

AN OVERVIEW OF ORGANIC SUNFLOWER PRODUCTION IN ROMANIA

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ABSTRACT

Helianthus annuus (sunflower) is an oilseed crop with multiple food and industrial uses, such as production of edible oil, the biofuel industry, the manufacture of soap and fodder production. Sunflower is the most important honey plant, considering the large areas cultivated with sunflower and the quality of nectar. Due to its ability to use soil moisture and soil nitrogen reserve better than other species, and to good productivity and the high quality of its by-products, sunflower crop is representing a good option for organic farming systems.

This study presents an overview of organic production of sunflower in Romania, starting from a general analysis of the European Union organic production of sunflower and going to an in depth analysis of Romanian cultivation and production, presenting an up-to-date report on the dynamics of the sunflower cultivation, up to county level.

Keywords: organic agriculture, sunflower production, Romania, farm to fork strategy.

INTRODUCTION

Organic production, as defined by the European Commission, is a “global system of farm management and food production based on the most efficient implementation of environmental and climate action practices, a high level of biodiversity, the preservation of natural resources, the application of high animal welfare standards and production standards in line with the demand of a growing number of consumers for products produced using natural substances and processes” (EC, 2018).

Across European Union, organic farming is regulated by Council Regulation (EC) No 834/2007. This regulation establishes the framework for the organic production of both crops and livestock, as well as for the labelling, processing and marketing of organic products. The rules for imports of organic products into the EU, are also set up

(EC, 2007). The implementation rules for (EC) No 834/2007 were described in Commission Regulation (EC) No 889/2008 (EC, 2008). The latest regulation on organic farming practices is represented by Regulation (EU) 2018/848 of 30 May 2018 on organic production and labelling of organic products (EC, 2018). This will come into force starting with January 2022.

Having as target the transition to a sustainable, low-emission economy, the latest action plans and regulations released by the European Union cover a wide range of processes and products. The production of healthy food that possesses superior nutritional qualities is one of the requirements of the modern consumer. The Farm to Fork strategy and the Biodiversity Strategy, included in the package of measures regulated by the European Green Deal, have set clear objectives in terms of organic farming (EC, 2020; EC, 2020b). Achieving these objectives involves a series

of strategic measures that will start from the identification of the existing needs in each Member State, and the development capacity in order to fulfil the proposed desideratum.

First of all, it is necessary to review the existing situation, evaluating the development stage of each Member state, the existing needs at national, regional and local level, as well as an in depth analysis of agricultural productions.

This article represents such an overview of the production system in Romania, in terms of production and areas cultivated with sunflower in an ecological system, analysing the dynamics and overall situation at county level, in terms of certified areas or under conversion.

The sunflower is well adapted to the mode of organic production, as it is not very demanding in mineral elements and its cultivation management does not present significant technical brakes (Popovici et al., 2018). It is also insensitive to water stress and can thus be positioned on non-irrigable plots. Sunflower crop is characterized by high ecological plasticity, but generally requires a warm and moderately humid climate. Although it has high requirements for heat, light and soil fertility, the cultivation area of this plant is large due to drought resistance, high temperature fluctuations and low temperatures in the first part of the vegetation (Petcu and Petcu, 2008). Therefore, due to its ability to use soil moisture and soil nitrogen reserve better than other species, and to good productivity and the high quality of its by-products, sunflower crop is representing a good option for organic farming systems.

MATERIAL AND METHODS

The main objective of this study is to highlight the importance of sunflower production in organic system in Romania.

The study employed publicly available datasets available on official website of Ministry of Agriculture and Rural Development (MARD, 2020a), The National Institute of Statistics and Eurostat database.

The analysis covers a three years period, from 2017-2019, based on county data provided by the Ministry of Agriculture and

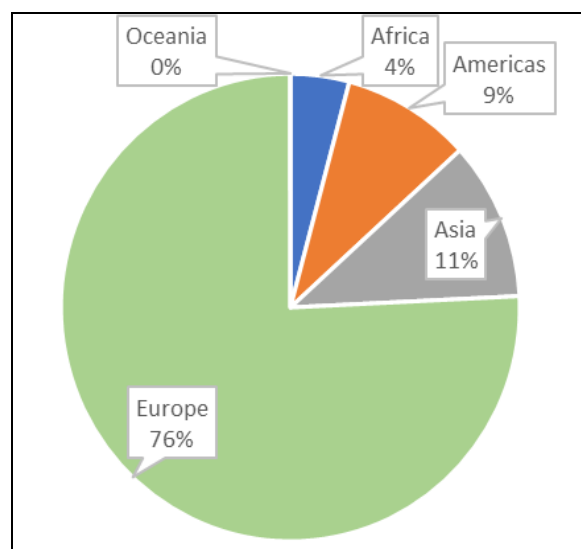
Rural Development (MARD, 2020b) on areas under conversion and certified in ecological system occupied by sunflower in Romania. Data available in the scientific literature and at ministerial structures were used to complete the analysis.

An assessment was performed at the level of each county regarding the areas occupied by sunflower in ecological system and for a better representation in territorial profile of the analysed data, the data were plotted on Romania's map, by county, using QGIS 3.16.0 "Hannover" software.

