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THE EVOLUTION OF THE VEGETABLE SECTOR OF ECOLOGICAL AGRICULTURE IN ROMANIA

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Abstract

Organic farming is a modern concept which combines several factors such as tradition, innovation, science with the principles of health and ecology. It uses the existing resources for the welfare of the humanity without harming the environment. Through its content, the aim of the paper is to present the evolution of the ecological agricultural sector at national level. The paper presents aspects regarding the data of the exploited surfaces, the number of certified operators, the average size of the existing operators, during 2010-2016 period. The analysis of the indicators in the present paper was performed using the method of comparison and the percentage method. In this regard, the relative importance of different types of activities in the vegetal sector is highlighted for the analysed reference market. The data presented indicate a certified average area of 252,752.08 ha, an average number of operators of 11,161 units and an average area of 22.64 ha per operator. In the studied range, grain crops prevail (35.17%), followed by permanent crops - pastures and hayfields (28.93%) and industrial crops (21.43%), while the lowest weights are held by other crops on arable land (0.14%).

Key words**:** *dynamic, organic farming, operators, surface.*

INTRODUCTION

Among the global issues of humanity, the security of the population's diet and the protection of the environment are priorities. In present, efforts are being made to raise awareness of the limited capacity of natural resources as they are not inexhaustible [3]. Practicing the organic farming system can be a solution to these problems. The role of the organic farming system is to contribute to improving food security through the existence of a large number of economic opportunities that increase the added value of the products obtained [5]. Processing and marketing activities, better communication and cooperation between consumers and producers can lead to improved long-term food security and the development of an eco-friendly food system [8, 11].

Some authors recommend that an ecosystem approach should be prioritized in planning and policy-making at national and international level to ensure ecosystem health, to maintain food security and to achieve the Millennium Development Goals [6].

Others affirm that organic production accounts for only 1% of global agricultural production and suggests that organic farming can expand [1]. In addition, organic farming systems have various sustainability advantages and can contribute more to feeding the world. Organic farming has a long-term economic importance in the delivery of ecosystem services such as biodiversity conservation and environmental improvement [12].

In recent years, organic farming has grown rapidly globally, in 2016 being practiced in approximately 179 countries, with an area of 50.9 million ha and 2.4 million organic farms [10].

Promoting organic farming is an approach to a growing demand for high quality consumer products. The new EU policy confirms the importance and the rise of this sector in

agriculture. Thus, in 2016, in the European Union there were 12.1 ha organically grown, an increase of 68% (4.9 million ha) compared to 2007 [13].

The objectives, principles and rules applicable to organic production are included in Community and national legislation in this field. The organic production system is regulated at European level by Council Regulation (EC) No 834/2007 on organic production and labelling of organic products [4].

In the case of Romania, organic agriculture can be considered a market niche which is not sufficiently exploited, the development potential of the agricultural sector being well defined and real [2].

In order to achieve sustainable agriculture it is necessary to implement programs and initiatives aimed at minimizing the environmental impact and improving benefits for farmers. Romania can capitalize this sector on the advantage of less polluted soils and appropriate conditions for the development of this farming system. Supporting entrepreneurship in the field of organic farming can be a solution for the development of national agriculture sector. In the recent years, two agricultural support programs under the National Rural Development Program (2007-2013 and 2014-2020) have been in force, including measures to support the ecological sector.

The aim of this study was to examine the evolution of the vegetal sector in organic farming in Romania during 2010-2016.

MATERIALS AND METHODS

In the study are presented information about the number of certified operators, total area, names of crops and crop groups to be presented. The existing data has been retrieved and processed through various methods.

In this paper were used indices analysis, the method of comparison over time being emphasized through the mobile base index, calculated using the formula: $I_{bm} = \frac{Y_n}{Y_{n-1}} x100$, in which: Y_n - the level of indicator for each component of the dynamic series; Y_{n-1} - the level of temporal sequence indicator considered as a basis for comparison or reference period. In order to determine de indices structure at the national level (for the cultivated area) it was calculated after the following formula: $I_s = \frac{S_i}{S_t} x100$ (%), in which: S_i - the area occupied by each culture group (ha), S_t – total national area (ha) [7].

