BARLEY MARKET DEVELOPMENT IN ROMANIA IN THE PERIOD 2007-2017

Agatha POPESCU[1]

Abstract. *The paper aimed tan analyze the trends and changes in one row and two row barley in Romania during the period 2007-2017 using the empirical data for the cultivated area, yield, production, export, import and trade balance as well as acquisition price and FOB and CIS price to assess the efficiency in barley external trade. The results pointed out an increase of cultivated area by 25%, by 186.5% in yield and by +258.8% in output in 2017 versus 2007. In 2017, Romania cropped 455 thousand ha with barley, from which it produced 1,906.7 Thousand tons, meaning an yield performance of 4,186 kg/ha. Also, in 2017 compared to 2007, export value was 8.1 times higher, import value was 6.6 times higher and finally trade balance was 9.1 times higher. In 2017, Romania's barley trade balance accounted for Euro 148,750.2 thousand. As final conclusion, the higher and higher production performance stimulated external trade with barley, and Romania proved to be not only one of the main producing country of the EU-28 and also an important exporting country. Besides maize, barley is one of the agricultural commodities having a positive trade balance, Romania being a net exporting country.*

Keywords: barley**,** cultivated area, yield, production, trade, Romania

1. Introduction

Barley *(Hordeum vulgare L.)* comes on the 5th position worldwide as importance among grains crops taking into account its economic, social, and environmentally friendly features.

Firstly, barley is cultivated for producing feedstuffs of high nutritive and energetic value for animal growing and fattening. In many countries like France, United Kingdom, Netherlands, Germany and Romania, concentrated food of barley is successfully used for growing pigs, poultry and horses. In a mix between barley and peas, it is obtained a high value meslin. The barley straw are also used as animal feed having a higher nutritive value than wheat straw.

Secondly, barley is a raw material for processing industry. In many countries, two row barley grains are used to produce beer like in Germany, Austria, Denmark, Poland, Netherlands, and Romania. Also, from barley it is produced: alcohol, glucose, dextrin, starch, pearl barley and roosted coffee substitutes, syrup, flakes, sweets.

[1]Prof., Ph.D., University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, Full Member of the Academy of Romanian Scientists, Corresponding Member of the Academy of Agricultural and Forestry Sciences "Gheorghe Ionescu-Şişeşti", Bucharest, Romania, (e-mail: agatha_popescu@yahoo.com).

Thirdly, barley has an agro-technical importance, being a precursory plant for other crops.

In Romania, one row barley is largely cultivated in almost all the regions where it finds favourable soil and climate conditions. Barley is successfully cultivated in the Southern and Eastern Romania, and also in the West area. In Dobrogea, Muntenia, Moldova and Transilvania the conditions for this crop are less favourable. Two row barley is suitable to be cropped in Transilvania, Timis, Bihor, Suceava areas and less suitable in Dobrogea and South Moldova (Balteanu, 1989) and Sima (2009) [1, 17].

To increase production performance, barley responds very well to fertilization and sowing density. Experiments in Romania proved for Prestige and Jersey varieties that fertilization based on poultry wastes is very efficient as well as N40P40 and N80P80 levels, while N120P120 levl has no a positive impact on production (Ifrim, 2010) [3].

Regarding the influence of the sowing period, it was found that dry matter content increased when barley was sown in late April and not in October and early March, and also that the higher the plant density, the lower the nitrogen (Kirby, 2008) [4]. Other authors found that "increasing sowing density, root length density increases in the topsoil as well as specific root length with importance for nutrient and water acquisition, and for the metabolic efficiency of the root system. Sowing density influenced individual plant size and relative biomass allocation to different plant organs." (Hecht el al., 2016) [2].

Romania is an important producing and exporting country in the EU-28, its production and trade being intensified mainly after the Country accession into the EU on January 1st 2007.

The objective of this study was to analyze the dynamics of the cultivated area, production, yield, and trade of barley in Romania in order to identify the main trends and changes in the period 2007-2017.

2. Materials and Methods

2.1. Data collection

The analysis is based on the following specific system of indicators for a market study: cultivated area, average production per surface unit, total output, average acquisition price, exported and imported amounts, the value of export, import and trade balance and export and import price.

For this purpose, the data were collected from the data base on the National Institute of Statistics and Ministry of Agriculture and Rural Development for the period of reference 2007-2017.

2.2. Methodological aspects

Fixed basis Index having the formula: $I_{FB\%} = (X_n/X_0)*100$ was utilized to characterize the dynamics of each analyzed indicator mentioned above.
The average annual growth rate, $\bar{\Delta} = (y_n - y_0)/(n - 1)$, where y_n is the level of the indicator in the year n (1,2,..11) and y_0 is the valeu of the indicator in the 1st year.
Descritptive statistics in terms of mean, standard deviation and variation coefficient was also determined using Excel facilities.
Trade balance (TB) was calculated as difference between export value (E) and import value (I), according to the formula: TB = E - I.
The results were presented in tables and specific comments and interpretations accompanied them. In conclusions, there were included the main ideas resulting from this research and also a few recommendations for farmers to improve barley production.

3. Results and discussions

In the period 2007-2017, ***the cultivated surface*** with barley increased by 25.06% from 363.8 thousand ha in 2007 to 455 thousand ha in 2017. The highest cropped area was 517.5 thousand ha in 2009 and the minimum area in 2007 as mentioned before. The largest surfaces cultivated with barley and other cereals like maize and wheat are in the South, South East, South West and West Romania (Popescu, 2015a, 2015b) [10, 11]. The surface increased due to the need on the domestic and external market and due to the incentives given to farmers offered by the EU Commission and the Government (MARD, 2018) [5].

Average production registered a high growth rate +186.5% in 2017 compared to 2007. If in the first year of the analysis Romania obtained the lowest productivity per ha, 1,461 kg/ha, in 2017, it carried out the highest performance, accounting for 4,186 kg/ha. This was determined by the implementation of the new technologies involving high potential cultivars and hybrids adapted to the local conditions, resistant to diseases and pests, by the modernization of the equipment for tillage and sowing till harvesting, by the application of a suitable fertilization level. However, in the year 2009, 2010 and mainly in 2012, a severe and long drought affected grains yield whose performance was lower than in the other years.

Barley production was 3.58 times higher in 2017 compared to 2007. In 2017, Romania achieved 1,906.7 thousand tons, the highest performance, compared to only 531.4 thousand tons in the year 2007. In 2012, production had the lowest level, only 986.4 thousand tons due to the climate change. Barley looks to be cultivated in a more intensive system than maize as proved by yield and production level (Popescu, 2017a) [13].

In the territory of Romania, the competitiveness among the eight regions of development is very high regarding cereal production. For barley, as well as for the other cereals like maize and wheat, South-Muntenia, South- East, South West Oltenia and West are the most competitive areas. However, in Romania production performance depends not only by the technological factors which are enough well managed by producers, but also on the climate change regarding especially the extreme phenomena like: high temperatures, long period of severe drought, huge rainfalls etc. Also, the lack of irrigation systems have to be mentioned as a restraining factor of production performance (Voicilas, 2014) [18].

Average acquisition price was Lei 0.6/kg in 2017 by 1.6% higher than in 2007, when it accounted for Lei 0.59. The highest price was Lei 0.86 per kg at the farm gate in the year 2012, when production was very small due to the drought. This prove the price elasticity in connection with production a feature characterizing cereal production in Romania (Popescu, 2015c) [12]. (Table 1).

Table 1. Dynamics of barley cultivated area, yield, production and average acquisition price

	Cultivated area (Thousand ha)	Yield (kg/ha)	Production (thousand tons)	Average acquisition price (Lei/kg)
2007	363.8	1,461	531.4	0.59
2008	394.0	3,069	1,209.4	0.67
2009	517.5	2,284	1,182.1	0.44
2010	515.8	2,542	1,311.0	0.41
2011	419.5	3,170	1,329.7	0.73
2012	424.2	2,325	986.4	0.86
2013	495.7	3,111	1,542.2	0.79
2014	516.0	3,319	1,712.5	0.62
2015	468.5	3,461	1,623.2	0.66
2016	481.6	3,773	1,817.3	0.57
2017	455.0	4,186	1,906.7	0.60
2017/2007 %	125.06	286.50	358.80	101.6
$\bar{\Delta}$	9.12	272.5	137.53	0.001
Mean	459.23	2,972.81	1,377.44	0.63
St. Dev.	52.83	768.29	401.89	0.13
Variation coefficient %	11.50	25.84	29.17	20.63

Source: Own calculation based on the data from NIS, MARD, 2018 [5, 6].

In the studied interval, these four indicators registered the following mean and standard deviation: cultivated area 459.23 ± 52.83 thousand ha, average production 2,972.81 ± 768.29 kg/ha, grains production 1,377.44 ± 401.89 thousand tons and average acquisition price Lei 0.001 ± 0.13 per kg.

The value of the variation coefficient reflected that in case of the surface, the data were homogenous and the mean is representative as 10% < CV% < 20%, while in case of yield, production and producer's average price, the values of the indicators were relatively heterogeneous and the means are not representatives.

Exported and imported quantities had a various evolution from a year to another, but the general trend is an increasing one in the both cases. Romania is not only an important producer of barley, but also an exporting and importing country.

The exported amount of barley increased 10.3 times from 139.8 thousand tons in 2007 to 1,442.7 thousand tons in 2017. Also, the imported quantities registered an increasing trend accounting for 467.9 thousand tons in 2017 compared to 46.1 thousand tons in 2007, therefore being 10.1 times higher in the last year of the analyzed interval (Fig. 1).

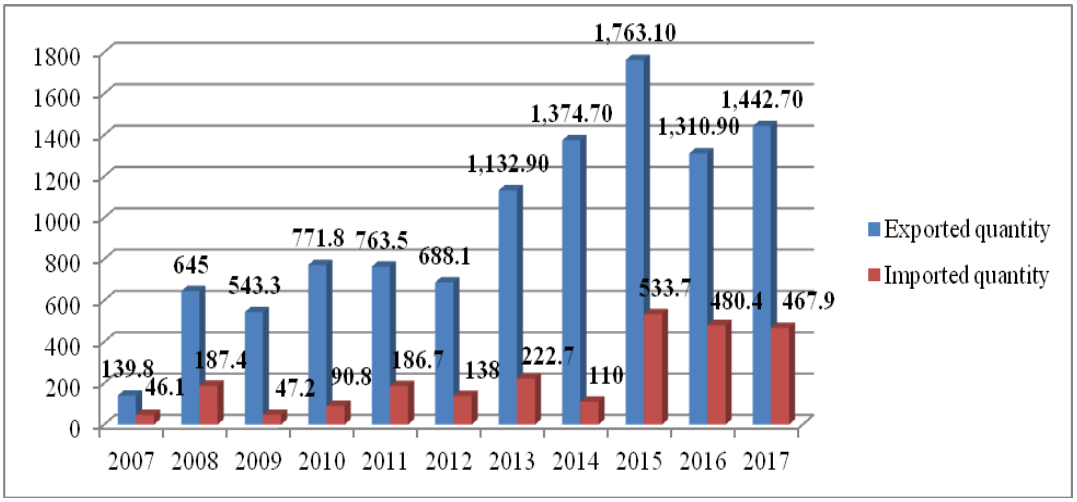

Fig. 1. Dynamics of the exported and imported barley grains, 2007-2017 (Million tons)
Source: Own design based on the data from NIS, MARD, 2018 [5, 6].