RESULTS AND DISCUSSION

Sunflower (*Helianthus annuus*) is one of the most important oil plants grown in the world (9% of world oil production) (FAO, 2019) and the most important oil plant for Romania (Csép, 2018; Popescu, 2018). The oil extracted from sunflower achenes is characterized by pleasant color, taste and smell, high content of vitamins (A, D, E, K) and aromatic substances (Toader and Roman, 2014).

According to FAO, in 2019, more than three quarters of world's sunflower production was supplied by Europe (74%) and about 11% by Asia (Figure 1). Worldwide, the largest producers of sunflower are Ukraine, Russia and China. Romania ranks fourth in the world, after these countries (FAOSTAT data, 2020).



Source: Faostat data.

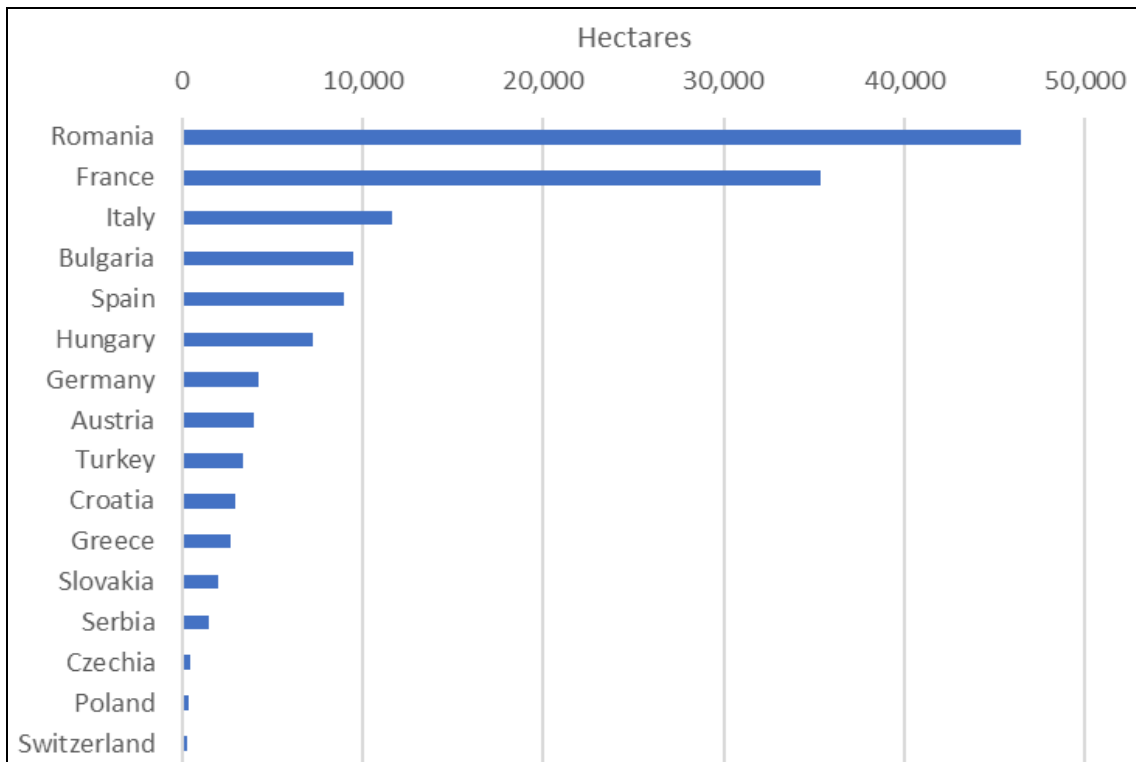
Figure 1. World sunflower production, 2019

The first three sunflower producers in Europe are Romania, Bulgaria and Hungary (FAOSTAT data, 2021). Statistical data show that in 2019 Romania ranked first in the EU in sunflower both in production and area, with a harvest totaling 3.569 thousand tones (INS data, 2021). In 2019, the area cultivated with sunflower in Romania reached 1,282.7 thousand hectares representing almost one quarter of EU's sunflower cultivated area (FAOSTAT, 2021; INS data, 2021).

Romania owns specific natural conditions for setting up efficient organic production, with good soil profile and favorable climate

(GAIN Report, 2019). In Romania, sunflower has a large growing area due to the ability of plants to adapt to large temperature fluctuations, resistance to low temperatures, especially in the first part of the growing season, and drought resistance (Petcu and Petcu, 2008; Toader and Roman, 2018; Bran et al., 2020; Kaya, 2020).

Regarding the organic sunflower production area (Figure 2), it can be seen that Romania is on the first place in Europe (46,461 hectares), followed a short distance by France (35,418 hectares).



