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COMPARATIVE STUDY ON THE DYNAMICS OF SURFACES CULTIVATED IN CONVENTIONAL AND ORGANIC SYSTEM, IN CROPS OF WHEAT, CORN, BARLEY AND SUNFLOWER

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Abstract

Agriculture is the economic sector that benefited most from Romania's entry into the European Union, especially through the National Rural Development Program - PNDR 2014-2020 program, which was based on providing non-reimbursable funds to Romanian farmers in order to modernize and expand agricultural holdings. In total, since Romania's accession to the EU, the Ministry of Agriculture and Rural Development, has developed European and national funds for agriculture of over 26 billion euros, the average annual absorption rate being 96%. The paper presents the dynamics of cultivated areas, in a crop formed by wheat, barley, corn and sunflower crops, in the period 2015-2020, cultivated in an organic system compared to the conventional one. Because crop rotations play a key role in ensuring the sustainability of modern farming systems, they remain crucial in the practice of organic farming systems, as they combat diseases, pests, weeds, water shortages and soil nutrients.

Key words: *culture systems, organic farming, conventional agriculture, cultivated areas*

INTRODUCTION

In 2019, Romania ranked first in the EU in corn and sunflower production and fourth in wheat, after France, Germany and Poland.
Agriculture is a strategic sector of the Romanian economy. It has a share of 5.2% of the Gross Domestic Product and 23% of the population is involved in this field, which places Romania on the first place in the European Union [4], [1].
Agriculture is at a critical stage as it tries to balance its nutritional, economic and environmental requirements. One solution to these problems would be organic farming, which focuses on sustainability, human health, biological conservation and combines scientific knowledge and modern technology with traditional agricultural practices based on thousands of years of agriculture, where we must not forget crop rotation [12].
The transition from conventional to organic agriculture is gradual, so that it does not feel the effects of declining productivity, and producers gain confidence in organic systems [6].
All EU Member States must draw up work plans in this regard, so that by 2030 the percentage of organically cultivated areas will reach 25% at the level of each country. Romania currently utilizes about 3% of the registered area in the organic system [10].
Organic farming means a return to the values of traditional agriculture, but not to its methods [2], [5].
The new policy of the European Union emphasizes the importance and rise of this new sector of agriculture. Organic farming enters a new stage, characterized by mega-trends (neo-ecology, connectivity, globalization, etc.), which pursue the effects of social change [11].

MATERIALS AND METHODS

In this paper were studied four crops frequently present in crop rotation used by most farmers, namely, wheat, barley, corn and sunflower. The surfaces cultivated in organic

system and in conventional system, in the period 2015-2020 were analyzed by comparison. The data related to organic agriculture were provided by the database of the Romanian Ministry of Agriculture and Rural Development and also, the documentation was performed through the TEMPO Online Database – National Institute of Statistics (INS) - 2020.

RESULTS AND DISCUSSIONS

Organic agriculture is the branch of agriculture that has registered the highest pace of development in the last 10-15 years worldwide, in the European Union and in Romania [13]. This has emerged as an alternative to the intensive, conventional (industrialized) practice of agriculture based on maximizing production by using inputs, energy-intensive production stimulators in large quantities, in order to continuously increase agricultural production for a population. constantly growing, mostly urban [9]. Although the fertilization used to practice conventional agriculture, increases production, the lack of fertilization in the organic system can be compensated with the practice of a proper crop rotation, this being crucial for organic agriculture [3].

Regarding the cultivated areas, in 2014 Romania had an agricultural area of over 14,600,000 hectares and an arable area of over 9,395,000 hectares. From the analysis of the evolution of cultivated areas with wheat, barley, corn and sunflower, in Romania, we see that of the four crops analyzed, corn is the crop in first place after the cultivated area, with an average of 2,515,726 ha, followed by wheat crop (Table 1). The largest area cultivated with corn was registered in 2019, when we observe an area of 2,678,504 ha [8]. The second place was occupied by wheat cultivation, followed by sunflower and barley (Figure 1).

Table 1. Areas cultivated with the main crops, in 2015-2020 period

Cultivated plants	The year					
	2015	2016	2017	2018	2019	2020
	- ha -	- ha -	- ha -	- ha -	- ha -	- ha -
Wheat	2,106,591	2,137,731	2,052,917	2,116,154	2,168,370	2,111,438
Barley	266,941	295,996	268,826	250,797	285,065	308,090
Corn	2,605,165	2,580,975	2,402,082	2,439,842	2,678,504	2,514,230
Sumflower	1,011,527	1,039,823	998,415	1,006,994	1,282,697	1,166,090

Source: TEMPO Online Database - NIS, 2021 [8].

