurocents/egg)

	EU	Romania	Romania's egg price/EU egg price % (Deflation)
2007	6.90	6.78	98.26
2008	7.07	6.95	98.30
2009	7.49	6.76	90.25
2010	7.00	5.77	82.42
2011	6.98	6.04	86.53
2012	10.01	8.50	84.91
2013	8.07	6.39	79.18
2014	8.59	6.40	74.50
2015	8.15	6.40	78.52
2015/2007 %	118.11	94.39	79.91

Source: Van, I, 2016, The Romanian poultry breeders, good technologists, but the marketing must be improved, AviMagazine No.1/2016 [30].

Therefore, even thou the Romanian egg producers have improved their technologies of production aligning them at the EU standards and reduced production cost, even thou in Romania the delivery price increased in the domestic market, the gap between Romania's egg price and the EU price has become more accentuated [30].

Egg consumption/inhabitant varied from a year to another depending on the egg production and the demographic evolution in Romania. In 2016, the average egg consumption per inhabitant accounted for 313 pieces, having a general decreasing trend from

the year 2008 till the year 2014, and then registering a recover. In 2015, the average egg consumption was 262 pieces/capita, by 5.08 % less than in 2007 (Fig.15).

The self-sufficiency rate registered a general positive trend from 113.04 % in 2007 to 126.33 % in 2016. The figures reflect that production is enough higher compared to consumption and that there are important amounts of eggs which could be exported (Fig.16).

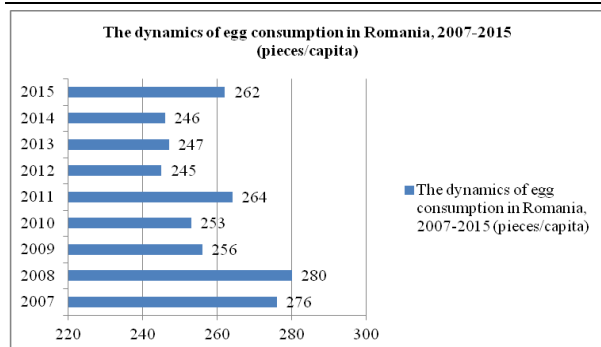


Fig.15. The dynamics of the egg consumption in Romania, 2007-2015 (pieces/capita)

Source: Own design based on the data provided by National Institute of Statistics, Tempo online Data base, 2017 [19].

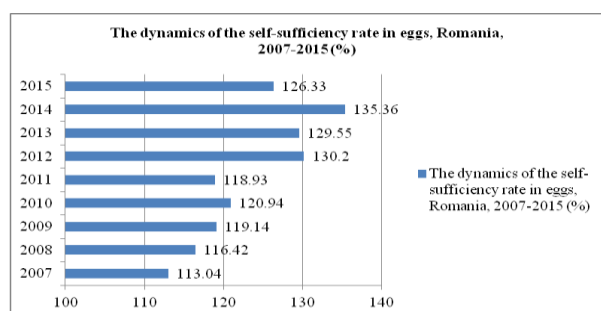


Fig.16. The dynamics of the self-sufficiency rate for egg in Romania, 2007-2015 (%)

Source: Own calculations.

The regression model of egg consumption per inhabitant (Y) depending on egg production per inhabitant (X) was $Y = -0.0437 X + 272.7$. This regression equation reflects that an increase by 1 kg of egg production will led to a decline consumption by 0.0437 eggs. Also, the determination coefficient showed that only 12 % of the variation of the consumption is due to the variation of egg production per inhabitant.

Table 5. The estimated regression model for the agro-food export value depending on the GDP created in agriculture, Romania, 2007-2016

Regression statistics						
Multiple R	0.0346					
R Square	0.00119					
Adjusted R Square	-0.1414					
Standard Error	13.711					
Observations	9					
ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	1.5782	1.578	0.0083	0.9295	
Residual	7	1315.977	187.99			
Total	8	1317.556				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	272.695	151.9697	1.7944	0.1158	-86.655	632.047
X Variable 1	-0.0437	0.4770	-0.0916	0.9295	-1.1716	1.0842

Source: Own computation based on National Institute of Statistics, Tempo on line Data Base, 2017, [19]

Therefore, other factors have a deeper influence on the egg consumption such as: income per household, preference for a special type of eggs, diets and restrains in consumption due to diseases etc.