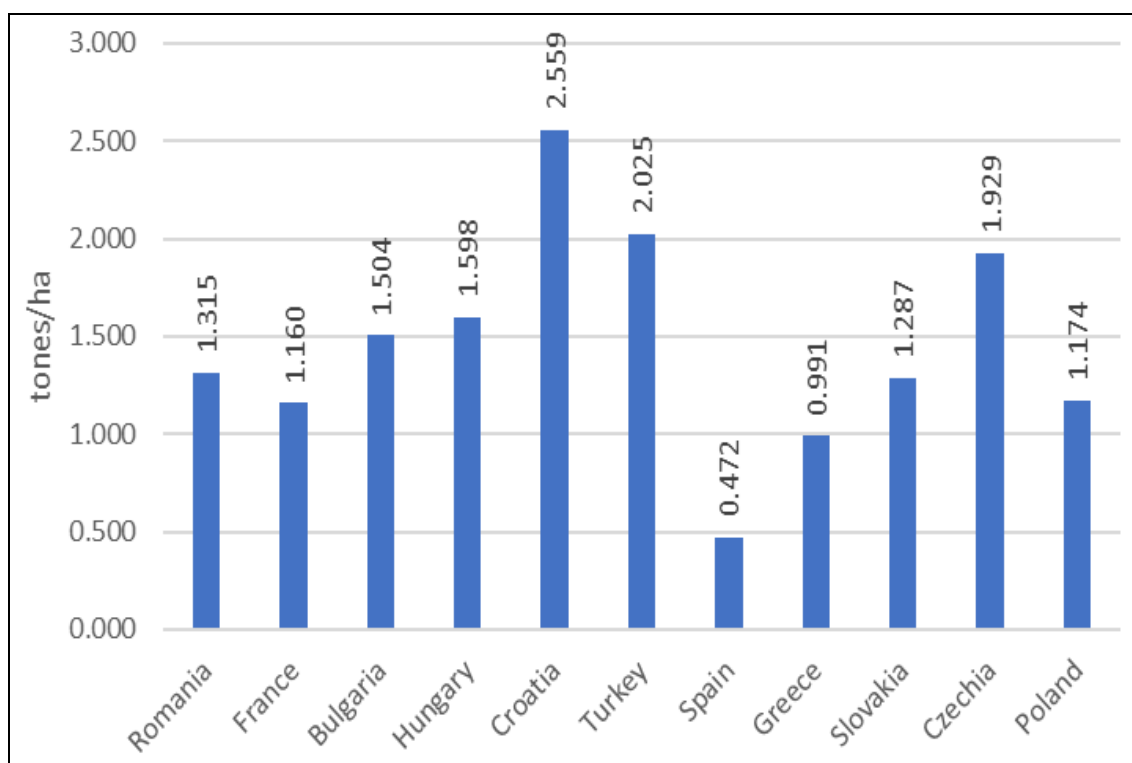
Source: Eurostat, 2021, own calculation.

Figure 2. Main countries in EU with sunflower area cultivated under organic production

Other countries cultivating sunflower under organic production are Italy, Bulgaria, Spain, Hungary, Germany and Austria, but with much smaller cultivated areas.

From the data available on Eurostat, it can be observed that in 2019 Croatia had the highest

average production per hectare (2.559 tons/ha). The lowest yield was obtained in Spain (0.472 tons/ha). Romania ranked on the 6th place regarding average production per hectare, respectively 1.315 tons/ha (Figure 3).



Source: Eurostat, 2021, own calculation.

Figure 3. The yield of organic sunflower production, Europe, main producing countries

Going more deeper with the analysis, we shall further on take a look to the organic production of the Romanian territory over a three years period, namely 2017-2019. It can

be observed that the area cultivated under organic farming with sunflower, has increased slowly but steadily over the last three years (Table 1).

Table 1. Cultivated areas with sunflower in ecological system from total area cultivated with sunflower, Romania, 2017-2019

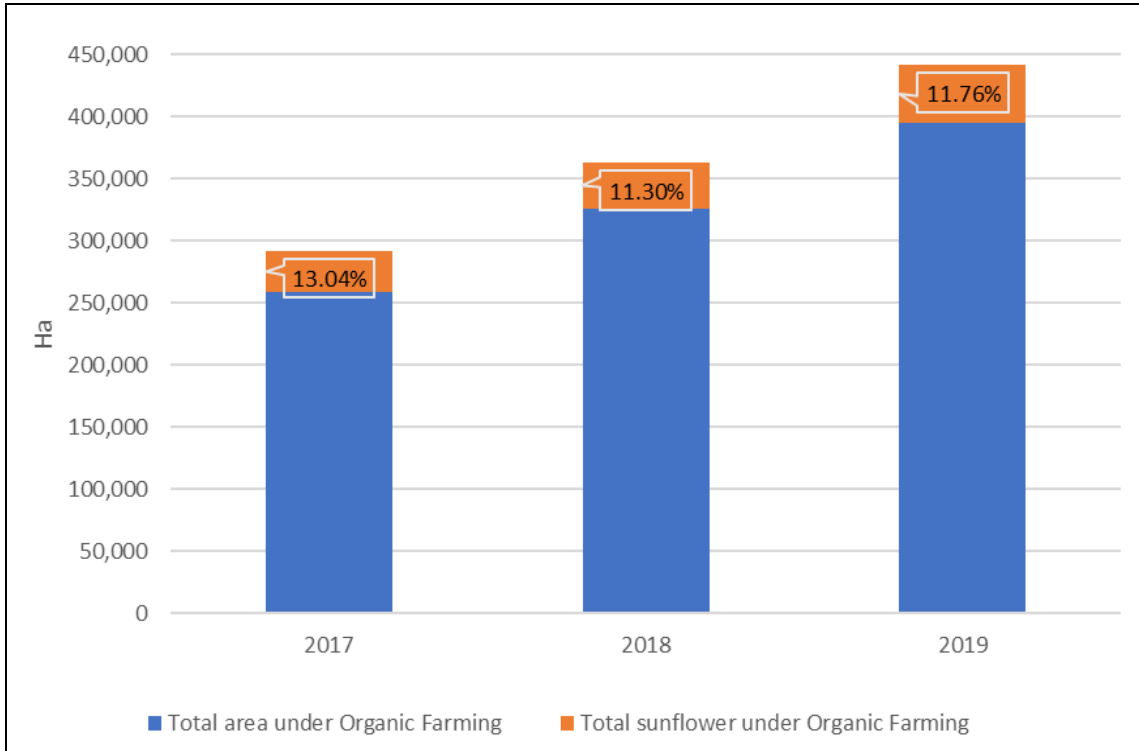
Year	Total sunflower cultivated area (ha)	Total are under sunflower organic production (C1+C2+Certified) (ha)
2017	998,415	33,712
2018	1,006,993	36,870
2019	1,282,697	46,461