RESULTS AND DISCUSSIONS

In Table 1, there are presented information on the evolution of the total area, the number of operators and the average area per operator in Romania.

The number of operators certified in organic farming was between 3,155 (2010) and 15,544 (2012) and during this period the average was 11,161 operators. Regarding the evolution over time, the indicator recorded an upward trend from 2010 to 2012 (+207.5% and +60.2%), after which the dynamics are downward (the terms of comparison being higher than the current terms: -2.3%, -4.8%, -15.5%, -13.7% and -20.15% for 2013, 2014, 2015, 2016 and respectively 2017).

The total area recorded an average of 252752.08 ha (-2.21% in dynamics), with variation limits of 182,706 ha in 2010 and 301,148 ha in 2013. Until the year 2013, the dynamics of the indicator showed an upward trend (+25.9% in 2011 - 229,946 ha, +25.4% in 2012 - 288,261 ha, +4.5% in 2013), after which it decreased with 4.0% in 2014 (289,251.79 ha), with 15.0% in 2015 (245,923.9 ha), with 8.0% in 2016 (226,309 ha) and again increased in 2017 with 14.21% (258,470.92 ha).

Referring to the average area per certified operator, there exist variations limits from 18.54 ha in 2012 and 57.91 ha in 2010, and the period analysed the average of was 22.64 ha (-26.02% in dynamics compared to the previous term of the series). The evolution of the indicator was uneven over the time period studied. Therefore, there are decreases regarding the terms of comparison of 59.1% in 2011 (23.70 ha) and 21.7% in 2012, while

the other indicators of the dynamic series exceeded the baselines by 0.6% (20.11 ha in 2015), 0.9% (19.99 ha in 2014), 6.6% (21.43 ha in 2016), 6.9% (19.82 ha in 2013) and 43.03% (30.65 ha in 2017).

This decline in the number of operators and areas in organic farming may be due to difficulties in commercializing the products, insufficient financial resources for operators and even failure to comply with production and certification rules in this sector. Analysing the level of support for ecological practices [9], reported a significant increase in compensatory payments in comparison with the previous programming period, which should stimulate operators to continue such practices.

Table 1. The dynamics of the number of operators in organic farming

Year	Specification	Number of certified operators	Total area (ha)	Operator's average area (ha)
2010	Effective	3,155	182,706	57.91
2011	Effective*	9,703	229,946	23.70
	2011/2010**	307.5	125.9	40.9
2012	Effective*	15,544	288,261	18.54
	2012/2011**	160.2	125.4	78.3
2013	Effective*	15,194	301,148	19.82
	2013/2012**	97.7	104.5	106.9
2014	Effective*	14,470	289,251.79	19.99
	2014/2013**	95.2	96.0	100.9
2015	Effective*	12,231	245,923.9	20.11
	2015/2014**	84.5	85.0	100.6
2016	Effective*	10,562	226,309	21.43
	2016/2015**	86.3	92.0	106.6
2017	Effective*	8434	258,470.92	30.65
	2017/2016**	79.85	114.21	143.03
Average	Effective*	11,161	252,752.08	22.64
	Average/2017**	132.34	97.79	73.98

*http://www.madr.ro/agricultura-ecologica **own calculation

Tables 2 and 3 present the evolution of the surfaces of different types of crops.

Regarding the cereals, there are variation limits between the years 2010-2013 from 72,297.8 ha to 109,105 ha, and concerning the average of the period it reached 88,726.70 ha (+4.5% in dynamics). From 2010 to 2013, the area of cereals increases successively as follows: +9.5% in 2011 (79,167 ha), +32.8% in 2012 (105,149 ha) and +3.8% in 2013. After this time sequence there are decreases in the area cultivated by 6.0% for the year 2014 (102,531.47 ha), 20.6% in 2015 (81,439.5 ha), 7.7% in 2016 (75,198.31 ha), followed also by an increase of 12.9% in 2017 (84,925.51 ha).

