Dynamic Comparison of the Fruit Sector and the Pollution Associated to Agriculture

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Pollution in agriculture plays a major role. One of the sector affected by this phenomenon is the perennial plants, such as fruits sector. This sector is an important part of agricultural production in Romania, mainly because of the areas that have been dedicated; that is why the sector should be reconsidered because it could be one of the engines of the agriculture. This have to led to important efforts and increased attention in managing the opportunities offered by the development of the associations and producer groups involved. The present paper aims to address certain aspects of the national, macro-regional and European aspects of these fruits productions and the impact of the degree of pollution in agriculture. In this respect, data derived from the public databases dedicated to this field, namely Eurostat, the National Statistics Institute, DG Agriculture / FADN database and the Ministry of Agriculture, were used. The methods used to analyze and interpret the results are descriptive statistics, dynamics and comparisons between target areas and indicators. The results highlighted in the first part of the paper the Romania's position upon the European average in what concern the fruit sector but also upon a competing country on the fruit market, Poland, which is considered to have a European top position.

Keywords: fruits sector, producers, pollution, FADN, Romania, Poland, Europe

Addressing a common study on the fruit sector and pollution in agriculture involves focus and attention on several aspects, starting from the vocation and potential of the areas, the allocated areas, even that the market is more than that and completed with pollution issues. Of the air pollutants, methane, along with carbon dioxide (CO2), is one of the most important greenhouse gases. It is known that methane persists in the atmosphere less than CO2, but it blocks much more heat. Managing these emissions, their origin and impact, should be one of the most important concerns of decision-makers. These methane emissions mostly result from a series of human activities, of which agriculture plays a definite role, and so environmental implications are becoming increasingly important. Focusing on agriculture we can underline that multiannual plants such as fruit plants are more than other affected by the pollution effects. For doing this mixed subject, it is important to underline also that associative forms of producers will have the power and will be the ones who will ensure, besides production, the conditions of transport, storage and conditioning of the products. There are Regulations on the fruit sector at national and European level. From the national regulations we will recall here the Norms on the recognition of producer organizations and other associative forms in the fruit and vegetables sector, and the Method of accessing financial support by these (Monitorul Oficial al Romaniei, December 28, 2017) [13], specifying the legal framework and organizational arrangements for the implementation of European regulations, such as Regulation (EU) 1.308 / 2013 establishing a common organization of agricultural markets, Regulation (EU) No. Commission Regulation (EC) No 891/2017, Regulation (EU) 1.308 / 2013 of the European Parliament and of the Council, Implementing Regulation (EU) 892/2017 etc. Thus, the most important regulations were made on how to calculate the value of marketed production, the conditions for recognition of producer organizations, the procedure for granting financial support, etc. Among the national regulations of this sector, we will mention here the Book of Procedures for the Recognition of Producer Organizations in the Fruit and Vegetables Sector, elaborated by the Ministry of Agriculture and Rural Development, Directorate General for Agricultural Policy and Strategies, January 2018. In this area, a series of fruit market analyzes, with the most varied approaches. On the other side, the pollution issues are covered by interesting papers, of which we mentioned here some. A general approach linked to the topic of our paper was made by FAO [8]. Thus, it was stated that *Food Security and Agriculture face major challenges under climate change, in terms of expected negative impacts on productivity as well as implementation of sectoral actions to limit global warming. Agriculture's greenhouse gas emissions continue to rise – although not as fast as emissions from other human activities.* It is globally known that global warming affects a major part of the planet, that is why the climate frames is touched by higher and higher temperatures and by the droughty conditions. More than other sectors, the agriculture is affected because this *is a carefully manipulated ecological system, the productivity of which could increase because higher levels of carbon dioxide …Moreover, the perennial plants (mostly fruit plants) are at more risk than annuals or seasonals* [6]. There were some other studies where authors stated that *The climate change is a complex phenomenon due to the overlapping effects of anthropogenic activities on the normal climate variability with the change in atmospheric composition and one of the effects is the increase of the average global temperature by 0.6 +/- 0.2 °C* [2]. Meanwhile, there were other approaches where authors have been underlined the role of the emerging markets in the sector of renewable energy. This can consist in *short rotation coppice plantations, where wood material is compressed in highly energetic pellets, based on fast growing tree stands, with short harvest intervals* [3]. In an article with a topic adjacent to the pollution factors, the authors stated the some other problems, this time related to the use of fuels and