Fig. 1 illustrates that the exported quantities were much higher than the imported amounts in each year of the researched interval.

Trade balance resulted from the difference between the value of exports and imports of barley grains.

The export value increased 8.1 times from Euro 26.5 million in 2007 to Euro 215 million in 2017. *The import value* also raised 6.5 times from Euro 10.1 million in 2007 to Euro 66.3 million in 2017. As a consequence, barley *trade balance* had a positive and ascending tendency. In 2017, barley trade balance was Euro 148.7 million, 9.1 times higher compared to Euro 16.3 million in 2007.

Therefore, barley is among the agricultural products with a positive trade balance. This good situation was determined, on one side, by the higher and higher exported quantities of grains compared to the lower increasing rate of the imported quantities, and, on the other side by the level of the export and import price (Popescu, 2017b) [14].

Analysing the average price received per ton of exported and imported barley grains, we may easily observe a variation from a year to another across the studied interval depending on the international market circumstances. However, in 2017, the average export price FOB was Euro 149.1 per ton compared to Euro 189.5 per ton, i.e. lower by 21.45, while the import price CIS was Euro 141.7 per ton in 2017 compared to Euro 220.7 in the year 2007, meaning by 35.8% smaller. Based on these data, we may say that both the export and import price registered a decreasing trend in the analyzed period (Table 2).

Table 2. Dynamics of the value of barley grains export and import, and trade balance (Euro Million)

	Export value	Import value	Trade balance
2007	26.5	10.2	16.3
2008	110.2	32.8	77.4
2009	60.2	5.2	55.0
2010	94.9	14.3	80.6
2011	145.4	34.5	110.9
2012	154.0	32.1	121.9
2013	223.6	44.4	179.2
2014	228.0	17.2	210.8
2015	229.1	83.1	216.0
2016	171.8	70.3	101.5
2017	215.1	66.3	148.8
2017/2007 %	811.3	651.7	910.8
$\bar{\Delta}$	18.86	5.61	13.25
Mean	150.8	37.3	119.8
St. Dev.	71.0	26.1	63.6
Variation coefficient %	47.1	69.9	53.1

Source: Own calculations based on the data from NIS, MARD, 2018 [5, 6].

Comparing the average export price with the average import price, we may find out that in 2009, 2011, 2014, 2015 and 2017, the export price FOB exceeded the import price CIS, having a positive influence on the trade balance. In the years 2007, 2008, 2010, 2012 and 2013, the average import price was higher than the average export price and this had a negative impact on the trade balance, Romania recording losses due to this difference between the two prices (Table 3).

The biggest customers of Romania's exports of barley grains are Saudi Arabia, Iran, Spain and in a smaller measure other beneficiaries. The greatest amount of grains is shipped on the Black Sea through the port of Constanta which is the main trading hub for agricultural products.

Table 3.Dynamics of the average barley grains export and import price (Euro/ton)

	Average export price	Average import price	Difference AEP-AIP
2007	189.5	220.7	-31.5
2008	170.9	175.0	-4.1
2009	110.7	110.1	+0.6
2010	122.9	157.5	-34.6
2011	190.4	184.8	+5.6
2012	223.8	232.8	-9.0
2013	197.3	199.5	-2.2
2014	165.8	156.1	+9.7
2015	169.6	155.6	+14.0
2016	146.3	146.3	0
2017	149.1	141.7	+7.4
2017/2007 %	78.60	64.20	-

Source: Own calculations.

In Romania's cereals export value in 2017, barley occupied the 3rd position with a share of 9.15%, after wheat 55.35 and maize 34.4%. In the same year, the share of barley in the import value was 11.95, after wheat 56.9% and maize 24.9% (Popescu, 2012, 2014, 2018) [8, 9, 15].

The coverage index Import/Export, ICD, accounted for 2.7 in case of barley in 2017 being by 8% higher than in 2007. For ICD level, barley came on the 3rd position after maize ICD 4.9 and wheat ICD 3.4 (Popescu, 2010) [7].

Romania is ranked the 3rd in the EU-28 for barley export, with a similar position for wheat export, and on the 1st position for maize export (Popescu et al., 2018) [16].

Conclusions

(1). The development of barley market and of cereals market in general in Romania represents an important factor for rural development, for assuring incomes for producers, whose job is a noble one, as they provide food and life for population.

(2). In Romania, barley is a cereal situated on the 3rd position after maize and wheat regarding the cultivated area and production.

(3). Both the increased cultivated area and mainly the growth of the yield have contributed to the continuous higher performance in grains output.

(4). Grace to the high production able to cover the requirements of the domestic market, but also to valorise the surplus on the external market, Romania's international trade with barley has been intensified and assured a positive trade balance, making the country a net exporter.

(5). Romania's foreign trade with cereals has a positive balance with a good impact on the payment balance and the economy in general.

(6). Romania's producers have to intensify their efforts to produce more barley using new technologies adapted to the climate change in order to export more grains and bring foreign currency in the country improving the efficiency of external trade.

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SOYBEAN MARKET DEVELOPMENT IN ROMANIA IN THE PERIOD 2007-2017

Agatha POPESCU[1]

Abstract. *The paper aimed to analyze the trends and changes in soybean market in Romania in the interval 2007-2017 based on the statistical data for the cultivated area, yield, production, export, import and trade balance. The results emphasized that in 2017, Romania cultivated 165 thousand ha with soybean, produced 2,390 soybeans per ha in average and obtained 393 thousand tons beans. In 2017 versus 2007, the cropped area was by 23.9% higher, yield was by 134% higher and production by 188.7% higher. Both export and import have quantitatively increased, but imports are higher than exports. For this reason the trade balance was mainly a negative one during the studied period, except the years 2010-2012. However, in 2017, the negative value of the trade balance was - Euro 9,431.3 thousands, by about 50% smaller than in 2007, which is a positive aspect. Romania has to continue to extend the cultivated area with soybean and increase production to cover better the domestic market and stimulate exports.*

Keywords: soybean**,** cultivated area, yield, production, trade, Romania

1. Introduction

Soybean (*Glycine max*, L.) is considered the "golden plant of mankind" and "the plant of the future" because has an economic importance being an oleaginous plant largely cultivated by many farmers in the world and occupying the top position in the world oilseeds production (BASF, 2018) [1].

It has the capacity to make a symbiotic relationship with the bacteria fixing nitrogen into the soil and in this way it contributes to the improvement of soil fertility leaving about 80-120 kg nitrogen per ha. For this reason it is considered a valuable precursory crop for most of the agricultural plants, being included in crop rotation. Taking into account that it is a lack of fertilizers which are imported at high prices, the extend of the cultivated area with soybean could have a positive impact in reducing production cost with fertilization (Bîlteanu and Bîrnaure, 1989) [2].

Soybean has a lot of uses for humans, animals and industry.

It is a magnificent plant using as human food because a large range of food products are obtained from soybean due to its chemical content rich in protein, such as: vegetal milk, tofu cheese, coffee, chocolate, sweets, cakes, biscuits,

[1]Prof., Ph.D., University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, Full Member of the Academy of Romanian Scientists, Corresponding Member of the Academy of Agricultural and Forestry Sciences "Gheorghe Ionescu-Ş iş eş ti", Bucharest, Romania, (e-mail: agatha_popescu@yahoo.com).

pastas, vegetal meat etc. Also, the soybean oil is used for producing margarine, canned vegetables, soaps, plastic materials, varnishes and paints (Muntean, 1997, and Mogârzan et al., 2004) [7, 8].

Nowadays, soybean plays an important role as raw material for producing renewable energy, mainly for biofuels (biodiesel) which are environmentally friendly diminishing pollution (Popescu, 2012a) [10].

After the oil extraction, the cakes or meslins are successfully used as animal feed. Also, the green soybean plant in combination with Sudan grass is used to produce silage for dairy cows.

At the world level, soybean production was estimated in the year 2017/2018 at 346 million metric tons. Soybean is the top oilseeds crop worldwide, having a production 4.9 times higher than rape seeds output and 6.1 times higher than sunflower seeds. The main producing countries worldwide are USA, Brazil, Argentina, China, India and Canada (Soybean Meal Info Center, 2018) [12].

The EU-28 produced about 18.5 million tons soybeans, the main producing countries in the decreasing order being: France, Germany, Poland, Czechia, Hungary and Romania (EU, Crop Market Observatory, 2018) [5].

Romania has a high potential for producing soybean, which justify its sixth position among the EU-28 top producing member states (Dima, 2015 and Surca, 2019) [4, 13].

Among the oil seeds plants cultivated in Romania, soybean comes on the rd postion as importance after sunflower and rape (Popescu, 2012b) [11].

The most suitable areas for soybean cropping in Romania are South, South East, West, North West, North East Moldova and West and South West Transilvania (Brătulescu, 2018) [3].

The purpose of the research was the analysis of soybean market in Romania in the interval 2007-2017 regarding cultivated area, production, yield, and trade in order to identify the main trends and changes.

2. Materials and Methods

2.1. Data collection

The statistical data concerning cultivated area, average production per surface unit, total output, average acquisition price, exported and imported amounts, the value of export and import were provided by the National Institute of Statistics and Ministry of Agriculture and Rural Development.