If we analyse the areas allocated to dried pulses for the production of grains, an average of 3,152.02 ha is recorded, which is under 0.63 times the comparison term. During the dynamic series the downward trend of the indicator is observed. Thus, it starts from an area of 5,560.22 ha in 2010, after which the indicator records annual successive decreases of: 43.4% for 2011 (3,147.36 ha), 12.2% for 2012 (2,764.04 ha), 13.3% for 2013 (2,379.34 ha), 3.5% for 2014 (2,314.43 ha) and 20.7% for 2015 (1,834.35 ha). The exception is for the years 2016 and 2017 when there is an increase of 20.1% (2,203.78 ha) and respectively 26.6% (4,994.66 ha) (Table 2).

Regarding the situation of tuberculous and root plants, it starts from an area of 504.36 ha in 2010, then it grows 2.13 times in 2011 (1,074.98 ha), in 2012 there is an increase of 4.6% compared to the previous term of the dynamic series (1,124.92 ha), the indicator for the year 2013 decreased by 34.2% (740.75 ha), the downward trend with 15.4% (626.99 ha) continues for the year 2014, for the year 2015 the indicator increases by 6.5% compared to the reporting base (667.55 ha), a trend that is also maintained in 2016 (+5.9% representing 707.03 ha).

Table 2. The evolution of the areas related to organic agriculture in Romania at some types of crops (ha)

Year	Specification	Cereals	Dried pulses	Tuberculous and root plants	Industrial crops	Green harvested plants
2010	Effective*	72,297.8	5,560.22	504.36	47,815.1	10,325.4
2011	Effective*	79,167	3,147.36	1,074.98	47,879.7	4,788.49
	2011/2010**	109.5	56.6	213.1	100.1	46.4
2012	Effective*	105,149	2,764.04	1,124.92	44,788.7	11,082.9
	2012/2011**	132.8	87.8	104.6	93.5	231.4
2013	Effective*	109,105	2,397.34	740.75	51,770.8	13,184.1
	2013/2012**	103.8	86.7	65.8	115.6	118.9
2014	Effective*	102,531.47	2,314.43	626.99	54,145.17	13,493.53
	2014/2013**	94.0	96.5	84.6	104.6	102.3
2015	Effective*	81,439.5	1,834.35	667.55	52,583.11	13,636.48
	2015/2014**	79.4	79.3	106.5	97.1	101.1
2016	Effective*	75,198.31	2,203.78	707.03	53,396.86	14,280.55
	2016/2015**	92.3	120.1	105.9	101.6	104.7
2017	Effective*	84,925.51	4,994.66	665.54	72,388.33	20,350.75
	2017/2016**	112.9	226.6	94.1	135.5	142.5
Average	Effective*	88,726.70	3,152.02	764.02	53,095.97	12,642.78
	Average/2017**	104.5	63.1	114.8	73.3	62.1

*http://www.madr.ro/agricultura-ecologica/ **own calculations

In 2017 is recorded a decrease by 5.9% (665.54 ha) compared to the previous term. Under these circumstances, the average of the period reached 764.02 ha, which in dynamics determines the over-values of the calculated indices (114.8%).

Referring to the industrial crops, they are characterized by variation limits of the cultivated area, of 44,788.7 ha in 2012 (-6.5% in dynamics) and 72,388.33 ha in 2017 (+35.5%). In this period, the average was 53,095.97 ha (-26.7%). During the dynamic series analysed, the surface increased with 0.1% in 2011 in comparison with the previous term of the dynamic series (47,879.7 compared to 47,815.1 ha), in 2012 there is a decrease, the value in 2013 surpasses the reporting base 1.15 times (actual level of 51,770.8 ha), a trend that continues in 2014 (54,145.17 ha). The year 2015 recorded a decrease of 2.9% in comparison with the previous term of the dynamic series (actual level of 52,583.11 ha) and the year 2016 recorded an increase of 1.6% (Table 2).