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underlined the difficulties which conduct the cement production, so not directly linked to the agriculture. Still, there were solutions somehow solved by using alternative fuels, but nevertheless taking into consideration the technological compatibility between these alternative fuels and the materials that are processed [7]. In another paper, the authors have been concerned about the food waste. They stated that landfill disposal which has been used for food wastes is linked to the landfills availability and thus, it is important to find alternative ways to divert food wastes, such as *composting, anaerobic digestion to generate biogas, use of food waste disposers* [1].

Experimental part

Materials and methods

The methodology used in this study has been framed by type of descriptive analysis and dynamics, comparisons at regional level and between our country and Poland. Also by means of graphical representations there were highlighted interesting results. Both the regions and the macro-regions of Romania were considered for the analysis. The data sources used for this analysis were: Eurostat, National Institute of Statistics, DG Agriculture (FADN), Ministry of Agriculture, etc.

Results and discussions

In order to present the results of this study, the first approach was the macro-regional situation of the private fruit sector, in the last years. Thus, in the tables that we presented for the period 2013-2017, the number of fruit trees, the average production and the fruit production for three categories of fruit trees: apple, pear and plum trees; these being the first types of productions presented in the statistics of our country (source: www.insse.ro). Next below, in the table 1 it was showed the regional dynamics of the number of fruit trees in the period 2013-2016 for apples, pears and plums. It can be noticed that in recent years the number of fruit trees has fallen.

In the table 2, the average production dynamics at the macro-region level was presented, on the same tree categories. And in this case a downward trend was observed in the analyzed categories.

For the analysis of the dynamics of the fruit tree fruit production during the analyzed period, 2013-2016, with a

Table 1
DYNAMICS OF THE NUMBER OF FRUIT TREES PER ROMANIAN MACRO-REGIONS, PRIVATE SECTOR, NUMBER (2013) AND PERCENTAGE

Private Sector	Macroregion	2013	2014 / 2013 (%)	2015 / 2014 (%)	2016 / 2015 (%)	2017 / 2016 (%)
Apples	M1	11,735,901	101.60	98.14	98.73	101.32
Pears	M1	1,056,572	101.86	93.50	100.89	102.87
Plums	M1	7,489,233	96.24	91.96	104.03	94.01
Apples	M2	6,325,348	99.30	97.12	98.89	99.60
Pears	M2	996,687	94.07	94.95	96.48	99.43
Plums	M2	6,075,565	100.51	88.33	108.56	99.46
Apples	M3	3,713,603	373.95	23.76	97.92	98.27
Pears	M3	755,420	95.80	101.17	99.01	99.03
Plums	M3	8,522,424	95.38	108.14	91.47	99.92
Apples	M4	4,593,804	99.25	97.24	99.05	99.39
Pears	M4	665,717	98.00	97.19	96.60	104.37
Plums	M4	14,766,271	99.14	108.18	85.87	96.02

Source: National Institute of Statistics, Bucharest, Tempo online, dataset accessed August - September 2018 M1, M2, M3, M4 – the Romanian macro-regions

Table 2
DYNAMICS OF THE AVERAGE PRODUCTION FOR FRUITS, ROMANIAN MACRO-REGIONS, PRIVATE SECTOR, KG/TREE, NUMBER (2013) AND PERCENTAGE

Private Sector	Macroregion	2013	2014 / 2013 (%)	2015 / 2014 (%)	2016 / 2015 (%)	2017 / 2016 (%)
Apples	M1	17	106.67	100.00	93.75	86.67
Pears	M1	14	111.76	100.00	94.74	83.33
Plums	M1	13	100.00	75.00	106.67	93.75
Apples	M2	17	100.00	100.00	108.33	92.31
Pears	M2	20	88.24	106.67	106.25	88.24
Plums	M2	15	90.00	72.22	115.38	113.33
Apples	M3	33	23.53	400.00	118.75	68.42
Pears	M3	26	87.88	100.00	110.34	59.38
Plums	M3	17	76.92	80.00	131.25	76.19
Apples	M4	17	107.69	107.14	93.33	92.86
Pears	M4	20	111.76	89.47	94.12	68.75
Plums	M4	12	107.14	73.33	127.27	107.14