2.2. Methodological aspects

The main methods and procedures to process tha data have been:
-*Fixed basis Index,* $I_{FB\%,}$ whose formula is: $I_{FB\%} = (X_n/X_0)*100$. It was used to assess the time evolution of each analyzed indicator mentioned above.
-*The average annual growth rate,* $\bar{\Delta}$, whose formula is: $\bar{\Delta} = (y_n - y_0)/(n - 1)$, where y_n is the variable value in the year n (1,2,..11) and y_0 is the variable value in the 1st year.
-*Descritptive statistics* regarding: mean, standard deviation and variation coefficient.
-*Trade balance (TB)* was determined with the formula: TB = E - I, where E is export value and I is import value.
The results were exposed in tables and graphics being commented and correspondingly interpreted. The main ideas resulting from this research were presented in conclusions.

3. Results and discussions

In the studied period 2007-2017, ***the cultivated surface*** with soybean raised by 23.96% from 133.2 thousand ha in 2007 to 165.1 thousand ha in 2017. After a period of deep decline in 2008-2014, since 2015 the cultivated land with soybean exceeded 100 thousand ha and it is expected to be expanded in the coming years as Romania has a high potential for producing soybean even on 500 thousand ha and even 1 million ha.

In 2017, Romania cultivated 1,766.34 thousand ha with oilseeds crops, of which soybean occupied 165.1 thousand ha (9.34%), coming on the 3td position after sunflower and rape.

The largest surfaces cultivated with soybean are in North Eat (21.77%), West (20.21%), South (19.77%), South East (19.61%), and North West (11.52%) Romania (MARD, 2018) [6].

Soybean yield increased by 134% in the studied interval from 1,021 kg/ha in 2007 to 2,390 kg/ha in 2017 as farmers have been more and more interested in this crop during the last decade. The highest performance in soybean yield was achieved in South East, 3,197 kg/ha, South area 3,173 kg/ha, North West 2,377 kg/ha and in South West Oltenia 2,075 kg/ha.

Soybean production was 2.88 times higher in 2017 compared to 2007. In 2017, Romania achieved 393 thousand tons soybeans, the highest performance, compared to 136.1 thousand tons in 2007. The share of soybean production in Romania's oilseeds production achieved in 2017 is 7.89%.

In the territory of Romania, the competitiveness among the eight regions of development is very high regarding soybean production. The contribution of the main producing micro regions of development to the national soybean production in 2017 was the following one: South 26.32%, South East 26.31%, North East 16.36 %, West 13.63% and North West 11.49. The other micro regions had smaller contributions.

Average acquisition price was Lei 1.34/kg in 2017 by 71.7% higher than Lei 0.78 per ha in 2007. Its substantial growth rate was justify by the high interest of the EU for extending the cultivated surfaces and raise production of soybean, a reason which was sustained by various types of subsidies (Table 1).

Table 1. Dynamics of soybean cultivated area, yield, production and average acquisition price

	Cultivated area (Thousand ha)	Yield (kg/ha)	Production (thousand tons)	Average acquisition price (Lei/kg)
2007	133.2	1,021	136.1	0.78
2008	49.9	1,817	90.6	0.97
2009	48.8	1,726	84.3	0.96
2010	63.9	2,345	149.9	1.23
2011	**72.1**	1,980	142.6	1.30
2012	**79.8**	1,308	104.3	1.71
2013	67.7	2,216	149.9	1.83
2014	79.9	2,539	202.9	1.43
2015	128.2	2,045	262.1	1.33
2016	127.3	2,067	263.4	1.39
2017	165.1	2,390	393.0	1.34
2017/2007 %	123.9	234.0	288.7	171.7
$\bar{\Delta}$	3.19	136.9	15.26	0.056
Mean	92.35	1,859.4	179.91	1.29
St. Dev.	39.12	789.11	93.59	0.31
Variation coefficient %	42.36	42.43	52.02	24.03

Source: Own calculation based on the data from NIS, MARD, 2018 [6, 9].

In the studied interval, these four indicators registered the following mean and standard deviation: cultivated area 92.35 ± 39.12 thousand ha, yield 1,859 ± 789.11 kg/ha, production 179.91 ± 93.59 thousand tons and average acquisition price Lei 0.056 ± 0.31 per kg.

The value of the variation coefficient had higher values over 20% in case of cultivated surface, yield and production, reflecting that the variables have heterogeneous values and that the means are not representative. In case of average price, the value of the coefficient of variation was over 20% reflecting that the

variable levels are relatively heterogeneous and that the mean is less representative.

Exported and imported quantities had different levels, in fact imported amounts were higher than the exported ones in almost all the analyzed years. The general trend is an increasing one both in case of export and import

The imported amount of soybean increased 1.95 times, while the exported quantity increased 12.40 times in the analyzed interval. In 2017, Romania exported 273.9 thousand tons compared to 22 thousand tons in 2007. Also, in 2017, the country imported 133.7 thousand tons compared to 68.5 thousand tons in 2007 (Fig. 1).

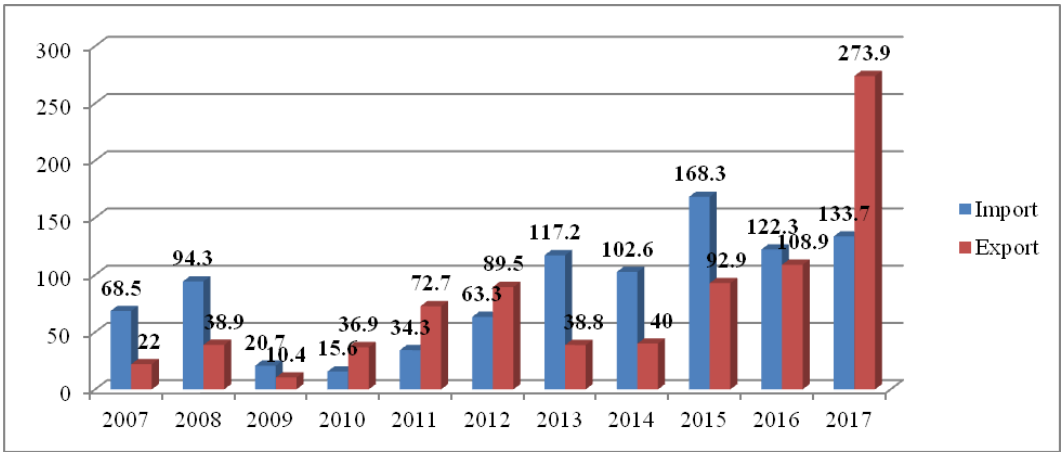

Fig. 1. Dynamics of the exported and imported soybeans, 2007-2017 (Thousand tons)
Source: Own design based on the data from NIS, MARD, 2018 [6, 9].

Fig. 1 illustrates that the exported amount was more than double than the imported amount of soybean seeds.

Trade balance was either negative or positive depending on from the difference between the value of exports and imports of soybean seeds.

The export value increased 21.58 times from Euro 4,705.1 thousand in 2007 to Euro 101,548.1 thousand in 2017. *The import value* also raised 2.3 times from Euro 23,770.3 thousand in 2007 to Euro 54,689.9 thousand in 2017.

In consequence, soybean *trade balance* was positive only in the years 2010, 2011 and 2012, and also in 2017. In the other years, it had negative values. In 2017, soybean trade balance was Euro 46,858.2 thousand compared to Euro -19,065.2 thousand in 2007 (Table 2).

Analysing the average price received per ton of exported and imported soybean seeds, we may find out that in 2017, the average export price FOB was Euro

370.6 per ton compared to Euro 212.9 per ton, meaning + 74.1% higher, while the import price CIS was Euro 408.8 per ton in 2017 compared to Euro 346.7 in the year 2007, meaning by 17.9.8% higher (Table 3).

Table 2. Dynamics of the value of soybean seeds export and import values and trade balance (Euro Million)

	Export value	Import value	Trade balance
2007	4.7	23.7	-19.1
2008	13.5	38.0	-24.5
2009	3.0	7.9	-4.9
2010	13.2	5.9	+7.3
2011	28.4	12.9	15.5
2012	41.8	29.8	+12
2013	21.9	53.7	-31.8
2014	21.4	41.9	-20.5
2015	40.4	65.9	-25.5
2016	43.1	52.5	-9.4
2017	101.5	54.7	+46.8
2017/2007 %	2,159.5	230.8	245.0
$\bar{\Delta}$	9.68	3.10	6.59
Mean	30.26	35.17	-4.91
St. Dev.	27.56	20.68	23.49
Variation coefficient %	91.07	58.80	-

Source: Own calculations based on the data from NIS, MARD, 2018 [6, 9].

Table 3.Dynamics of the average soybean seeds export and import price (Euro/ton)

	Average export price	Average import price	Difference AEP-AIP
2007	212.9	346.7	-133.8
2008	346.4	402.7	-56.3
2009	291.0	380.5	-89.5
2010	358.0	383.2	-25.2
2011	390.6	376.6	+14.0
2012	467.0	471.1	-4.1
2013	564.1	458.0	+106.1
2014	534.0	408.0	+126.0
2015	434.4	391.2	+43.2
2016	395.2	429.2	-34
2017	370.6	408.8	-38.2
2017/2007 %	174.1	117.9	-

Source: Own calculations.

Comparing the average export price with the average import price, we may find out that in the period 2007-2010, in the year 2012, 2017 and 2017, the export price FOB was smaller than the import price CIS, and this resulted in a negative influence on the trade balance. In the years 2011 and 2013-2015, the average export price exceeded the import price having a positive impact on the trade balance (Table 3).

Conclusions

(1). Soybean surface, yield and production have substantially grown in the analyzed period, reflecting that this crop could give a high performance in the conditions of Romania and that soybean is an important source of food, feed and raw materials for manufacturing industries.

(2). Both exports and imports had an ascending evolution, both from a quantitative and value point of view.

(3). The trade balance with a variation of its value from negative to positive and the reverse reflects an instability of Romania's commercial transactions on the EU and other markets.

(4). Taking into account the high potential of Romania to produce more soybean, farmers have to extend the cultivated surface, to apply the modern technologies for getting a better yield and production performance. The price on the domestic market is more attractive than the cereals price, and on the external market as well.