Source: own calculations based on MADR data and AGR108A - Area cultivated with main crops by ownership form, macroregions, development regions and counties.

However, although organically grown areas with sunflower have increased, the share of sunflowers cultivated under organic system has decreased over the analysed period, compared to the total areas cultivated with sunflowers. In 2019, the cultivation of

sunflower in organic system, represented approximately 3.6% of the total area cultivated with sunflower in Romania (Table 1), and 11.7% of the total area under organic farming (Figure 4).

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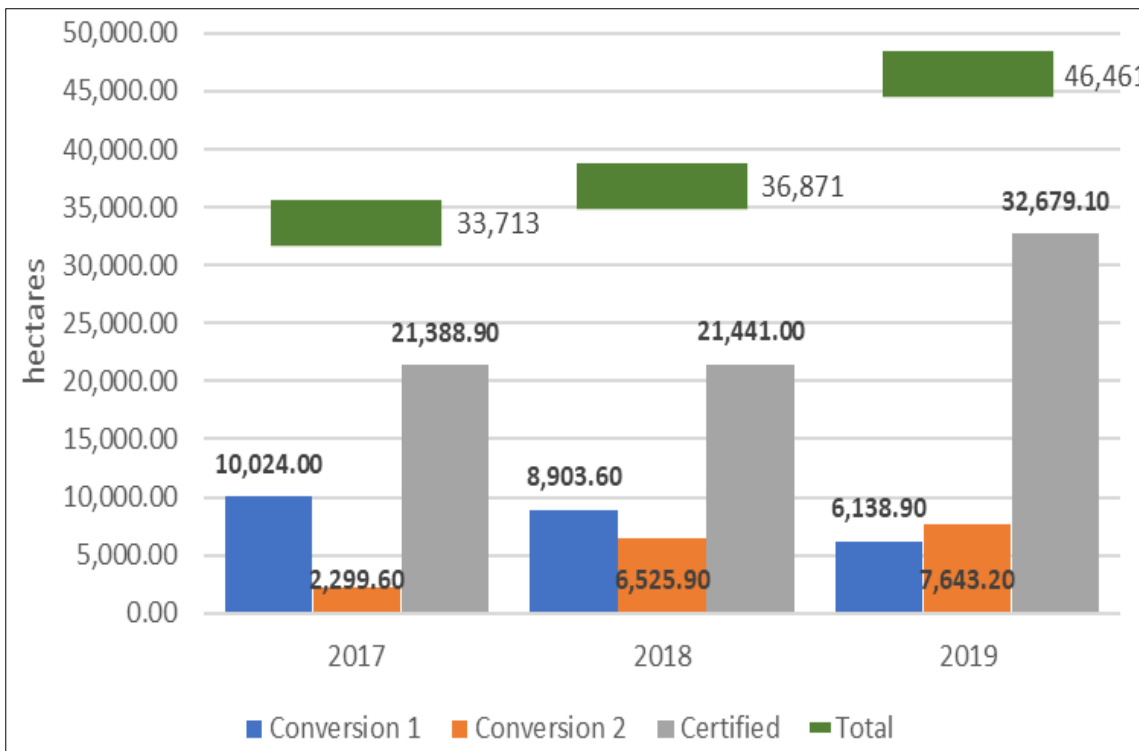


Source: own calculations based on MADR data.

Figure 4. Area under organic farming cultivated with sunflower vs total area under organic farming, Romania, 2017-2019

The areas cultivated with sunflower under organic system, in conversion or certified, showed an ascending trend in Romania in

the period 2017-2019 (Figure 5), with an increase of 37.8%.