Source: National Institute of Statistics, Bucharest, Tempo online, dataset accessed August – September 2018 M1, M2, M3, M4 – the Romanian macro-regions

Table 3
DYNAMICS OF THE FRUIT PRODUCTION PER TREE, PRIVATE SECTOR, ROMANIAN MACRO-REGIONS, TONNES - NUMBER (2013) AND PERCENTAGE

Private Sector	Macroregions	2013	2014/ 2013 (%)	2015 / 2014 (%)	2016 / 2015 (%)	2017 / 2016 (%)
Apples	M1	196,319	110.90	87.95	92.02	71.39
Pears	M1	14,691	106.79	76.08	110.21	104.39
Plums	M1	100,398	102.03	102.49	92.93	96.26
Apples	M2	110,519	112.24	90.48	94.99	87.84
Pears	M2	19,518	96.67	71.76	107.78	90.49
Plums	M2	89,450	109.57	97.19	91.33	93.31
Apples	M3	121,362	84.70	99.96	112.37	58.22
Pears	M3	19,501	74.60	83.23	126.35	73.82
Plums	M3	143,558	80.52	103.21	121.10	66.81
Apples	M4	79,688	78.97	102.72	101.88	90.52
Pears	M4	13,022	92.97	65.14	121.96	110.09
Plums	M4	177,283	100.65	98.39	104.04	94.37

Source: National Institute of Statistics, Bucharest, Tempo online, dataset accessed August – September 2018
M1, M2, M3, M4 – the Romanian macro-regions

Table 4
FADN INDICATORS BY TYPE OF FARMING IN SPECIALIST ORCHARDS - FRUITS, 2016, ROMANIA AND POLAND

2016	Regional level	Labour input (SE011)	Rented U.A.A. (SE030)	Orchards (SE055)	Fruit (SE175)	Farmhouse consumption (SE260)
Romania	(0840) Nord-Est	3181.14	1.57	3.16	10589	721
	(0841) Sud-Est	2129.86	0.36	2.58	7384	25
	(0842) Sud-Muntenia	3003.11	0.68	2.22	6636	377
	(0843) Sud-Vest-Oltenia	2633.17	1.42	2.81	6068	226
	(0844) Vest	4405.91	2.73	4.07	30074	153
	(0845) Nord-Vest	3115.31	0.72	2.77	9484	316
	(0846) Centru	5265.71	2.08	9.74	27218	241
	Average	**3390.60**	**1.37**	**3.91**	**13921.86**	**294.14**
Poland	(0785) Pomorze and Mazury	-	-	-	-	-
	(0790) Wielkopolska and Slask	6082.07	0.93	8.74	26280	78
	(0795) Mazowsze and Podlasie	4774.37	0.78	8.17	22551	136
	(0800) Malopolska and PogÁrze	4066.8	0.69	5.75	17845	137
	Average	**4974.41**	**0.80**	**7.55**	**22225.33**	**117.00**

Source: EUFADN Database, dataset accessed August – September 2018

few exceptions, in this analysis too, there were noticeable significant decreases, especially in the last analyzed year.

In the following part, based on the data available in the Farm Accountancy Data Network (source: FADN database), we presented, on the comparison Romania - Poland, a series of indicators. We intended to reflect on similarities and differences between two countries relatively similar in terms of relief, two important European fruit producers (table 4).

Thus, in the table above we could identify for the year 2016 the main similarities and differences encountered at farm level - specialized orchards, between Romania and Poland (according to the FADN classification). We then presented, on the basis of Eurostat data, a comparison between the two countries, some of the largest fruit-producing countries in Europe. This time, we were interested in a certain category of productions, namely organic production. These represent a different and expanding category on the fruit market and with an important development perspective, we have presented the areas and the percentage of Total Farms converted to organic farming in 2016 for apples and pears.

The table 5, indicated that Poland has been registered a more accentuated trend in the organic crop area, that Romania.

The second part of the paper consisted in presenting the results of the pollution data in agriculture, for both Romania and Poland. This was made first for the air emissions of greenhouse gases, for all the economic activities, at the national level and at the European level. The figure showed that Romania has less greenhouse level than Poland and the trend for both countries is relatively constant.