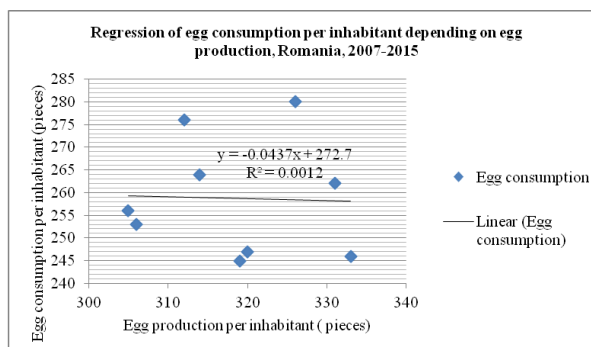


Fig.17. The regression model of egg consumption depending on egg production per inhabitant, Romania, 2007-2015

Source: Own design based on the data provided by National Institute of Statistics, Tempo Online Data base, 2017 [19].

The coefficient of correlation, $r = 0.034$ reflects that between consumption and production of eggs per inhabitant is a very weak but a positive relationship. Therefore, the hypothesis H_0 that between consumption and production is a positive and strong relationship it must not be accepted (Fig.17). The regression statistics and ANOVA for the egg consumption per inhabitant depending on the egg production per inhabitant is presented in Table 5. The results confirm once more that between consumption and production is a weak relationship.

Romania's trade with eggs varies during the year. In general, it increases in the fall-winter season, and decline in the warm season, when in fact production is higher. In the fall-winter period, the imports invade the Romanian market leading to the decline in egg price. In 2015, the amount of exported eggs increased

by 36.87 %, while the amount of imported eggs increased faster by 56.68 %, so that in 2015 the export exceed by only 1.4 % the import. However, the positive aspect is that the trade balance is still an excess one (Table 6).

Table 6. The quantity of exported and imported eggs by Romania, 2014-2015 (Million eggs)

	2014	2015	2015/2014%
Exported eggs	133.7	183.0	136.87
Imported eggs	115.9	181.6	156.68
Trade balance	+27.8	+1.4	5.03

Source: Pop Patricia Alexandra, 2016, The Romanian eggs in competition with the Polish ones, Agribusiness, May 9, 2016, <http://www.agro-business.ro/ouale-romanesti-in-competitie-cu-cele-poloneze/2016/05/09/>, Accessed on January 4, 2018 [21]

The value of egg export, import and trade balance is presented for the same year in Table 7. One can see that the egg export value reached Euro 14,451 thousands in 2015, being by 98.63 % higher than in 2014. The egg

import value also increased by 60.18 %, reaching Euro 12,781.2 thousands. As a result, the trade balance was a negative one in 2014, but a positive one in 2015 (Table 7).

Table 7. The value of exported and imported eggs by Romania, 2014-2015 (Euro Thousand)

	2014	2015	2015/2014%
Exported eggs	7,275	14,451	198.63
Imported eggs	7,979	12,781.2	160.18
Trade balance	-704	+1,669.8	166.16
Export/Import ratio	91.17	113.06	-

Source: Pop Patricia Alexandra, 2016, The Romanian eggs in competition with the Polish ones, Agribusiness, May 9, 2016, <http://www.agro-business.ro/ouale-romanesti-in-competitie-cu-cele-poloneze/2016/05/09/>, Accessed on January 4, 2018 [21]

The value of egg export and import price is presented in Table 8 The export price increased by 15.74 % in 2015 compared to the level of 2014, while the egg import price increased by 6.18 %. The ration between

export price and import price has improved from 81.44 in 2014 to 88.77 in 2015. But, the export price is still lower compared to the import price which is much higher (Table 8).