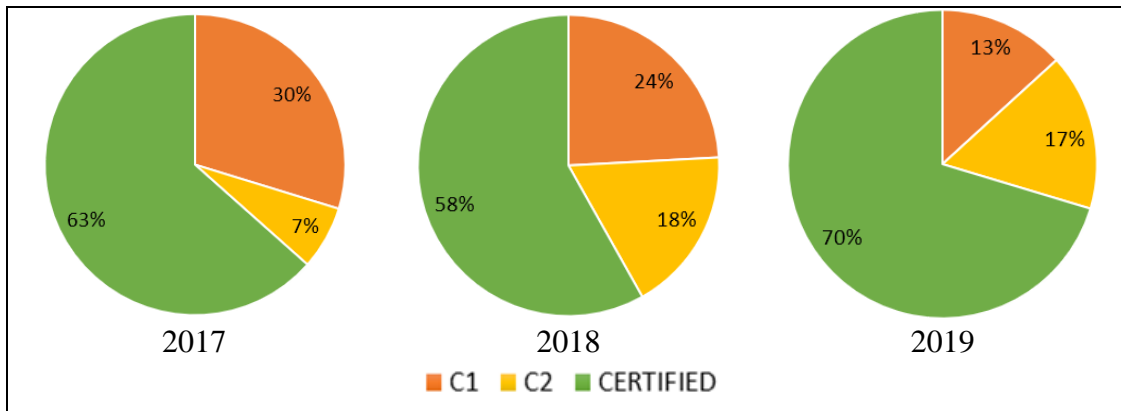


Source: own calculations based on data provided by MARD, 2020.

Figure 5. Evolution of sunflower cultivated areas, by certification stage

It should be noted that farmers prefer to set up sunflower crops mainly on certified organic land, about 70% of the total area cultivated organically in Romania in 2019

being on such land (Figure 6). This is also due to the higher price obtained on certified organic production.

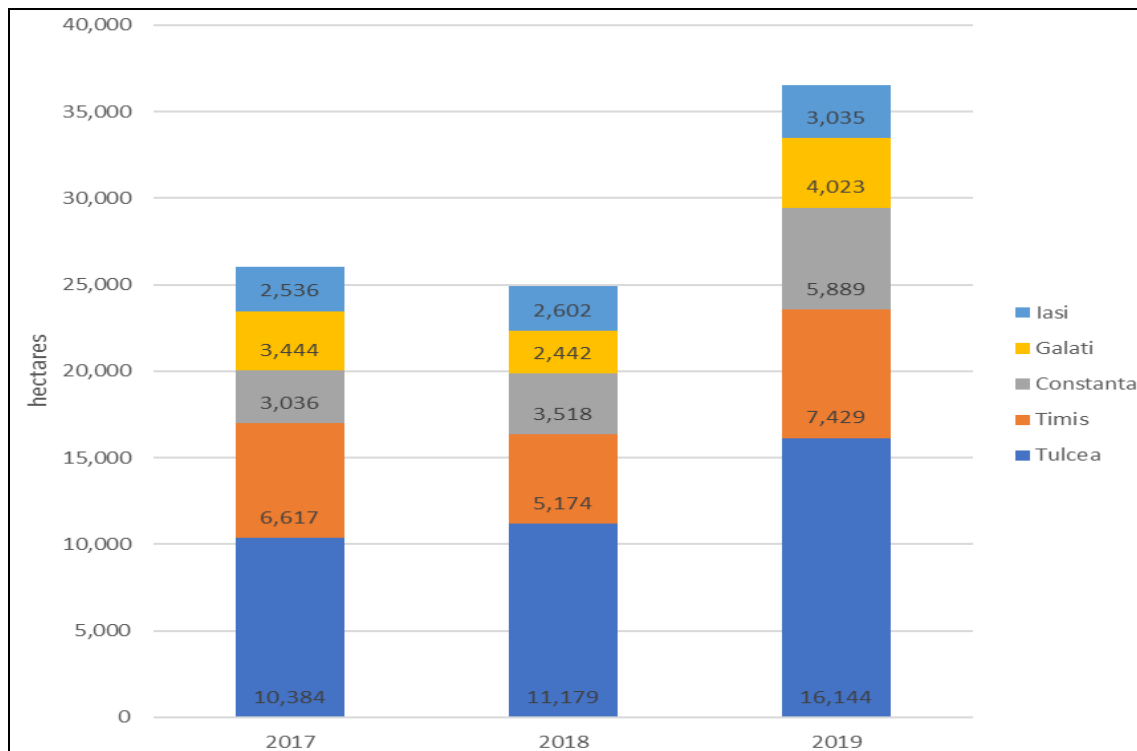


Source: own calculations based on data provided by MARD, 2020.

Figure 6. The share of areas cultivated with sunflower, depending on certification stage

In territorial profile, the cultivation of sunflower in organic system is unevenly distributed, the most significant share being found in Zone I of favourability (Hera et al.,

1989) for this crop, in Dobrogea region, namely in Tulcea County (34.75%, 2019) and Constanța County (12.68%, 2019) and Western Plain, Timiș County (15.99%, 2019) (Figure 7).



Source: own calculations based on data provided by MARD, 2020.

Figure 7. Territorial profile for areas cultivated with organic sunflower, main counties

Tulcea ranks the first regarding organic agriculture areas in Romania, and more specifically for sunflower (30% of total sunflower crops in Romania). About 10% of

the arable area of Tulcea County is represented by organic farming. Reaching such share, compared to the national average share of organic farming in total agricultural

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area, organic farming in this county should be flagged as a model of sustainable development towards European strategies. It can be stated that it is a good practice example of transforming the disadvantages resulting from restrictions due to the vicinity of Danube Delta

Biosphere Reserve, in advantages for creating superior crop production, with high value added.

The detailed situation regarding area cultivated under organic system with sunflower in Romania is presented in Table 2.