Table 3. The evolution of the areas related to organic agriculture in Romania at other types of crops (ha)

Year	Specification	Other crops on arable land	Fresh vegetables and strawberries	Permanent crops - orchards and vineyards	Permanent crops - pastures and hayfields	Uncultivated land
2010	Effective*	579.61	734.32	3,093.04	31,579.1	10,216.8
2011	Effective*	851.44	914.08	4,166.62	78,197.5	9,758.55
	2011/2010**	146.9	124.5	134.7	247.6	95.5
2012	Effective*	27.77	896.32	7,781.33	105,836	8,810.73
	2012/2011**	3.3	98.1	186.8	135.3	90.3
2013	Effective*	263.95	1,067.67	9,400.31	103,702	9,516.33
	2013/2012**	950.5	119.1	120.8	98.0	108.0
2014	Effective*	29.87	1,928.36	9,438.53	95,684.78	9,058.66
	2014/2013**	11.3	180.6	100.4	92.3	95.2
2015	Effective*	356.22	1,210.08	11,117.26	75,853.57	7,225.85
	2015/2014**	1192.6	62.8	117.8	79.3	79.8
2016	Effective*	258.47	1,175.33	12,019.81	57,611.65	9,457.2
	2016/2015**	72.6	97.1	108.1	76.0	130.9
2017	Effective*	88.25	1,458.78	13,165.41	50,685.74	9,747.94
	2017/2016**	34.1	124.1	109.5	88.0	103.1
Average	Effective*	306.95	1,173.1	8,772.8	74,893.8	9,224.01
	Average/2017**	347.8	80.4	66.6	147.8	94.6

*http://www.madr.ro/agricultura-ecologica/ **own calculation

The green harvested plants are characterized by an average area of 12,642.78 ha (-37.9% in dynamics), with extreme values of 4,788.49 ha for 2011 (-53.6% compared to 10,325.4 ha cultivated in 2010) and 20,350.75 ha for the year 2017 (+42.5% compared to the reporting base). The indicator evolved in descending order only in 2011 compared to 2010, after which is an upward trend (2.31, 1.18, 1.02, 1.1 and 4.7 times of the reference terms for the years 2012, 2013, 2014, 2015 and 2016 (Table 2).

If we refer to the specific situation of other crops cultivated on arable land (Table 3), there is an area of 579.61 ha in 2010, an area that grows 1.46 times in 2011 (851.44 ha), then the indicator decreases drastically in 2012 (27.77 ha which represents only 3.3% of the reporting base). In 2013 occurs a spectacular increase of the indicator (it surpasses 9.50 times the previous term of the dynamic series - 263.95 ha), followed by a sharp decrease registered in 2014 (-88.7% comparative to the previous year - an area of 29.87 ha), while in 2015 the indicator is spectacularly recovering (surpasses 11.92 times the comparison term - 356.22 ha), and in 2016 it decreases (-27.4% that account for 258.47 ha) followed also by a significant decrease 88.25 ha (-65,9%) in 2017. As a result of the above mentioned, an average of 306.95 ha is reached, which in dynamics highlights an upward trend (+247.8%).

Fresh vegetables and strawberries were grown on average on 1,173.1 ha (-19.6% in dynamics), with variations of the indicator from 734.32 ha in 2010 to 1,928.36 ha in 2014. The evolution of the area planted with vegetables highlights supraunitary values of the indices for the years 2011, 2013, 2014 and 2017 (124.5, 119.1, 180.6% and 124.1% - actual levels of the areas of 914.08, 1,067.67, 1,928.36 ha and 1,458.78 respectively), but also subunit values in 2012, 2015 and 2016 (98.1, 62.8 and 97.1% - actual levels of 896.32, 1,210.08 and 1,175.33 ha respectively).

Considering the situation of the permanent crops - orchards and vineyards, there is a permanent increase of the certified areas starting from 3,093.04 ha in 2010, 4,166.62 ha in 2011 (+34.7% in the dynamics), 7,781.33 ha in 2012 (+86.8%), 9,400.31 ha in 2013 (+20.8%), 9,438.53 ha in 2014 (+0.4%), 11,117.26 ha in 2015 (+17.8%), 12,019.81 ha in 2016 (+8.1%) and also 13,165.41 ha in 2017 (9.5%). Consequently, during this period analysed the average was 8,772.8 ha, which in dynamics registered a 33.4% decrease unlike the previous term (2017) of the dynamic series.