The next figure represents also the air emissions of greenhouse gases and carbon dioxide, but only for the agriculture sector. We observed that even the trend is almost constant during the period covered in our analyze (2012-2016), the parts of the agriculture air emissions, from the total, are different for the analyzed countries.

Another pollution issue analyzed in the paper concerns the methane in agriculture. The figure 3 represents the

Table 5

ORGANIC CROP AREA BY AGRICULTURAL PRODUCTION METHODS AND CROPS, 2016, EUROSTAT

Country	Total fully converted and under conversion to organic farming	Fully converted to organic farming	Total fully converted and under conversion to organic farming	Fully converted to organic farming
	Hectare		**% of total utilised agricultural area**	
	Apples			
Poland	12,541	11,172	0.09	0.08
Romania	2,325	1,440	0.02	0.01
	Pears			
Poland	1,421	1,279	0.01	0.01
Romania	94	61	0.00	0.00

Source: Eurostat database, https://ec.europa.eu/eurostat/data/database

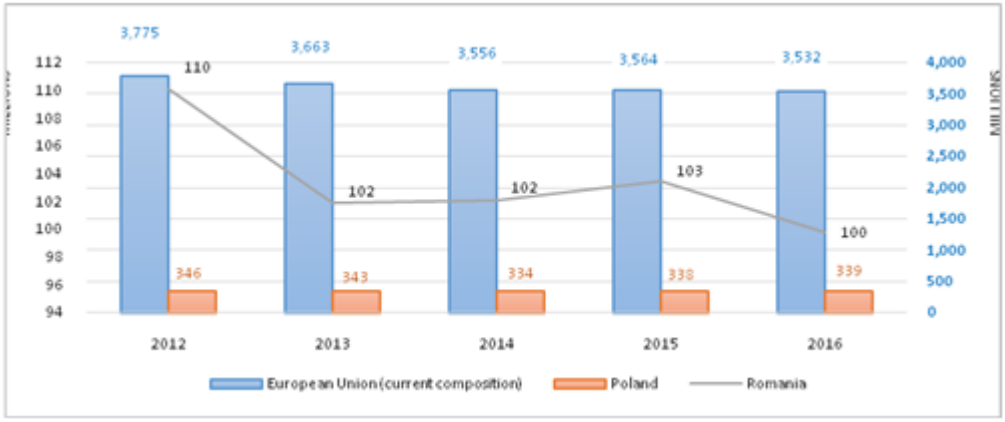

Fig. 1. Air emissions accounts - Greenhouse gases (CO2, N2O in CO2 equivalent, CH4 in CO2 equivalent), Total - all activities, Tonne; *Source: Eurostat database, https://ec.europa.eu/eurostat/data/database*