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DISCREPANCIES IN DAIRY FARMS STRUCTURE BETWEEN ROMANIA AND THE EU-28 TOP COUNTRIES RAISING COWS IN THE PERIOD 2010-2017

Agatha POPESCU[1]

Abstract. *The paper analyzed dairy farms structure in Romania comparatively with the top EU-28 countries growing dairy cows. The period of reference was 2010-2017 and the main studied indicators have been: number of dairy cows, number of dairy farms, dairy farms structure by farm size (ha) and by herd size (cows/farm), and yield (kg/cow/year). The number of dairy cows declined in Romania by 17.27% from 1,441.4 thousand heads in 2010 to 1,192.5 thousand heads in 2017, while milk yield increased by 16.16% from 2,750.7 kg/cow/year in 2010 to 3,198 kg in 2017. Romania has 531,851 dairy farms of which 81.58% were raising 1-2 cows, 10.97% between 3 and 5 cows, and just 0.09% are farms with over 100 cows. The average herd size is 2.4 cows/farm compared to United Kingdom (143), Netherlands (97.4), Ireland (76.2),Germany (61.7), France (57.1), Italy (37.6), and Poland (9). Herd size is a key factor for getting yield performance. Romania comes the penultimate position in the EU for its cow yield, which reflects the inappropriate dairy cows farm structure. Farmers have to join in associative forms for better managing farm inputs, increasing yield and production, reducing production cost and selling raw milk efficiently.*

Keywords: farm structure, dairy of cows, milk yield, Romania, discrepancies, EU countries

1. Introduction

Dairy sector is a strategic field of activity assuring milk, a basic food for the population and raw milk for processing industry, as well as giving an important contribution to agricultural output and sustaining producers' income.

Cow milk has the highest share in raw milk delivered to dairies. Its production depends on the number of dairy cows and their performance in terms of yield. In its turn, milk yield is the result of a large range of factors such as: farm size, herd size, breed, feeding, reproduction, animal health and welfare etc. [16, 23].

The economic efficiency in dairy farming is quantified by gross margin resulting as difference between gross product and variables costs, which in this area have a high percentage about 70% [9, 10, 11, 13].

The practice proved that the higher milk yield, the higher gross product and as a result gross margin as well [12, 16, 17, 18, 19, 20, 21].

[1]Prof., Ph.D., University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, Full Member of the Academy of Romanian Scientists, Corresponding Member of the Academy of Agricultural and Forestry Sciences "Gheorghe Ionescu-Ş iş eş ti", Bucharest, Romania, (e-mail: agatha_popescu@yahoo.com).

In this respect, research results showed various models which included the factors which could increase economic efficiency in dairy farming [22, 24, 25, 26, 27].

Production is stimulated by the increased demand on the internal and international market of milk and dairy products [28, 29, 32]. The demand/offer ratio is also closely linked of milk price [30, 31, 33, 34, 35].

The EU-28 is able produced about 170 million tons milk per year, of which over 97 % comes from dairy cows. About 70% of the EU milk output is achieved by Germany, France, the United Kingdom, Poland, the Netherlands and Italy. The EU average milk yield accounts for 7,280 kg/cow, but it is exceeded by more than 15 member states, the top position being kept by Denmark (9,504 kg/cow) [1, 2].

About 23 million dairy cows are grown in 1,237 thousand farms, the average herd size being 32 cows, ranging between 219 heads in Czechia and 2.4 heads in Romania.

The majority of EU countries recorded an annual decline in cow numbers, but milk yield and production increased at the community level as a result of the structural dynamics changes in dairy herds oriented to the growth of the most productive ones [4].

Romania has an important number of cows, for which it comes on the 8th position in the EU, but the smallest yield, accounting for just 3,198 kg/cow/year, being by almost 50% lower than the EU average [15, 23].

In this context, the goal of the research was the comparatively analysis between Romania and the other EU top countries raising dairy cows regarding the number of cows, farm structure, herd size, and milk yield in order to assess the differences and point out that farms structure is a key influencing factor on production performance in dairy farming.

2. Materials and Methods

2.1. Data collection

The data have been collected from various sources such as National Institute of Statistic, Eurostat, Faostat, Ministry of Agriculture and Rural Development and refer mainly at the years 2010 and 2016 for which the data were provided [2, 3, 7, 8, 36].

The main studied indicators have been: number of farms, number of dairy cows, farm structure by herd size (number of cows/farm), farm structure by farm size (ha), and milk yield.

2.2. Methodological aspects

The main methods and procedures to process tha data have been:

-*Fixed basis Index*, $I_{FB\%}$, whose formula is: $I_{FB\%} = (X_n/X_0)*100$ was used to evalute the growth rate of the number of cows and milk yield in Romania in the studied interval.
-*Comparison method* allowed to emphasize in what measure Romania's performance differed from the achievements registered by the other EU top seven member states which are dealing with dairy farming.

-*Trend line model* was used to reflect the general tendency in the number if dairy cows and yield.

The results shown in tabels and graphics were accompanied by their interpretation, and in conclusions there were were synthetized the main ideas resulting from this research.

3. Results and discussions

In Romania, in the analyzed interval 2010-2017, the number of dairy cows decreased by 17.27% from 1,441.4 thousand heads in 2010 to 1,192.5 thousand heads in 2017. Since 2014 it was noticed a slight growth (Fig. 1).

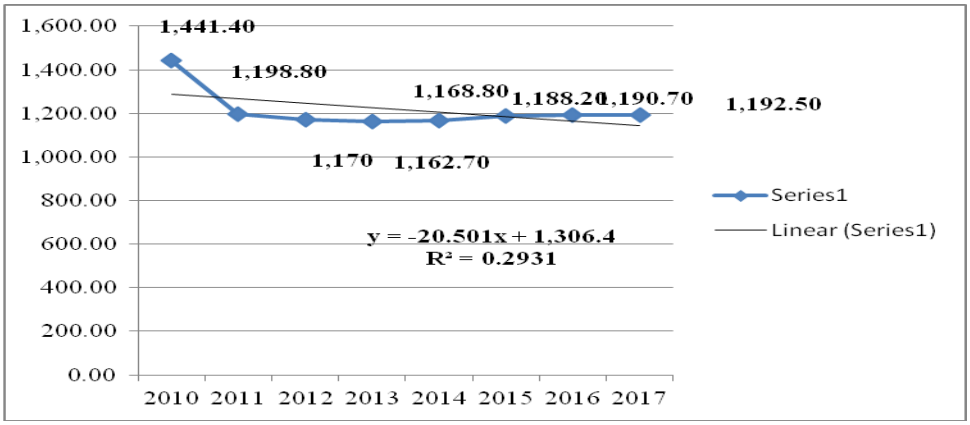

Fig. 1. Dynamics of the number of dairy cows in Romania, 2010-2017 (thousand heads)
Source: Own design based on the data from [3].

This was due to the fact that input prices increased and in consequence production cost also went up, milk collection was facing with difficulties, milk price at farm gate was enough small as milk quality does not fit the standards in all the cases, and the breeders thought that herd size has to be adapted optimizing production in relationship with resources [27, 30, 32, 33].

In 2017, for the number of dairy cows, Romania came on the 8th position in the EU after Germany, France, Poland, Italy, United Kingdom, Netherlands and Ireland.

In the same year, Romania had 604,473 dairy farms, representing 48.86% of the 1,237.12 thousand EU dairy holdings [6].

Within the farm structure, the farms with the smallest number of cows, 1-2 heads have the highest share, accounting for 83.7% in 2016 compared to 87.29% in 2010. Also, the farms raising between 3 and 5 cows are situated on the 2nd position with a share of 12.27 % in 2016 compared to 10.14% in 2010 (Table 1).

The figures confirm that it is a weak tendency to improve farm structure in dairy farming but it is a slow process, as long as the smallest farms are dominant, and the farms with over 100 cows represent just 0.07% of the number of dairy farms.

Table 1. Dairy farms structure in Romania in 2016 versus 2010 by herd size (%)

Herd size (heads)	2010	2016	2016-2010 (± Δ)
Number of dairy farms	761,528	604,473	-157,055
1-2	87.29	83.70	-3.59
3-5	10.14	12.27	+2.13
6-10	1.52	2.07	+055
11-15	0.45	0.83	+0.38
16-20	0.23	0.39	+0.16
21-30	0.17	0.27	+0.10
31-50	0.11	0.19	+0.08
51-100	0.07	0.19	+0.12
over 100	0.04	0.07	+0.03

Source: Own calculation based on the data from [7].

A Field Survey run in 2016 by NIS identified the number of dairy cows holdings, the number of cows raised by them, which allowed to calculate the average herd size by each size class of dairy cows [8] (Table 2).

Table 2. Number of agricultural exploitations with dairy cows by size classes of dairy cows in Romania in 2016

Size class (cows)	Number of agricultural units with dairy cows	Number of dairy cows	Average herd size (cows/farm)
1-2	**365,080**	**498,196**	**1.36**
3-9	**96,158**	**382,301**	**3.97**
10-19	8,448	107,570	12.73
20-19	1,607	37,024	23.03
30-49	854	31,098	36.41
50-99	409	27,417	67.03
100-499	207	40,939	197.77
500 and over	**15**	**13,341**	**889.4**
Total	**472,778**	**1,237,885**	**2.41**

Source: Own calculation based on [8].

The results showed that the average herd size by size class varied between 1.36 cows in the smallest farms and 889.4 dairy cows in the largest farms raising 500 and over cows.

Taking into account that in dairy farming it is important as the farm to have its own surface to produce forages and purchase at least as possible, the survey presented the situation of the number of agricultural holdings raising cows by class size of the utilized agricultural area (UAA) (Table 3).

At the country level, in 2016, there were 472,778 agricultural holdings with dairy cows raising 1,137,885 cows, the average herd size being 3.4 cows.

Table 3. Number of agricultural holdings with dairy cows by size classes of dairy cows and by size classes of utilized agricultural area in Romania in 2016

Size class (UAA-ha)	Number of agricultural units with dairy cows	of which: with 1-2 cows	with 3-9 cows
Below 0.1	18,505	14,858	3,102
0.1-0.3	23,639	19,669	3,641
0.3-0.5	15,658	13,610	1,960
0.5-1	44,445	40,632	3,533
1-2	92,445	81,597	10,505
2-5	**170,732**	**138,014**	**31,350**
5-10	75,137	45,569	27,221
10-20	22,858	8,977	11,277
20-30	4,231	1,075	1,983
30-50	2,504	631	906
50-100	1,693	338	487
100 and over	**1,031**	**110**	**193**
Total	**472,778**	**365,080**	**96,158**

Source: [8].

The most numerous farms, more exactly, 170,732 dairy farms have between 205 ha, and raise 327,581 cows, meaning 1.9 cows in average per farm.

Also, of the total number of agricultural holdings with dairy cows, 365,080 farms, meaning 77.22% are growing 1-2 cows, summing 498,195 heads, representing 43.78% of the number of dairy cows in Romania, the average herd size being 1.36 cows.

A number of 96,158 agricultural holdings representing 20.32% of the number of dairy farms in Romania are growing 3-9 cows, summing 382,301 cows, meaning an average herd size of 3.97 cows.