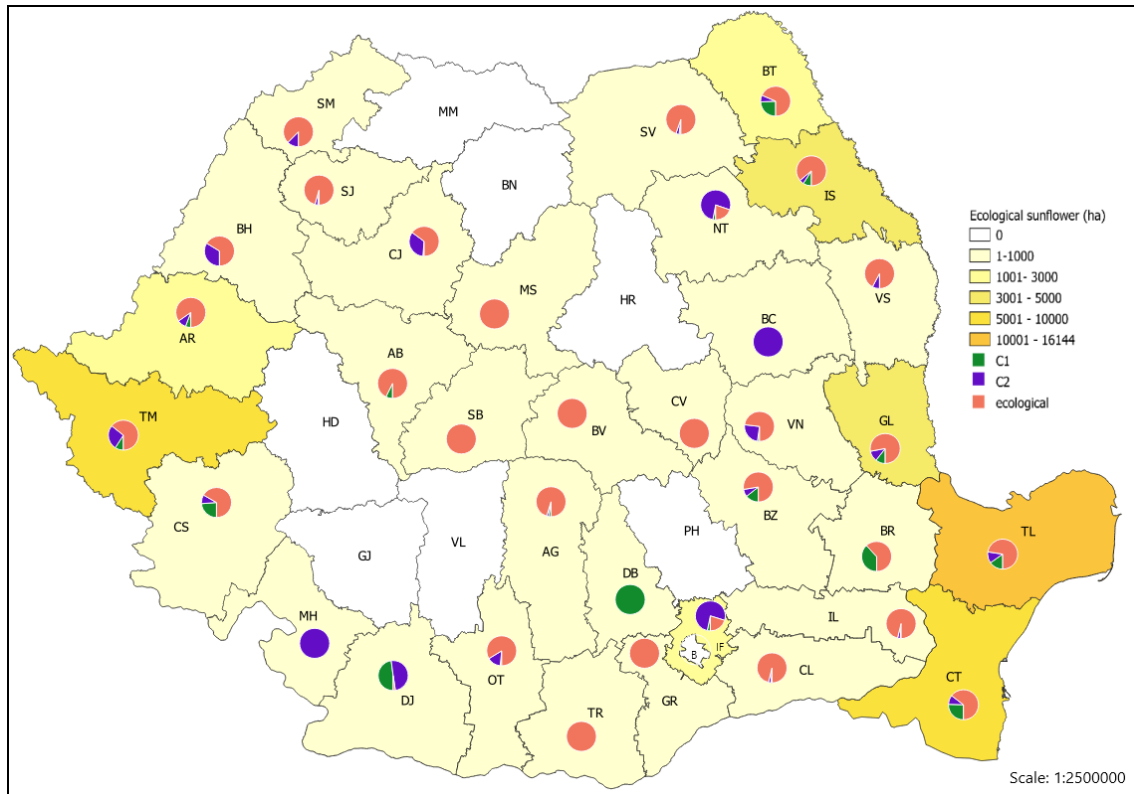
Table 2. Area cultivated under organic system with sunflower in Romania, by county, by certification stage (Hectares)

County	2017				2018				2019			
	C1	C2	Certified	Total	C1	C2	Certified	Total	C1	C2	Certified	Total
TL	5,465	882	4,037	10,384	1,911	3,882	5,386	11,179	2,454	1,981	11,709	16,144
TM	1,034	267	5,316	6,617	1,697	311	3,166	5,174	675	1,978	4,777	7,429
CT	498	294	2,244	3,036	725	518	2,275	3,518	1,500	586	3,804	5,889
GL	821	279	2,343	3,444	772	230	1,440	2,442	426	462	3,136	4,023
IS	376	210	1,950	2,536	599	48	1,955	2,602	277	144	2,613	3,035
B+IF	8	2	204	214	987	15	337	1,340	69	1,589	420	2,078
AR	62	99	1,103	1,264	303	145	1,838	2,285	105	175	1,553	1,834
BT	48	0	458	506	21	40	808	869	340	102	960	1,402
CL	6	11	414	431	29	27	622	678	9	23	798	831
OT	76	1	122	199	107	0	158	264	11	100	570	681
DJ	10	0	2	13	101	31	2	134	165	171	8	344
SV	25	0	24	49	0	2	139	140	6	10	281	297
SJ	37	3	296	336	30	5	290	325	4	9	281	294
SB	8	0	188	196	0	172	353	524	0	0	283	283
VN	0	0	458	458	94	2	355	450	6	64	191	262
AG	87	5	42	134	55	1	138	195	6	5	222	232
VS	1	0	13	13	17	0	90	106	0	17	201	218
BZ	60	0	62	122	6	0	124	130	25	14	135	173
BH	0	0	46	46	71	1	41	112	0	58	114	172
SM	43	51	64	159	29	0	256	285	0	20	141	161
CJ	101	0	3	103	7	0	40	46	2	50	96	147
MS	0	0	75	75	13	7	232	252	0	0	123	123
IL	979	0	201	1,180	107	689	346	1,143	1	3	101	105
BR	126	0	71	197	141	65	67	274	27	0	44	70
NT	5	0	20	25	226	0	3	229	2	51	13	66
AB	4	0	0	4	1	2	76	79	4	0	51	56
BV	0	35	0	35	0	0	0	0	0	0	23	23
CS	0	0	0	0	797	1	130	929	5	2	14	22
DB	3	22	232	256	0	0	1	2	19	0	0	19
MH	13	0	0	13	0	0	0	0	0	18	0	18
TR	117	77	1,223	1,417	55	327	759	1,141	0	0	12	12
BC	11	0	93	104	0	0	15	15	0	11	0	11
CV	0	0	0	0	0	0	0	0	0	0	5	5
GR	0	61	82	143	0	0	0	0	0	0	2	2
BN	0	0	0	0	0	1	0	1	0	0	0	0
GJ	0	0	0	0	0	0	0	0	0	0	0	0
HD	0	0	0	0	3	0	0	3	0	0	0	0
HR	0	0	0	0	0	0	0	0	0	0	0	0
MM	0	0	0	0	0	4	0	4	0	0	0	0
PH	0	0	4	4	0	0	0	0	0	0	0	0
VL	0	0	0	0	0	0	0	0	0	0	0	0
Total	10,024	2,300	21,389	33,712	8,904	6,526	21,441	36,870	6,139	7,643	32,679	46,461