Table 8. The egg export and import price, Romania, 2014-2015 (Eurocents/egg)

	2014	2015	2015/2014%
Export price	5.40	6.25	115.74
Import price	6.63	7.04	106.18
Differences (E-I)	-1.23	-0.79	64.22
Export/Import price ratio	81.44	88.77	-

Source: Pop Patricia Alexandra, 2016, The Romanian eggs in competition with the Polish ones, Agribusiness, May 9, 2016, <http://www.agro-business.ro/ouale-romanesti-in-competitie-cu-cele-poloneze/2016/05/09/>, Accessed on January 4, 2018 [21]

The main problems of the egg market in Romania are the following ones:

-the high price for inputs in poultry growing for egg production, which determines some breeders to relinquish the enriched cage system of keeping laying poultry and to pass

to barn or free range system in order to reduce production cost;

-the reduction of the egg production carried out in cage system to 60 % (compared to the EU where is still 75 %) and the increased egg production from the alternative systems of

keeping (40%), mainly barn and free range, because the Romanian farmers' desire to reduce production cost;

-the increased production cost in egg production due to the higher and higher price of farm inputs;

-the low selling price compared to other EU countries;

-the disloyal competition practiced by Poland selling eggs at higher price in Romania and determining the local producers to reduce the price;

-the existence of a about 4 billion eggs produced in the peasant households, which can't be sold in the market as they do not compile with the EU regulations;

-the high production and consumption per inhabitant in the rural areas and the non sufficient production achieved by the commercial companies to cover egg consumption in the urban areas which determines Romania to import eggs;

-the unfavorable market in summer season, but favorable in winter season; however, even thou it is a favorable period, in fall-winter season, the inflow of egg imports is higher and determine a reduction in egg price (44%) affecting the Romanian producers;

-the consumption of eggs is limited by the low purchasing power of the Romanians who have lower income levels per household, by the consumer's lack of knowledge about the high nutritive value of eggs, about how many eggs a person could consume per week, month or year, and how to identify the organoleptic features of the egg on the shelf (freshness, term of availability), traceability (origin of the egg);

-egg quality which does not always compile with the EU standards and restrict the amounts of eggs for export;

-the export based just on a small percentage of processed eggs (5%) compared to other countries which are more oriented for egg processing and trading in order to get a higher export price;

-the strong seasonality of egg consumption with a peak mainly around Easter fest leading to a decline of egg price in the market [4, 21, 23, 26, 29].

CONCLUSIONS

The EU egg market is characterized by an overproduction of eggs which has intensified the egg intra-EU export from the countries with high egg production to the countries with a low output performance. Due to this, the egg price has a slight trend to decline at the EU level, but the price is very different from a country to another. The export price creates advantages for some exporting countries, disadvantaging other countries reflecting a non consequence in respecting the EU regulations. In the Euro-zone and the countries with a subsidized egg sector, production cost is smaller and egg price is high. The egg trade balance is a positive one, as long as the EU is one of the most important egg producer and exporter in the world.

Despite that Romania has a long tradition and high potential for egg production as proved before 1989, at present the production performance is far away from the figures recorded in the old times. The laying hen number and the number of holdings raising hens is low and with a decreasing trend. Egg production registered a decline as well as egg production per inhabitant because of the changes in the poultry growing technologies for producing eggs, the movement from the cage system to the barn and free range systems as decided by breeders in order to reduce production cost. The poultry farmers are facing year by year by the increased price for farm inputs (enriched cages, combined fodder, electricity, water etc), with a deep impact of production cost. Egg price at the farm gate has increased, but it is not at the average EU level and even at the level in the other EU countries. As long as the egg sector in Romania is not subsidized, the poultry breeders are not able many times to cover production cost by egg selling price. The high seasonality in egg production, with peaks in the fall-winter season when the demand is lower, and the seasonality of egg consumption with peaks around Easter has a negative influence of egg price. Egg price declines in the warm season when production is higher, and increases in the fall-winter season when production is lower but the demand is higher.