Also, 157 farms, whose share is 0.03% in the number of farms with cows are raising between 50-99 cows, totalizing 27,416 cows, meaning 174.6 cows in average per farm.

A number of 161 farms are growing between 100 and 499 cows, summing 40,939 heads, reflecting an average herd size of 254.2 cows/farm.

Only 15 farms have 500 and over cows, summing 13,341 heads, meaning 889.4 heads per farm, the highest herd size in Romania (Table 3).

The number of farms utilizing 100 ha and over accounted for 1,031 holdings, of which 110 farms have 168 cows, meaning 1.5 cows/farm. A number of 193 farms grow 1,019 cows, and their herd size is 5.3 cows in average. A number of 157 farms have 10,942 cows, meaning 69.7 cows average herd size. A number of 161 farms keep 33,221 heads, accounting for 206.3 cows in average per farm. Finally, only 15 farms have 13,341 heads, which means the highest herd size in dairy farming in Romania, that is 889.4 heads.

As mentioned above, the countries with the largest number of dairy cows in the EU-28, in the decreasing order, are Germany, France, Poland, Italy, Netherlands and Ireland, followed by Romania [36].

Studying the situation of the dairy farms structure in these member states, we noticed a huge difference regarding the distribution of the number of cows by farm size in terms of UAA (ha) and the average herd size which is far away from the figures registered in Romania (Table 4).

In Germany, about 30.3% of the dairy cows are raised in farms with 50-100 UAA (ha), having an average herd size of 62.58 dairy cows, and 50% of the number of cows are raised in the largest farms with over 100 ha, and the average herd size in this case is 151.92 heads. Therefore, in Germany the largest farms grow the highest number of dairy cows.

In France, also the largest farms with over 100 ha grow 57.34% of the dairy cows, the average herd size being 77.93 heads. On the second position, there are the farms with 50-99.9 ha, which raise 34.77% of the number of dairy cows, and the average herd size is 49.59.

In Poland, 27.725 of the cows are raised in small farms whose size varies between 10 and 19.9 ha, and the average herd size is 8.49 cows, about 18.87% of the dairy cows are grown in farms with 20-29.9 ha, and the herd size is 15.41% and 17.99 dairy cows are kept in farms with 30-39.9 ha, and the herd size is 22.63. All these farms totalize 65% of the number of dairy farms in the country.

In Italy, 16.16 % of dairy cows is grown in small farms of 10-20 ha, with a herd size of 25.54 cows, and 24.74% dairy cows are raised in the largest farms with over 100 ha, and the average herd size is 34.55 cows.

In Netherlands, 43.19% of dairy cows are grown in the farms with 50-99.9 ha, the average herd size is 124.18 cows, and 29.20% dairy cows are raised in farms with 30-49.9 ha, with an average herd size of 80.47.

Table 4. The dominant dairy farms structure in the main EU countries raising dairy cows in 2016

	Number of farms	Farm size (ha)	Number of dairy cows	Average herd size (cows/farm)	Number of cows in the country	Share of the number of cows in the farm (%)
Germany	20,420	50-100	1,278,060	62.58	4,217,700	30.30
	13,890	> 100	2,110,190	151.92		50.03
France	26,760	> 100	2,085,480	77.93	3,637,000	57.34
	25,500	50-100	1,264,780	49.59		34.77
Poland	70,050	10-19.9	595,000	8.49	2,145,800	27.72
	26,280	20-29.9	405,070	15.41		18.87
	17,060	30-49.9	386,110	22.63		17.99
Italy	11,530	10-20	294,490	25.54	1,821,700	16.16
	11,400	> 100	450,830	34.55		24.74
Netherlands	6,420	50-99.9	774,890	124.18	1,794,000	43.19
	6,510	30-49.9	523,880	80.47		29.20
Ireland	7,740	50-99.9	673,550	87.02	1,397,900	48.18
	1,930	> 100	321,720	166.69		23.01

Source: Own calculation based on the data from [36].

In Ireland, 48.18 dairy cows are raised in farms whose size varies between 50 and 99.9 ha and the herd size is 87.02 cows in average, and 23.01 cows are raised in the largest farms with over 100 ha, the average herd size is 166.69 heads (Table 4).

Milk yield in Romania increased by 16.26% in the analyzed interval, from 2,750.7 kg/cow/year in 2010 to 3,198 kg/cow in 2017. This is a positive aspect, but the growth rate is very small compared to other EU countries (Fig. 2).

Milk yield is influenced by a large range of factors, among which the most important ones are: breed production potential, forage amount and quality, reproduction activity, animal health.

Milk yield is closely connected with production cost, a higher milk performance imposes higher expenses, but cost level per kg of milk is smaller. Variable costs have to be kept under control, as their share in production cost is about 75%, the main weight being kept by feeding. Only in this way, the difference between gross product and variable costs, may assure a higher gross margin and obviously a higher income and profit per cow and at the farm level [5, 6, 14, 17, 18, 19].

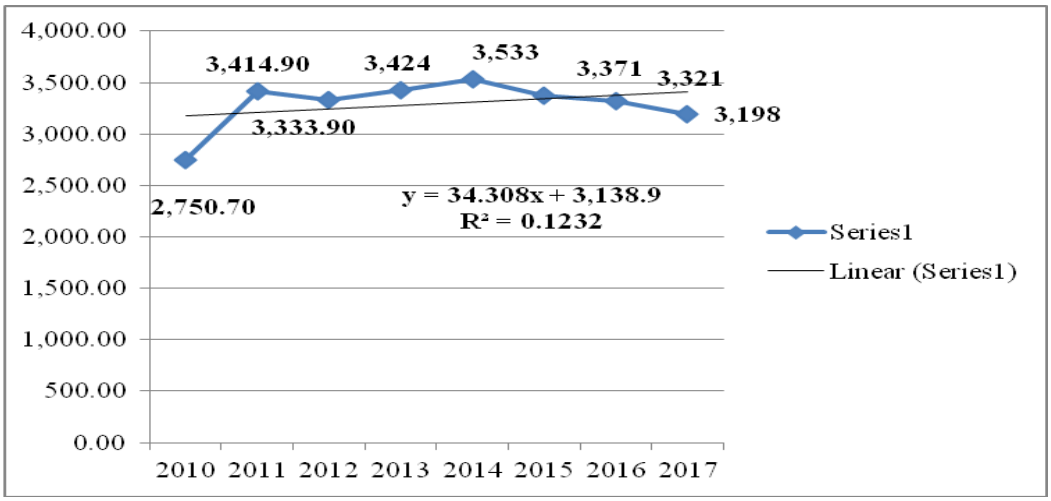

Fig. 2. Dynamics of cow mik yield in Romania, 2010-2017 (kg/cow/year)
Source: Own design based on the data from [3].

Milk yield in Romania is very small and the comparison with the records in the other countries emphasizes the gap in this respect as well. The figures show huge discrepancies regarding average herd size and milk yield between Romania and the EU average and the performances of Romania compared to the other EU countries considered in this research (Table 5).

Table 5. Number of dairy cows, number of cows per farm and milk yield in Romania compared to other EU countries in 2016

	Number of dairy cows	Average number of cows per farm	Milk yield (kg/cow/year)	Differences in milk yield Romania and the other country	
				±Δ	±Δ %
Germany	4,274,490	61.77	7,746.5	-4,425.6	-57.14
France	3,678,410	57.09	7,046.2	-3,725.3	-52.87
Poland	2,183,490	8.96	6,172.1	-2,851.2	-46.20
Italy	2,010,110	37.65	5,913.6	-2,592.7	-43.85
United Kingdom	1,897,000	143.00	7,729.0	-4,408.1	-57.04
Netherlands	1,744,830	97.47	7,984.6	-4,663.7	-58.41
Ireland	1,398,070	76.27	4,901.2	-1,580.3	-32.25
EU-28	-	32	7,280	-3,959.1	-55.39
Romania	1,137,885	2.41	3,320.9	-	-

Source: Own calculation based on the data from [3, 36].

Conclusions

(1). The analysis showed a decline in the number of dairy cows and just a slight recover since the year 2014 in Romania.

(2). Milk yield increased in Romania by 16.26% in the analyzed interval, but its level of 3,320.9 is the lowest one in the EU-28.

(3). Romania has an inappropriate farm structure, as the smallest farms of 1-2 cows are dominant, representing 83.7%, while the farms with 30-50 heads represent 0.46%, the ones with 50 dairy cows represent 0.22 %.

(4). Romania has 2.4 cows average herd size, the smallest in the EU-28. Its level varies between 1.36 cows in the farms with 1-2 cows, 67.03 cows in the farms with 50-99 dairy cows, 197.77 heads in the farms raising 100-499 cows, and 889.4 heads in the largest farms, with 500 and over dairy cows.

(5). A number of 170,732 dairy cows, that is 36.11% of the total number of dairy cows in Romania are raised by the farms having 2-5 ha utilized agricultural area.

(6). About 77.22 % of the number of cows are raised in the smallest farms with 1-2 heads and 20.33% of cows are grown in farms with 3-8 heads. This reflects that dairy farming is practiced in subsistence and semi-subsistence households, where the raising system is an extensive one, production potential of the breeds is low, feeding is not appropriate to sustain production, milk quality does not meet the standards, the obtained milk covers the family needs, and just a small amount could be sold mainly as direct delivery and not as raw milk for processing industry.

(7). The structure of dairy farms does not sustain yield performance, and this is why associative forms have to be created as breeders to strengthen their capital, assure farm inputs at lower prices, reproductive and production animals from breeds and crossbreds of high potential, a corresponding feeding, to keep under control animal health and wellness, reduce production cost, assure a high milk quality and deliver more milk to industry.

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TRENDS IN WINE PRODUCTION, CONSUMPTION AND TRADE IN ROMANIA IN THE PERIOD 2011-2017

Agatha POPESCU[1]

Abstract. *The paper aimed to identify the main trends in Romania's wine production, consumption and trade in the 2011-2017 and changes in the country position as producer and exporter. A slight production growth of only 5% was sustained by a slight growth in vine plantations area and in grapes yield. In 2017, Romania produced 4,264.3 thousand hl wine, of which 65% white, 27.8% red and 7.3% rose wine. Of total output, only 21% represent PDO wines and 5% PGI wines, 2.9% varietal wines and the remaining are others. Consumption accounted for 4,100 thousand hl and the average consumption per inhabitant was 21.8 litres almost the lowest in the EU. Romania's wine trade has developed, so that in 2017 the export value reached Euro 24.5 Million and the import value Euro 55.5 million, the trade balance being Euro -31 million. To increase wine sector competitiveness, Romania has to intensify production and wine promotion among the domestic and external consumers, to modernize plantations and infrastructure in wine producing, conditioning, bottling, storing and to promote selling.*

Keywords: wine, production, consumption, export, import, trade balance, trends, Romania

1. Introduction

Romania plays an important role among EU wine producers for a long time and its wines are well appreciated for their flavour, taste, savour, acidity by consumers. For its production performance, it is ranked the 6th in the EU-28 after Italy, France, Spain, Germany and Portugal [2, 3, 8].