Source: own calculations based on data provided by MARD, 2020.

Overlapping the cultivated areas at county level (Figure 8) with the map of the ecological zoning of crops in Romania, we notice that this is not mirroring the favourability area. There is still room for

increasing the areas under organic cultivation, however, taking into account the specificity of the regions regarding pests and diseases, and the most current European regulations.



Source: own calculations based on data provided by MARD, 2020.

Figure 8. Area under organic production cultivated with sunflower, by county

According to the Ecological Zoning prepared by Hera et al. (1989), in our country there are 6 favourability regions for sunflower, as follows:

- Zone I - Romanian Plain and Dobrogea and Western Plain;
- Zone II - Danube Meadow;
- Zone III - Romanian Plain and Dobrogea;
- Zone IV - Găvanu-Burdea Plain, Leu-Rotunda Plain and Plenița Plain;
- Zone V - Jijiei Plain, Bârlad Plateau and Transylvania Plain;
- Zone VI - Moldavian Plateau, Western Piedmont and Southern Getic Piedmont.

It is to be highlighted that for Zone I, Dobrogea, the Romanian Plain and the Western Plain, the soil is mostly chernozem-type and adequately meets the sunflower's temperature requirements. The precipitation regime is favorable in the Western Plain, where on large areas the plants also benefit from the groundwater supply. By contrast, in the Romanian Plain and Dobrogea the humidity requirements should be supplemented with irrigation.

For Zone II, Danube Meadow: the favorability is given by the fertility of alluvial

soils, the specific microclimate and the contribution of groundwater (Hera et al., 1989).

The production of sunflower in organic system is considered the production obtained exclusively from the ecologically certified lands. The production of sunflower obtained in the conversion period is not recognized as organic production. Therefore, considering the three years period taken into account (2017-2019) regarding the productions estimated by the producers on the areas cultivated with sunflower in a certified ecological system, one can observe the following aspects:

- not all producers submitted to the control and certification bodies the estimates of the productions obtained;

- out of the total organic certified areas, only for 16,934.9 ha in 2017, 19,995.6 ha in 2018 and 28,592.5 ha in 2019, data were submitted regarding the production estimate, representing 79.1% of the total certified area (2017), 93.2% (2018), and respectively 87.4% (2019).

If we analyse the data reported on the estimated productions, it can be noticed that the average production per unit area in 2017

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was 2.27 t/ha, ranging from 1.24 t/ha in Giurgiu County (GR) to 3.22 t/ha in Sibiu County (SB). In 2018 the average production was 2.34 t/ha, ranging from 1.09 t/ha in Cluj County (CJ) to 3.10 t/ha in Brăila County (BR). In 2019 the average production was 2.04 t/ha, ranging from 0.26 t/ha in Dolj County (DJ) to 3.35 t/ha in Sibiu County (SB).

Based on the estimated productions declared by the producers and the calculations regarding the average production obtained in

each county for the selected time period and taking into account the total organic certified areas, we can approximate the sunflower production obtained in Romania. Thus, in 2017 a total amount of 47,220.6 tons was produced, increasing during 2018 to total quantity of 50,209.6 tons, and reaching 66,079.9 tons in 2019 (Table 3).

The increase in total production is directly connected to the increase of area under organic farming, cultivated with sunflower.

Table 3. Average production and total estimated production for organic sunflower between 2017-2019, by county