Permanent cultures such as pastures and hayfields are characterized by an average of 74,893.8 ha (+47.8% in dynamics), having variation limits of 31,579.1 ha in 2010 and 105,836 ha in 2012. The indicator has experienced successive annual increases in 2011 and 2012 (+147.6 and +35.3% - an effective level of 78,197.5 ha for 2011), then from 2013 to 2017 the evolution registered downward trend (2.0, 7.7, 20.7, 24.0 and 12% while reaching actual areas of 103,172, 95,684.78, 75,853.57, 57,611.65 and 50,685.74 ha respectively for 2013, 2014, 2015, 2016 and 2017).

Uncultivated land is characterized by limits of 7,225.85 ha in 2015 (-20.2% in dynamics) and 10,216.8 ha in 2010. The average of the period recorded 9,224.01 ha (-5.4% in dynamics). The value of the indicator declined in 2011 by 4.5% compared to 2010 (9,758.55 ha), a trend which continued in 2012 (-9.7% and 8,810.73 ha), after which is an increase in 2013 (+8.0% of 9,516.33 ha), then the downward trend is registered for 2014 and 2015 (-4.8% for 2014, with an area of 9,058.66 ha), in 2016 again increased +30.9% (9,457.2 ha). In 2017 there is a slight increase of 9,747.94 ha (+3.1%).

In the year 2010 the structure of the total area was as follows (Table 4): 39.57% cereals, 26.17% industrial crops, 17.28% pastures and hayfields, 5.65% green harvested plants, 5.59% uncultivated land, 3.04% dried pulses, 1.69% orchards and vineyards, 0.40% fresh vegetables and strawberries, 0.32% other cultures, 0.28% tuberculous and root plants.

If we refer to the specific situation of 2011, the structure includes, in ascending order, the following weights: 0.37% other crops, 0.40% fresh vegetables (including melons) and strawberries, 0.47% tuberculous and root plants, 1.37% dried pulses, 1.81% orchards and vineyards, 2.08% green harvested plants, 4.24% uncultivated land, 20.82% industrial crops, 34.0% pastures and hayfields, 34.43% cereals.

For the year 2012, there are distinguished similar weights for pastures and hayfields and cereals (36.72 and 36.48%, respectively), followed by industrial crops with 15.53%, the rest of the crop groups having shares under 5%: 3.84% green harvested plants, 3.06% uncultivated land, 2.69% orchards and

vineyards, 0.96% dried pulses, 0.39% tuberculous and root plants, 0.31% fresh vegetables, 0.01% other crops.

Table 4. Share (%) of crops in total organic farming area in Romania*

Specification	2010	2011	2012	2013	2014	2015	2016	2017	Average
Total area	100	100	100	100	100	100	100	100	100
Cereals	39.57	34.43	36.48	36.23	35.45	33.12	33.23	32.86	35.17
Dried pulses	3.04	1.37	0.96	0.80	0.80	0.75	0.97	1.93	1.33
Tuberculous and root plants	0.28	0.47	0.39	0.25	0.22	0.27	0.31	0.26	0.31
Industrial crops	26.17	20.82	15.53	17.19	18.72	21.38	23.59	28.01	21.43
Green harvested plants	5.65	2.08	3.84	4.38	4.66	5.54	6.31	7.87	5.04
Other crops on arable land	0.32	0.37	0.01	0.09	0.01	0.14	0.11	0.03	0.14
Fresh vegetables (including melons) and strawberries	0.40	0.40	0.31	0.35	0.67	0.49	0.52	0.56	0.46
Permanent crops - orchards and vineyards	1.69	1.81	2.69	3.12	3.26	4.52	5.31	5.09	3.44
Permanent crops - pastures and hayfields	17.28	34.00	36.72	34.44	33.08	30.84	25.46	19.61	28.93
Uncultivated land	5.59	4.24	3.06	3.16	3.13	2.94	4.18	3.77	3.76

* own calculation

In 2013, the structure of the surface was as follows: 36.23% cereals, 34.44% pastures and hayfields, 17.19% industrial crops, 4.38% green harvested plants, 3.16% uncultivated land, 3.12% orchards and vineyards, 0.80% dried pulses, 0.35% fresh vegetables, 0.25% tuberculous and root plants, 0.09% other crops.