However, domestic production is not able to cover consumption and justifies wine imports whose amounts exceeds the exported quantities [2, 3].

EU-28 contributes by 70% to Europe production, by 65% to the global wine output, by 60% to the world consumption and 70% in the world wine export [6, 7, 12]. For keeping its top position, the EU adopted several regulations during the last decade aiming to enhance the competitiveness of the European wines on the international markets, to manage much better wine demand/offer ratio and preserve the best traditions in vine growing sustaining the durable development of the rural areas [2].

Despite its potential in producing wines, Romania is still facing some difficulties regarding the areas of vine plantations, the need to reorganize vine growing by zone, the structure of wine types regarding their origin, to stimulate production of

[1]Prof., Ph.D., University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, Full Member of the Academy of Romanian Scientists, Corresponding Member of the Academy of Agricultural and Forestry Sciences "Gheorghe Ionescu-Ş iş eş ti", Bucharest, Romania, (e-mail: agatha_popescu@yahoo.com).

grapes for wines, to improve vine growing and winemaking technologies and infrastructure and adapt them to climate change [4, 14, 15].

In this context, the goal of the paper was to analyze the evolution in wine production, consumption, and commercialization in order to identify the main trends in the period 2011-2017.

2. Materials and Methods

2.1. Data collection

The paper is based on the statistical data collected from National Institute of Statistic, Ministry of Agriculture and Rural Development and Eurostat Comext [1, 4, 5].

2.2. Methodological aspects

The main aspects approached have been:

-wine production, its distribution in the territory, wine structure by wine type, Romania's position among the EU main producing countries;

-wine consumption, wine consumption per inhabitant, production consumption ratio, comparison with wine consumption in other EU countries;

-wine exported amounts and imported quantities, as well as the export and import value and trade balance, the position of Romania in the EU intra and extra wine export and import.

To identify the main trends in wine production, there were used the following methods:
-*Fixed basis Index*, $I_{FB\%} = (X_n/X_0)*100$, where X_n is production in the year n and X_0 is production in the year zero in the studied interval;
-*Trend line regression model* was used to show the general tendency of the studied indicator;

-*Structural Index*, $S_{\%,}$ was used to reflect the share of wine types in production;

-*Production/Consumption ratio* was used to characterize self-sufficiency on the domestic market;

-*Trade efficiency* was assessed using *trade balance*, TB, as difference between export value (E) and import value (I) and *Export/Import ratio.*

-*Comparison method* allowed to assess Romania's position among other EU countries for its performance in wine production and trade.

The obtained results are reflected in tabels and graphics and are correspondingly interpreted. At the end, a few conclusions and recommendations were presented to synthetise the results and prospects for wine sector development.

3. Results and discussions

Wine production registered a slight increase in Romania, in the period 2011-2017, from 4,058.2 thousand hl in 2011 to 4,264.1 thousand hl in 2017 (5.07%). Its level varied from a year to another, in 2013 reaching the peak of 5,113.3 thousand hl, and in 2016 recorded the lowest level of 3,303.7 thousand hl (Fig. 1).

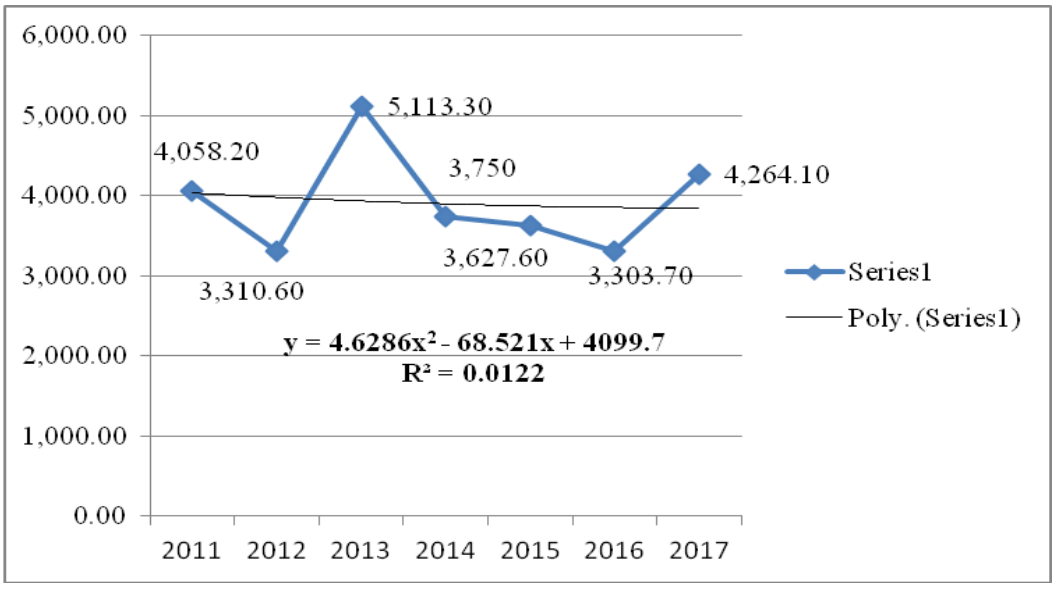

Fig. 1. Dynamics of the wine production in Romania, 2011-2017 (thousand heads)
Source: Own design based on the data from [4, 5].

This level was deeply influenced by the slight growth in the cultivated area (+1.3%) from 168.1 thousand ha in 2011 to 170.3 thousand ha in 2017 and by the average grape production destined for wines.

The highest contribution to wine production is given by the main viticultural region s as follows: Moldova 39%, Muntenia-Oltenia 18%, Dobrogea 17%, Crisana-Maramures 7%, Transilvania 6%, the Danube Terraces 6%, Sand and South areas 4%, and Banat 3% [4].
The main wine producers in Romania are Murfatlar (28%), Jidvei (14%), Cotnari (13%), Vincon Vrancea (8%), Tohani (7%), summing all together 70% [4, 16, 17].

In the whole production, the white wines have the highest share about 65%, being followed by red wines 27.8% and rose wines 7.2 %.
In 2017, about 66% of wine output was obtained from noble varieties and the remaining of 34% from the interspecific hybrids [4].
Also, of the total production, in 2017, 21.5% represented PDO wines, 5% PGI wines, 2.9% varietal wines and 70.6% other wines. From this point of view, there are discrepancies between Romania and the average in the EU-28, where PDO wines represent 46.&%, PGI wines 20.4%, varietal wines 6.7%, and other wines only 26.2% [2].
For its wine output, Romania is ranked the 6th in the EU-28 after Italy, France, Spain, Germany, and Portugal [2, 3].

Wine consumption declined in Romania from 4,871.5 thousand hl in 2011 to 4,100 thousand hl in 2017, meaning -25.84%.

The average consumption per inhabitant is 21.8 litres, almost the lowest in the EU, where consumption varies between 20 and 50 litres per capita and year: Portugal 45 litres, France 40, Italy 38, Germany 25, Belgium 24.7, Hungary 24, Sweden 22.5, Spain 22, Netherlands 21.9 litres [11, 16].

This is due to the fact that beer and spirits are preferred by Romanians, wine being ranked the 3rd in their preferences.

In general, Romanians prefer red wines (59.5%), white wines (27.1%), rose wines (11.2%) and sparkling wine (2%).

Production/Consumption ratio varied between 0.83 in 2011 and 1.04 in the year 2017. But in the other years, production was not able to cover consumption which explains why Romania has to bring wines from abroad to satisfy the domestic market (Table 1).

Table 1. Wine consumption and production/Consumption ratio, Romania, 2011-2017

	Wine consumption (Thousand hl)	Wine consumption per inhabitant (l/capita/year)	Production/Consumption ratio
2011	4,871.5	21.8	0.83
2012	5,113.3	21.1	0.64
2013	5,046.7	21.7	1.00
2014	4,079	22.6	0.91
2015	3,900	19.0	0.93
2016	3,800	18.0	0.86
2017	4,100	21.8	1.04
2017/2011 %	84.16	100.0	-

Source: Own calculation based on the data from [4, 5].

Wine trade was, first of all, analyzed in terms of wine exported and imported amounts.

The exported quantity of wine increased by 52.85 from 10.4 thousand tons in 2011 to 15.9 thousand tons in 2017, reflecting that Romanian wines are requested on the external market. The main beneficiaries being Germany, Spain, Netherlands, Italy, Estonia, but also other extra-EU countries such as USA, Canada, Russian Federation [9, 10, 16, 17].

The imported quantity of wine declined by 47.5% from 90.7 thousand tons in 2011 to 47.7 thousand tons in 2017, but, if we compare the imported amounts of wine with the exported ones, we notice that imports are much higher than exports [10].

The main market for Romanian wines is the EU, whose share in the exported quantities increased from 77.85 in 2011 to 85.5% in 2017. Also, the main suppliers of wine on the Romanian market are also from the EU whose share in wine imports was 72.55 in 2017 compared to 94.5% in 2011 (Table 2).

Table 2. Exported and imported quantities of wines, Romania, 2011-2017

	Export (Thousand tons)	Import (Thousand tons)	Differ. Export minus Import (Thousand tons)	EU-28 share (%) in	
				Wine export	Wine import
2011	10.4	90.7	-80.3	77.8	94.5
2012	11.4	54.5	-43.1	78.0	75.7
2013	10.4	36.7	-26.3	77.8	63.7
2014	10.5	34.1	-23.6	73.3	75.6
2015	13.8	50.7	-36.9	78.2	82.0
2016	12.8	50.2	-37.4	78.9	79.4
2017	15.9	47.7	-31.8	85.5	72.5
2017/2011 %	152.85	52.5	-	-	-

Source: Own calculation based on the data from [4, 5, 10].

For its wine export, both intra and extra-EU, Romania is ranked on the 17th position, while for its import, both intra and extra-EU, the county comes on the 18th position.

In 2017, the EU-28 total intra and extra-EU export accounted for 80.5 million hl, to which Romania contributed just by 194.9 thousand hl, that is 0.24%.