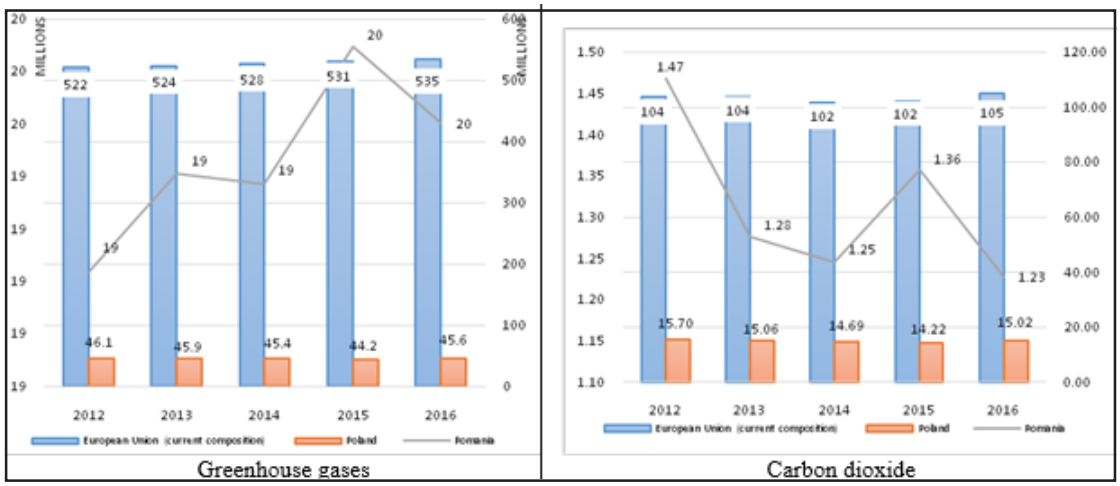

Fig. 2. Air emissions accounts - Greenhouse gases (CO2, N2O in CO2 equivalent, CH4 in CO2 equivalent) and Carbon dioxide, Agriculture, forestry and fishing, Tonne; *Source: Eurostat database, https://ec.europa.eu/eurostat/data/database*

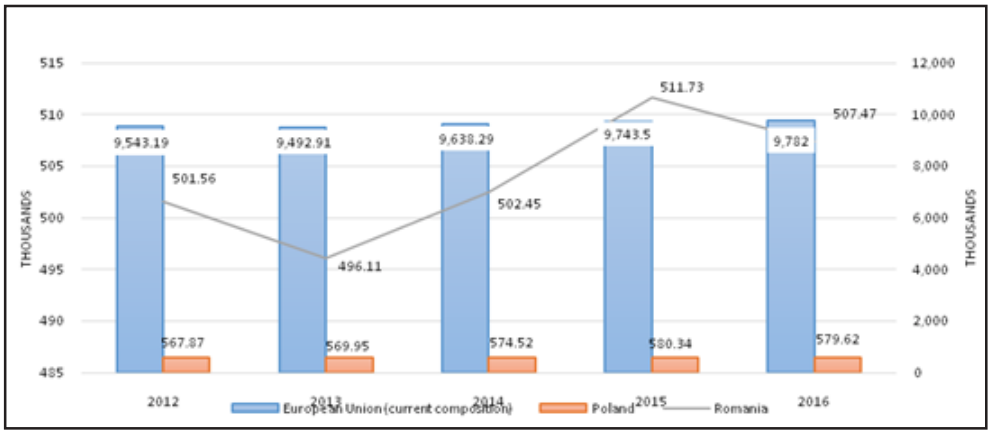

Fig. 3. Air emissions accounts - Methane, Agriculture, forestry and fishing, Tonne; *Source: Eurostat database, https://ec.europa.eu/eurostat/data/database*

dynamics of the quantities (in Tonnes) for European Union, Poland and Romania.

In the table 6 it was represented the share of both countries (Romania and Poland) from the air emission at the European level.

Thus, it was observed that greenhouse gases and carbon dioxide are at much lower level that the similar in Poland. It was only for methane, as air pollution factor, where the shares from the European Union level were at comparable levels.

Air emissions accounts	2012	2013	2014	2015	2016
Greenhouse gases (CO2, N2O in CO2 equivalent, CH4 in CO2 equivalent), Agriculture, forestry and fishing					
Poland / EU (%)	8.83	8.76	8.60	8.33	8.52
Romania / EU (%)	3.65	3.71	3.67	3.75	3.67
Carbon dioxide, Agriculture, forestry and fishing					
Poland / EU (%)	15.09	14.46	14.45	13.92	14.31
Romania / EU (%)	1.41	1.23	1.23	1.33	1.17
Methane, Agriculture, forestry and fishing					
Poland / EU (%)	5.95	6.00	5.96	5.96	5.93
Romania / EU (%)	5.26	5.23	5.21	5.25	5.19

Table 6
AIR EMISSIONS ACCOUNTS, PERCENTAGE FROM THE EU, TONNE

Source of data: own representation based on Eurostat database, accessed 2018

Conclusions

In conclusions of this study, we want to highlight that, in Romania, the indicators presented for the period 2013-2016 (number of fruit trees, average productions and productions) showed mostly a descending trend. The analysis of some FADN indicators between Romania and Poland revealed a certain level of differentiation, especially in terms of labor input, but also the level of self-consumption in farms, the regional differentiation in Poland not being as high as in our country. As far as the analysis of the agriculture sector is concerned, the differences were even more pronounced, Poland being netting the indicators presented in this paper. In what concerns the analyze on the pollutions issues we noticed that Romania has lower levels, compare with Poland and the trends for both of them are rather constant.

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