Year 2014 is characterized by an ascending structure as follows: 0.01% other crops, 0.22% tuberculous and root plants, 0.67% fresh vegetables, 0.80% dried pulses, 3.13% uncultivated land, 3.26% orchards and vineyards, 4.66% green harvested plants, 18.72% industrial crops, 33.08% pastures and hayfields, 35.45% cereals.

The structure of the crops in the year 2015 is predominantly of cereals and pastures and hayfields - which together account for about 64% of the total (33.12% and 30.84%), followed by the industrial crops (21.38%), followed by green harvested plants (5.54%), orchards and vineyards (4.52%), uncultivated land (2.94%), dried pulses (0.75%), fresh vegetables (0.49%), tuberculous and root plants (0.27%) and other crops (0.14%).

With regard to the specific situation of 2016, the structure comprises, in ascending order, the following weights: 0.11% other crops, 0.31% tuberculous and root plants, 0.52% fresh vegetables, 0.97% dried pulses, 4.18% uncultivated land, 5.31% orchards and vineyards, 6.31% green harvested plants, 23.59% industrial crops, 25.46% pastures and hayfields and 33.23% cereals.

Considering the situation in 2017, it is clearly that predominate cereals with 32.86%, than industrial crops 28.01%, pastures and hayfields have a share of 19.61%, followed by green harvested plants 7.87%, orchards and vineyards 5.09%, uncultivated land 3.77%, dried pulses 1.93%, while the rest of the cultures have shares under 1% such as fresh vegetables, tuberculous and root plants and other crops (0.56%, 0.26% and 0.03%).

The average of the period has a suggestive structure based on the data presented above: 0.14% other crops, 0.31% tuberculous and root plants, 0.46% fresh vegetables (including melons) and strawberries, 1.33% dried pulses, 3.44% orchards and vineyards, 5.04% green harvested plants, 21.43% industrial crops, 28.93% pastures and hayfields, 35.17% cereals.

The main difficulties with the ecological agriculture are those related to product marketing, limited financial resources, lack of information and business partners. Such difficulties are due to the lack of forecasting and organization of the sector.

CONCLUSIONS

This analysis led to the following conclusions:
-the number of certified operators experienced an upward trend from 2010 to 2012, after

which the trend was downward. It is worth noting, however, that the declines recorded since 2013 are not very pronounced;
- the total area increased from 2010 to 2013, after which there are somewhat similar decreases to the number of operators. In this context, it is worth pointing out that, for Romania, the ecological sector of agricultural production is not very important;
-the average area per certified operator declined substantially after 2010 (with recovery trends after 2012), which shows the attempts of many economic agents to fit into a niche market that is starting to grow better at the national level. This can be due to the structural changes that are beginning to take place at the level of consumers in terms of changes in consumer preferences (the phenomenon must be associated with the emergence of some consumers who, in terms of income, can turn to organic products);
- the evolution over time of the surfaces of different types of crops can be structured in the following directions: strictly descending trend for dried leguminous plants but has an increase in the last two years of the period analysed, strictly non-uniform evolution for cereals, fresh vegetables, industrial cultures, tuberculous and root plants and other crops, descending trend followed by a recovery and then again decrease for the uncultivated land, non-uniform evolution followed by an increase in green harvested plants, upward trend up to a point following decreases (pastures and hayfields), a strictly upward trend for orchards and vineyards;
-in the structure of the total area predominates the cereals (the first place almost every year), followed by pastures and hayfields (they held the third place only in 2010 and 2017, and for the rest of the period they were second), industrial crops (3rd place except the first and the last year when placed second). From the average total area, these groups of crop represent 85.74%. The surface occupied by the rest of the crops is below the 4.5% threshold. Nevertheless, it is worth noting that the surface of the uncultivated land had only 3.65% of the total average area;
- organic farming can be an opportunity to minimize the impact of human activities on the environment and to obtain benefits for farmers, the potential of this sector not being properly exploited in Romania, which requires further measures and policies to support this sector.

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