However, the imports are more intensified on the Romanian market exactly on the fall-winter season, which determine Romanian producers to reduce the selling price. Romania's egg trade balance is still a positive one, but the imports have an increasing trend affecting the Romanian producers.

For the moment, the Romanian egg market remains relatively stable, with a slight decline in the number of laying poultry and egg production. the gap between egg price in Romania and at the EU level is bigger and bigger year by year, because of the lack of subsidies in the Romanian poultry sector.

Also, an important amount of eggs produced in the peasant household is not commercialized in the market due to the fact that the eggs do not compile with the EU standards.

The disloyal competition practiced by Poland exporting eggs at high price on the Romanian market affects the interests of the Romanian producers, obliging them to diminish the selling price.

Taking into account the main aspects and trends identified in the Romania's egg market, some proposals to improve it are required as follows:

-the assurance of subsidies from the Government for poultry farmers both for the egg and meat poultry sectors;

- an easier access to the EU funds in order to keep pace with the technological orientation and to assure equipments and biological material at high standards;

- the improvement of the EU regulation regarding egg export, imposing the countries with high egg production to intensify extra-EU egg export for not affecting the egg producers from the countries where production is lower;

-the EU regulations must be entirely respected by all the EU countries assuring a loyal competition which must stimulate the development of the egg sector in all the EU member states;

-the quality of the commercialized eggs by each EU country must compile from all the points of view with the EU standards in order to assure a real consumer protection;

-at the EU level it is needed a new strategy in

the egg producing sector in order to face better the pressures existing in the world egg market;

-also this strategy must avoid the risk of the reduction of egg consumption due to the increased egg price as a result of the extend of free range and organic ways of producing eggs; it is sure that just a low percentage of consumers will desire to pay more for buying eggs;

-in Romania, it is needed a specific strategy for the development of the egg sector in order to strengthen it to be able to face better to the pressures from the EU and world market.

REFERENCES

- [1]Agriculture Statistics, Facts and figures. Production, yields and productivity. <http://ec.europa.eu/agriculture/sites/agriculture/files/statistics/facts-figures/production-yields-productivity.pdf>, Accessed on January 6, 2018.
- [2]Balaban, C, 2017, The egg exports of Romania in the EU are inferior to those of Bulgaria, Lithuania, and Latvia, *Agerpres*, <https://www.agerpres.ro/economie/2017/10/13/exporturile-de-oua-ale-romaniei-in-ue-sunt-inferioare-celor-ale-bulgariiei-lituaniei-sau-letoniei-10-42-45>, Accessed on December 25, 2017
- [3]CIRCA, U:\Aviculture\Normes oeufs (communications)\Number of laying hens by way of keeping_CIRCA.xlsx
- [4]Covasa Ana-Maria, Cofas, V., 2016, The market of the poultry products in the EU and Romania (Piata produselor avicole in UE si Romania), *AviMagazine* No.3/2016.
- [5]Covasa Ana-Maria, Cofas, V., 2016, The market of poultry products in EU in 2015 and at the beginning of the year 2016, *AviMagazine* No.1/2016, pp.8-16
- [6]EU, Agriculture and farm income. <http://ec.europa.eu/agriculture/sites/agriculture/files/statistics/facts-figures/agricultural-farm-income.pdf>, Accessed on January 6, 2018.
- [7]EU Agriculture Outlook for the agricultural markets and income 2017-2030, 18 Dec.2017, https://ec.europa.eu/agriculture/sites/agriculture/files/markets-and-prices/medium-term-outlook/2017/2017-fullrep_en.pdf, Accessed on January 8, 2018.
- [8]EU, Egg, <http://ec.europa.eu/agriculture/eggs.ro>, Accessed on December 20, 2017
- [9]Eurostat, 2016, Egg- Market situation, Dashboard, 2016
- [10]Eurostat, 2016, EU Agriculture, Forestry and Fishery Statistics, 2016 edition.
- [11]Eurostat, 2017, Comext, Eggs, Tonnes egg equivalent, 2017
- [12] Global Poultry Trends, 2015, Europe Dominates