In the same year, the EU-28 total intra and extra-EU import accounted for 69.4 million hl to which Romania contributed just by 501.8 thousand hl, that is 0.72%.

The main wine suppliers for Romania are France, Italy, Hungary, Spain, and from extra-EU New Zealand, Chile, Uruguay, USA, South Africa [1, 13, 16, 17].

The value of wine exports, imports and trade balance

The wine export value increased by 70% from Euro 14.4 million in 2011 to Euro 24.5 million in 2017. At the same time, the wine import value raised by 9.9% from Euro 50.5 million in 2011 to Euro 55.5 million in 2017. As long as import value was higher than export value, the trade balance was negative, Romania being a net importing country of wine every year (Table 3).

Table 3. The value of wine export, wine import, trade balance and Export/Import ratio, Romania, 2011-2017

	Export value (Euro Million)	Import value (Euro Million)	Trade balance (Euro Million)	Export/Import Ratio
2011	14.4	50.5	-36.1	0.28
2012	15.9	41.9	-26.0	0.38
2013	16.5	38.0	-21.5	0.43
2014	18.0	33.2	-15.2	0.54
2015	22.3	42.4	-20.1	0.53
2016	20.4	47.4	-27.0	0.43
2017	24.5	55.5	-31.0	0.44
2017/2011 %	170.0	109.9	85.87	157.1

Source: Own calculation based on the data from [1, 4, 5].

Wine trade efficiency is weak in Romania, as the share of export in wine production is very small, varying between 1.93% in 2011 and 3.72% in 2017, reflecting that the country is not among the largest exporters of wine in the EU.

The export/import ratio is also unfavorable, as the import exceeds export almost 2 times in 2014 and even in 2017. However, a positive aspect is the decrease in wine imported quantity and value (Table 3).

Conclusions

(1). In Romania, wine production has slightly increased, despite that the country potential is higher taking into account the long experience and tradition in cultivating vine, high value varieties and hybrids, soil and climate conditions, exposure of the hills slopes to the sun.

(2). The share of PDO and PGI wines is still low, compared to other important producing countries in the EU.

(3). Wine consumption is also low in Romania compared to other EU member states.

(4). Export quantity and value increased which is a positive aspect, but imports are still higher than exports because the domestic market requirements can not be covered by production.

(5). Therefore, it is needed a more intensive wine promotion among Romanian consumers about the role of wine as food for their health.

(6). Also, it is important to promote much better the wines of Romanian origin PDO and PGI both on the domestic and external market.

(7). Romania has to penetrate on other wine markets to extend its area of influence in the world and increase the competitiveness of its products.

(8). For this purpose, wine producers have to apply the programme of wine varieties reconversion, to reconsider vine plantations mapping in the territory, and to modernize vineyards. Investments are needed to modernize infrastructure in wine producing, conditioning, bottling, storing and wine aging technologies.

(9). The financial support offered by the EU is an opportunity for wine producers to increase competitiveness of Romanian wines on the international market.

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THE CURRENT SITUATION OF THE ROMANIAN GRASSLANDS AND THEIR MANAGEMENT AT THE EUROPEAN LEVEL

Teodor MARUSCA[1]

Abstract. *The paper summarizes the current situation of permanent grasslands in Romania concerning the productivity and animal load. Due to the advanced state of degradation on the about 5 million ha, the current animal load reaches 0.3 LU/ha, due to the lack of fertilization with organic and chemical fertilizers, the invasion of harmful grassy and woody species, abandonment, minimum works of maintenance, etc. Through adequate management measures, the productivity of the grasslands and their animal load can increase at least three times in order to join the European developed countries from this point of view.*

Keywords: permanent grasslands green grass production, animal load, adequate management

1. Introduction

Romania's permanent grasslands, covering an area of almost 5 million ha, represents one of the most important renewable natural resources which deserve a high attention regarding biodiversity and optimal valorisation as complete as possible (Anghel et al.,1967, Motcă et al., 1994) [1, 7].

Before going into the essence of the problem expressed in the title, the question arises why such an analysis is necessary and for what is it used for?

Over the centuries, the natural conditions and the management of the pastoral fund in each country has left their mark on the biodiversity of the meadows.

In order to enrich and maintain biodiversity in Romania, the EU bodies have decided to pay substantial funds, especially since the primary grasslands (alpine, subalpine, forest-steppeand steppe) and the secondary ones after deforestation, because the countries with a high developed animal husbandry have suffered profound changes through reseeding and intensive fertilization.

In addition to biodiversity conservation, a high important has also the productivity of the permanent grasslands, respectively greengrass production and forage quality for animal husbandry (Pușcaru-Soroceanu et al., 1963, Bărbulescu, and Motcă, 1983, 1987) [9, 2, 3].

[1]Assoc. Prof. Ph.D. Eng. Technical Director, Research and Development Institute for Grasslands Brasov, Romania, Corresponding Member of the Academy of the Romanian Scientists (e-mail: maruscat@yahoo.com).

A comparative study on grasslands productivity in Romania and in the countries with a high developed animal husbandry is necessary to be elaborated in order top know where we are at the moment.

It is also appropriate to highlight the specificity of the Romanian pastoral fund in comparison with the one in the EU in order to identify the differences that stimulates or aggravate animal husbandry.

Finally, an analysis on the optimal possibilities for loading animals at the actual production level of the permanent grasslanfs by bioclimate zones and stages is self-evident, with unsuspected possibilities to increase grass production after the application of measures for improvement, maintenance and rational use of this important renewable wealth at the European level.

In this context, the purpose of the paper was the analysis of the current situation of the grasslands in Romania and at the EU level in order to identify the possibility to increase grass production and animal load.

2. Materials and Methods

In order to know the current productivity of the Romanian meadows, the data refering to production and quality of the control (unimproved) plots were taken from the numerous experiments carried out in the last hlf century by the authores cited in the bibliography, who performed numerous syntheses such as: Pușcaru-Soroceanu et al. (1963) [9], Puia et al. (1976) [8], Bărbulescu and Motcă (1983 and 1987) [2, 3], Motcă et al. (1994) [7], Marușca (2001 and 2016) [5, 16] and many others.

The data concerning the productivity of the meadows from Switzerland were collected from Caputa (1966) [4], and Simtea et al., (1972) [10].

Based on these results from the specialized literature and the statistical data of the current herbivorous livestock, the actual and potential loading with animals of the permanent meadows in our country was further estimated.

3. Results and discussions

3.1.The level of the permanent grasslands production

In order to know where we stand with grass production of the permanent mountains meadows expressed in dry mmater (DM), we took as a basis the data from the specialized literature for Romania's grasslands in comparison with the meadows in Switzerland, an alpine country with a long tradition in grasslands management (Caputa 1966, Simtea et.al., 1972, Puia et al.,1976, Marușca, 2001) [4, 10, 8, 5] (Table 1).

From thease data it results that the mountain grasslands in our country has a production almost 4 times lower, respectively by 25.4% compared to those in Switzerland, in avergae on the 600-2,000 m altitudine range.

Table 1. Production of dry matter from the semi-natural mountain grasslands in Romania and Switzerland (tons/ha)

Altitudine (m)	**Romania** (after, Puia, 1976)	**Switzerland** (after Caputa, 1966)	**Differences** ±	**%**
1,801 – 2,000	0.9	3.5	+ 2.6	389
1,601 – 1,800	1.6	4.8	+ 3.2	300
1,401 – 1,600	1.3	5.4	+ 4.1	415
1,201 – 1,400	1.9	7.5	+ 5.6	395
1,001 – 1,200	1.9	7.8	+ 5.9	410
801 – 1,000	1.8	7.6	+ 5.8	422
601 – 800	1.7	7.8	+ 6.1	459
Mean	**1.6**	**6.3**	**+ 4.7**	**394**
Average fertilization level Nitrogen units (N)	20*)	150**)	+ 130	750

*) Approximatively 20 kg N/ha mostly during the grazing at an optimal load and very little manure and almost no chemical fertilizer

**) Approximatively 75 kg N/ha organic fertilizer + 75 kg/ha chemical fertilizer.

Any analysis we make and any explanation we find it is very clear that Swiss meadows are treated like the other agricultural crops, being organically and chemically fertilized with minimum 150 kg/ha N and other fertilizers (P, K, etc.), while ours do not carry out proper maintenace works and fertilizers are rarely used and in insignificant quantities.

By abandoning the mountain meadows today, grass production is even lower than in the past due to the replace,emt of the grassy carpet with woody vegetation harmful to animal husbandry (Maruşca, 2016) [6].

In the hilly and plain area, the productivity of the meadows is even lower than in the mountain area due to the long periods of drought and the lack of maintenance.

3.2. Practical cultural differences, endowment and capitalization of the pastoral heritage

To explain the lower current state of the productivity of the pastoral heritage it is necessary gto draw a paralel between the existant situation in Romania and the situation in the EU countries with developed animal husbandry (Table 2).

Table 2. Comparative situation of the pastoral heritage

Romania with extensive underdeveloped animal husbandry	**EU countries with advanced animal husbandry**
Average climate conditions	
- continental climate with warmer summers and frosty winters, low and unevenly precipitations	- milder oceanic climate with cooler summers, milder winters and more abundant and better distributed precipitations
Grassu carpet	
- natural and semi-natural meadows, often and in majority invaded by weeds and woody vegetation	- meadows sown wherever possible, highly productive
Nitrogen fertilization level (N)	
- N insignificant or missing	- N 200 – 300 kg/ha/year for many decades
Hay harvesting and storage conditions	
- much delayed, after seed ripening in general (June- July)	- the best time for perennial grasses and leguminous plants to bloom (April- May)
- most manual and mechanized in small proportions, loose hay under the open	- with fully mechanized means, baled hay, silage, properly stored
Grazing intensity with animals	
- extensively in majority, often with underload or abadon	- intensively, for decades on the entire surface
Fencing and parceling the pastures	
- almost non-existent, the animals move beyond the borders of the localities accompanied by shepherds	- all pastures are fenced, the animals graze rationally on the plots without shepherds
Romania with extensive underdeveloped animal husbandry	**EU countries with developed animal husbandry**
Species and categories of grazing animals	
- mixture of species and categories of animals	- subdivision by species, categories and production
Water supply	
- intermittent watering from natural sources	- permanent watering from arranged sources
Shelters on pasture	
- temporaru sheepholds with animals in open-air pens, crawling and supercrawling	- durable constructions provided with means for collecting and distributing manure
Access on pasture	
- unpaved roads and mountain paths, difficult to access	- roads arranged for car access and other means of transport
Moving animals	
- mainly walking on foot due to the lack of arranged access roads	- with mostly cars, less walking
Processing of animal products	
- in sheepholds, often unhygienic, with unknown processing and provenance	- centralized, under hygienic conditions, under different stamdardized landmarks

In the EU countries with developed animal husbandry, grasslands are formed especially of species of grasses and perennial leguminous of improved varieties which have gradually replaced by sowing the spontaneous flora. In other words, the sown meadows are spread everywhere it was possible to establish them, being treated like any other fodder crop.