County	2017					2018					2019				
	Area under organic farming (ha)	Area under declared production (ha)	Declared production (t)	Average production declared (t/ha)	Total estimated production (t)	Area under organic farming (ha)	Area under declared production (ha)	Declared production (t)	Average production declared (t/ha)	Total estimated production (t)	Area under organic farming (ha)	Area under declared production (ha)	Declared production (t)	Average production declared (t/ha)	Total estimated production (t)
TL	4,037	3,068.2	8,001.5	2.6	10,528.1	5,386	5,249.5	12,144.8	2.3	12,460.6	11,709	9,395.6	18,479.3	2.0	23,029.3
TM	5,316	3,197.1	4,762.4	1.5	7,918.7	3,166	2,984.8	7,209.2	2.4	7,646.9	4,777	4,486.5	8,644.0	1.9	9,203.7
CT	2,244	1,741.4	4,461.0	2.6	5,748.5	2,275	2,452.3	5,827.7	2.4	5,406.4	3,804	3,739.8	9,034.1	2.4	9,189.2
IS	1,950	1,573.8	3,332.1	2.1	4,128.6	1,955	1,645.5	3,621.2	2.2	4,302.3	2,613	2,481.0	5,284.8	2.1	5,566.0
GL	2,343	2,275.3	6,623.3	2.9	6,820.5	1,440	1,440.0	4,416.0	3.1	4,416.0	3,136	3,013.8	4,740.5	1.6	4,932.7
AR	1,103	1,083.2	2,910.4	2.7	2,963.7	1,838	1,338.7	3,303.3	2.5	4,535.3	1,553	1,413.2	2,502.2	1.8	2,749.7
CL	414	406.5	903.3	2.2	920.1	622	622.0	1,616.0	2.6	1,616.0	798	743.9	2,216.0	3.0	2,377.2
BT	458	455.3	959.1	2.1	964.8	808	806.0	1,018.6	1.3	1,021.1	960	960.0	2,292.3	2.4	2,292.3
OT	122	41.4	82.9	2.0	244.0	158	158.0	352.1	2.2	352.1	570	570.0	1,773.1	3.1	1,773.1
SB	188	188.0	604.5	3.2	604.5	353	353.0	1,020.7	2.9	1,020.7	283	283.0	948.0	3.4	948.0
AG	42	24.1	47.3	2.0	82.3	138	138.0	210.8	1.5	210.8	222	222.0	496.2	2.2	496.2
B+IF	204	203.8	458.8	2.3	459.3	337	303.2	593.1	2.0	659.2	420	222.5	257.3	1.2	485.7
BZ	62	n.a	n.a.	2.27 ^a	140.7	124	124.0	310.0	2.5	310.0	135	82.3	207.8	2.5	340.9
VN	458	443.9	1,224.3	2.8	1,263.2	355	355.0	648.1	1.8	648.1	191	107.4	190.0	1.8	337.9
SV	24	12.1	26.2	2.2	52.0	139	90.6	241.8	2.7	371.0	281	278.3	326.7	1.2	329.9
VS	13	13.0	19.4	1.5	19.4	90	89.8	232.1	2.6	232.5	201	39.4	59.2	1.5	302.0
BH	46	18.9	27.1	1.4	66.0	41	41.0	79.8	2.0	79.8	114	25.4	63.5	2.5	285.0
IL	201	201.0	501.9	2.5	501.9	346	346.0	644.0	1.9	644.0	101	101.0	273.3	2.7	273.3
MS	75	64.4	93.7	1.5	109.2	232	184.8	500.0	2.7	627.7	123	n.a.	n.a.	2.04 ^a	250.9
SJ	296	296.0	752.5	2.5	752.5	290	290.0	667.2	2.3	667.2	281	217.0	191.9	0.9	248.5
CJ	3	0.4	0.8	2.3	6.9	40	38.2	41.7	1.1	43.7	96	80.0	155.0	1.9	186.0
SM	64	59.4	107.3	1.8	115.6	256	183.4	381.3	2.1	532.2	141	53.4	68.1	1.3	179.8
AB	0	0.0	0.0	0.0	0.0	76	76.0	167.2	2.2	167.2	51	0.0	0.0	2.0	104.0
BR	71	18.8	55.9	3.0	211.0	67	67.0	208.0	3.1	208.0	44	44.0	78.6	1.8	78.6
BV	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	23	n.a.	n.a.	2.04 ^a	46.9
CS	0	0.0	0.0	0.0	0.0	130	n.a.	n.a.	2.34 ^a	304.2	14	n.a.	n.a.	2.04 ^a	28.6
NT	20	2.9	4.4	1.5	30.3	3	3.0	6.0	2.0	6.0	13	13.0	21.2	1.6	21.2
CV	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	5	n.a.	n.a.	2.04 ^a	10.2
TR	1,223	1,133.1	1,727.0	1.5	1,864.1	759	600.8	1,332.6	2.2	1,683.5	12	12.0	7.0	0.6	7.0
GR	82	82.0	102.0	1.2	102.0	0	0.0	0.0	0.0	0.0	2	n.a.	n.a.	2.04 ^a	4.1
DJ	2	2.0	3.0	1.5	3.0	2	n.a.	n.a.	2.34 ^a	4.7	8	8.0	2.1	0.3	2.1
BC	93	93.0	140.0	1.5	140.0	15	15.0	30.0	2.0	30.0	0	0.0	0.0	0.0	0.0
BN	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
DB	232	232.0	450.0	1.9	450.0	1	n.a.	n.a.	2.34 ^a	2.3	0	0.0	0.0	0.0	0.0
GJ	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
HD	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
HR	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
MH	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
MM	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
PH	4	4.0	10.0	2.5	10.0	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
VL	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0

CONCLUSIONS

Sunflower is one of the most important oil plants grown in the world and the most important oil plant for Romania. Romania ranked first in the EU in sunflower both in production and area. Its cultivation in organic system in Romania is very popular, our country ranking the first among European countries when speaking about cultivated area. The areas cultivated with sunflower under organic system, in conversion or certified, experienced an ascending trend in Romania in the period 2017-2019, with an increase of 37.8%. Tulcea ranks the first regarding organic agriculture areas in Romania, and more specifically for sunflower (30% of total sunflower crops in Romania).

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