- World Egg Trade, April 8, 2015,
<http://www.thepoultrysite.com/articles/3421/global-poultry-trends-europe-dominates-world-egg-trade/>,
Accessed on December 18, 2017
- [13]Global Poultry Trends - Egg Consumption Continues to Grow in Americas, 2015, March 25,
<http://www.thepoultrysite.com/articles/3395/global-poultry-trends-egg-consumption-continues-to-grow-in-americas/>, Accessed January 7, 2018.
- [14]Grigoras, M.A., 2016, Trends in Romania's animal production, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.16(4)2016, 137-148
- [15]Kritchevsky, S.B. (2004). A review of scientific research and recommendations regarding eggs. *J. Am. Coll. Nutr.* 23(6):596-600.
- [16]Mc Dougal Tony, 2017, Eggs, 75 5 of the EU egg production is concentrated in 7 countries, 15 Sept.2017,
<http://www.poultryworld.net/Eggs/Articles/2017/9/75-of-EU-egg-production-is-concentrated-in-7-countries-184560E/>, Accessed on Dec. 28, 2017.
- [17]Mincu, I. (1993). The impact human being-food. Medical Publishing House.
- [18]Mulder Nan-Dirk, 2017, Outlook for the Global and EU industry, Shapen the industry for competitiveness, Poultry Congress, 2017.
- [19]National Institute of Statistics, Tempo online Data base, 2017
- [20]Pirvutoiu, I., Popescu Agatha, 2012, Research on the Major Trends in the Romanian Egg Market, *Bulletin UASVM Horticulture*, 69(2)/2012, 229-238
- [21]Pop Patricia Alexandra, 2016, The Romanian eggs in competition with the Polish ones, *Agribusiness*, May 9, 2016, <http://www.agro-business.ro/ouale-romanesti-in-competitie-cu-cele-poloneze/2016/05/09/>, Accessed on January 4, 2018
- [22]Poultry Trends 2017,
www.poultry.trends.com/201711/ Accessed on January 5, 2018
- [23]Rogalski, D., 2017, The Romanians and the egg consumption: Eight of ten consume weekly, but less than a half have correct knowledge about egg properties, 7 dec 2017,
<https://www.smark.ro/articol/41045/romanii-si-consumul-de-oua-opt-din-zece-le-consuma-saptamanal-mai-putin-de>, Accessed on January 5, 2018
- [24]Single CMO [Council Regulation (EC) No 1234/2007 of 22 October 2007
- [25]Statistical Factsheet, European Commission, Romania, June, 2017,
https://ec.europa.eu/agriculture/sites/agriculture/files/statistics/factsheets/pdf/eu_en.pdf, Accessed on December 20, 2017.
- [26]The Romanians buy 180 million eggs in the period of Easter feast, 2017,
<https://ziarimm.ro/romanii-cumpara-180-de-milioane-de-oua-in-perioada-sarbatorilor-pascale/>, Accessed on January 4, 2018
- [27]Vacaru-Opris, I. (2007). Treatise of Aviculture, Vol. I, Ceres Publishing House, Bucharest.
- [28]Van, I., 2016, 55 years of industrial poultry farming in Romania, *AviMagazine* No.3/2016, pp.2-4
- [29]Van Ilie, 2017, Is the agro-food market of the EU a competitive or concurential market? (Este piata agroalimentara a UE o piata competitiva si concurentiala?), 24 March 2017,
<http://www.avicultura.ro/este-piata-agroalimentara-UE28-competitiva-concurentiala>, Accessed on December 20, 2017.
- [30]Van, I, 2016, The Romanian poultry breeders, good technologists, but the marketing must be improved, *AviMagazine* No.1/2016, 2-4
- [31]Wee Y. Rolando, 2017, Top egg producing countries in the world,
<http://www.worldatlas.com/articles/top-egg-producing-countries-in-the-world.html>, Accessed on January 6, 2018