The meadows with species from spontaneous flora are less efficient in terms of production and quality compared to the meadows sown with improved grass mixtures which better respond to the means of intensifying production, especially fertilization.

The meadows from the countries with a more wetter and warmer climate from the Western and Southern Europe are dominated by perennial ryegrass (*Lolium perenne*) and white clover (*Trifolium repens*) and the ones from the North of the continent consists of thymophytic (*Phleum pratense*) and red clover (*Trifolium pratense*), species adapted at a colder climate.

The intensification of fodder production on meadows by setting up sown meadows and fertilizing them with N 200 – 300 kg/ha/year in average, many decades has resulted that many of the spontaneous flora to disappear from the grassy carpet.

Thus, there was a need to reduce the amount of fertilizers in the practice of organic farming up to the level of N 40 kg/ha/year and to eliminate the improved species from outside to enrich and maintain biodiversity with native species before intensifying production on meadows.

3.3. Loading animals of the permanent grasslands in Romania

Based on the literature of the last half century, according to a simple calculation, the average grass production at the lowest level is 6.3 tons per hectare with large differences between different bioclimatic areas, respectively from 1.5 tons in the area of steppe and alpine floor, up to 10 tons/ha in meadows and depressions (Table 3, 4 and 5).

Table 3. Loading of permanent grasslands with animals in the mountain area by bioclimatic zone

Bioclimatic zone			Alpine floor	Subalpine floor (juniper)	Boreal floor (spruce)	Nemoral floor (beech and spruce)	Total
Altitute thresholds (m)			Over 2,100	1,700-2,100	1,200-1,800	800 - 1,300	**800 - 2,544**
Area (thousand ha)			40	60	1,000	1,000	**2,100**
Grass production	Average (t/ha)		1.5	3.0	6.0	9.0	**7.3**
	Total (Thousand tons)		60	180	6,000	9,000	**15,240**
Duration of grazing season (Days)			50	80	110	140	**124**
Loading with animals	Grazing season	Average (LU/ha)	0.46	0.58	0.84	0.99	**0.90**
		Total (Thous. LU)	18	35	840	990	**1,883**
	For 365 days	Average (LU/ha)	0.06	0.13	0.25	0.38	**0.31**
		Total (Thous. LU)	2.4	7.8	250.0	380.0	**640.2**
Distribution by zone (%)			0.2	0.6	18.7	28.5	**48.0**

On large physical-geographical areas, the highest grass production is registered in the mountain area with 7.3 tons/ha, followed by the hill area with 6.5 tons /ha and the lowest we have in the plain with 2.5 tons/ha, being determined especially by the provision of humidity from atmospheric precipitation.

Although the average production per hectare is quite small, the total grass production of permanent grasslands in our country reaches 31,650 thousand tons.

The situation regarding the loading animals of the permanent grasslands in Romania by physical-geographical and bioclimatic areas is presented in Tables 3, 4, 5 and at the national level in Table 6.

Table 4. Loading of permanent grasslands with animals in the hill area by bioclimatic zone

Bioclimatic zone			Nemoral floor (beech and gorun)	Nemoral floor (gorun)	Nemoral zone (mesophilic oaks)	Meadows and depressions	Total
Altitute thresholds (m)			500-800	300 - 600	200-400	-	**200 - 800**
Area (thousand ha)			800	900	200	400	**2,300**
Grass production	Average (t/ha)		7.0	5.0	4.0	10.0	**6.5**
	Total (Thousand tons)		5,600	4,500	800	4,000	**14,900**
Duration of grazing season (Days)			170	150	130	200	**167**
Loading with animals	Grazing season	Average (LU/ha)	0.64	0.51	0.48	0.77	**0.6**
		Total (Thous. LU)	512	459	96	308	**1,375**
	For 365 days	Average (LU/ha)	0.30	0.21	0.17	0.42	**0.27**
		Total (Thous. LU)	240.0	189.0	34.0	168.0	**631.0**
Distribution by zone (%)			18.0	14.2	2.5	12.6	**47.8**

In the condition of a temperate climate with continental influence and mountainous altitude stratification, the normal grazing season on permanent grasslands with primary vegetation from the steppe zone and the alpine floor is only 50 days, and in the meadows and depressions from the plain area and hills with assured humidity reacjes 200 days.

Between these two extremes is the rest of the optimal grazing seasons with a national average of 140 days.

In the mounain area, the grazing time is between the melting of the snow in spring and the falling of snow in winter, when animals have something to graze, without

the possibility to be prolonged, forcing the animals to descend further down the valley.

Table 5. Loading of permanent grasslands with animals in the plain area by bioclimatic zone

Bioclimatic zone			Nemoral zone (thermophilic oaks)	Forest-steppe zone	Steppe zone	Salty zone	Sandy zone	Total
Altitute thresholds (m)			100 - 200	50-150	20-100	-	-	**20 - 200**
Area (thousand ha)			200	250	90	50	10	**600**
Grass production	Average (t/ha)		3.0	2.0	1.5	5.0	2.0	**2.5**
	Total (Thousand tons)		600	500	140	250	20	**1,510**
Duration of grazing season (Days)			110	80	50	80	50	**84**
Loading with animals	Grazing season	Average (LU/ha)	0.42	0.39	0.46	0.96	0.62	**0.46**
		Total (Thous. LU)	84	98	41	48	6	277
	For 365 days	Average (LU/ha)	0.13	0.08	0.06	0.21	0.08	**0.11**
		Total (Thous. LU)	26.0	20.0	5.5	10.5	0.8	**62.8**
Distribution by zone (%)			1.9	1.5	0.4	0.8	0.1	**4.7**

Table 6. Loading of permanent grasslands with animals in all the physical-geographical and bioclimatic areas of Romania

			TOTAL
Area (thousand ha)			5,000
Grass production	Average (t/ha)		6.3
	Total (Thousand tons)		**31,650**
Duration of grazing season (Days)			**140**
Loading with animals	Grazing season	Average (LU/ha)	0.70
		Total (Thous. LU)	**3,535**
	For 365 days	Average (LU/ha)	0.27
		Total (Thous. LU)	**1,334.0**
Distribution by zone (%)			100.0

On contrast, on the plain area and hills lacked of a permanent snow straw for long time, the grazing period is much longer than normal.

The optimum duration of grazing season is equal to the duration of the days with average daily temperatures ranging betwee 10 – 15^0C. At average daily

temperatures below 10^0C and over 15^0C, the growing conditions of the grass are totally unfavorable and it si not wise to graze with animals.

Loading animals is less studied, but it is of the highest importance together with the optimal duration of the grazing season if we intend to superiorly capitalize grass production of the permanent meadows.From the very beginning we will have to clarify how many kinds of this load of animals are and what is the need for grass for a day per head of LU, the "common denominator" of all species and categories of animals.

The loading of a meadow with animals can be of two types: respectively for the actual grazing season and for the whole year of 365 days.

The average daily grass requirement for an LU is considered to be 65 kg/ LU/day of which 50 kg grass (10 kg dry matter) is actually consumed by animals. The difference in additional 15 kg of grass between the sample determined by mowing and that actually consumed by the animals is predicted due to climatic fluctuations with repercussions on the dynamics of seasonal or annual production as well as the degree of consumability depending on the quality of the grass.

Once these three parameters have been established, the grass production, the grazing duration and the daily grass requirement for a LU, the animal load can be determined, both in the actual season called grazing capacity and for a whole year which we will call in premiere for the literature, the forage capacity of the meadow.

In the territory of the 5 million hectares, approx. 1/3 of the surface of permanent meadows, is used in hay and the remaining 2/3 as pasture. The meadows of over 1,200 - 1,400 m altitude, above the permanently inhabited area of the Carpathians, are used exclusively as pastures.

For the grazing season, the load with animals varies between 0.39 LU/ha during 80 days in the forest-steppe area up to 0.99 LU/ha during 140 days in the floor of the mixed forests (beech + spruce + fir) located between 800 - 1,300 m altitude, the grazing capacity being on average 0.70 LU/ha.

If we take into account the loading with animals for the whole year regardless whether we graze directly or mow for canned fodder (hay, silage etc) necessary in the cold season, the forage capacity varies between 0.06 LU/ha in the steppe area and the alpine and 0.42 LU/ha in meadows and depressions, respectively 7 times higher. At the level of permanent grasslands in our country, this parameter is 0.27 LU/ha/year, respectively 1,334 thousand LU can be easily maintained only with the feed provided by permanent grasslands. This calculation on the average forage capacity of permanent pastures was the basis for establishing the mandatory

minimum level of pasture loading of 0.3 LU/ha (one cow per 3 hectares or 2 sheep per hectare).

Through the usual maintenance and fertilization works at an average level of 100 kg/ha nitrogen active substance, the grass production would increase substantially, this load would reach almost 1 LU/ha, respectively the livestock that would rationally capitalize the permanent meadows would be tripled, the cheapest feed resource.

Conclusions

(1). The permenent meadows of Romania have a surface of about 5 million ha and a very low productivity compared to other EU countries with high developed animal husbandry.

(2). The causes of the production and lower forage quality of our meadows are determined by the chronic lack of fertilizers, current care work, chaotic grazing in terms of duration and load, and last but not least, the concept of most breeders who believe that grass grows to yourself and you have nothing to do than to graze it with the animals.

(3). Increasing grass production by raising the level of fertilization from approx. N 20 to at least N 100 kg/ha/year of organic and chemical fertilizers, provision of access roads, water supply, fences for rational use, shade and animal shelters, civilized conditions for caretakers, animal processing centers, etc., inscribed in pastoral arrangements are absolutely necessary for the not too distant future if we really want to join the European civilization of meadows.

(4). The improvement, endowment and rational use of the pastoral heritage at European level can triple in perspective the number of herbivorous animals, which capitalize on permanent pastures from 1.3 to 4 million LU throughout the year or from 3.5 to 10 million LU for the grazing season, being a real revolution in animal husbandry.

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