Table 2. Land areas cultivated in organic system nationally, in 2015-2019 period (crops certified in organic agriculture)

The year	2015	2016	2017	2018	2019
Total area (organic system) (ha)	245,923.9	226,309.0	258,470.93	326,259.55	395,227.97
of which cereals (ha):	81,439.5	75,198.31	84,925.51	114,427.49	126,842.95

Source: Ministry of Agriculture and Rural Development [7].

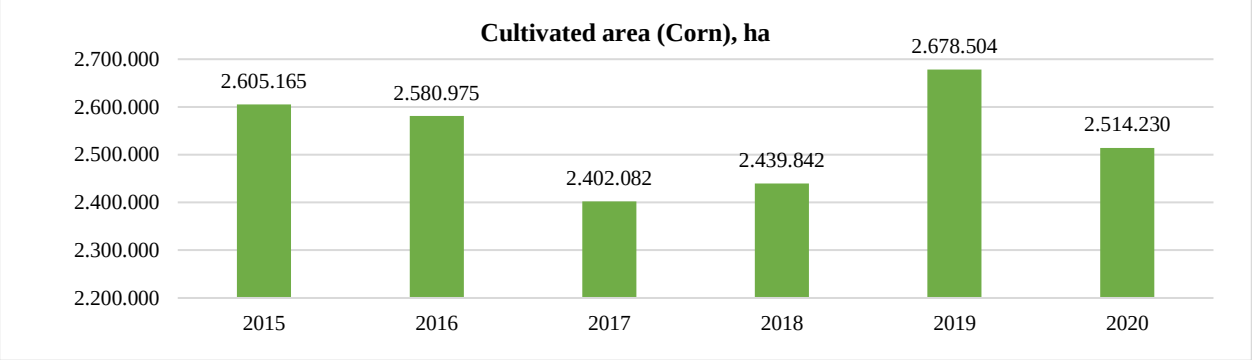

Fig. 1. Areas cultivated at national level with corn, in 2015-2020 period
Source: Own design based on NIS data, 2021[8].

Regarding the areas cultivated in organic system, nationally, we notice that if in 2015 an area of 245,923.90 ha was cultivated, of which 81,439.5 was occupied by cereals, in 2019, it increased by 60.7 % (Table 2).

Table 3. The dynamics of cultivated areas in conventional and organic system, in 2015-2020 period

Culture system	2015	2016	2017	2018	2019	Average
	- ha -	- ha -	- ha -	- ha -	- ha -	%
Conventional	3,883,633	3,916,794	3,669,323	3,697,633	4,246,266	92.51
Organic	245,923.9	226,309.00	258,470.93	326,259.55	395,227.97	7.48

Source: Ministry of Agriculture and Rural Development [7].

Analyzing the cultivated areas in organic system compared to the cultivated areas in conventional system [7], we observe that organic agriculture was practiced on small areas, on average 7.48% (Fig. 2).

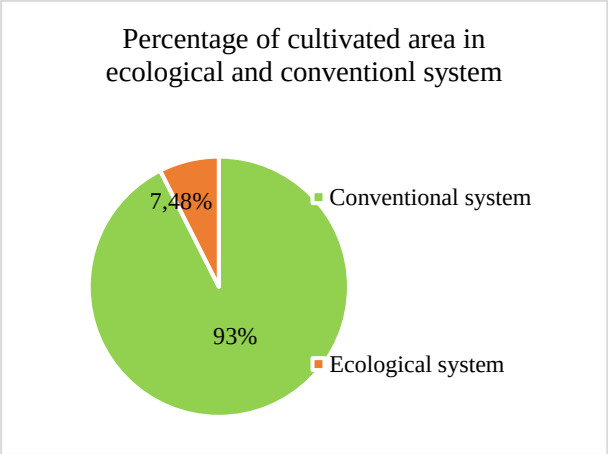

Fig. 2. Percentage of cultivated and area in organic and conventional system
Source: Own design based on the data from [7].

If we compare the cultivated areas in the conventional system, with the cultivated areas in the organic system, for the four crops analyzed, in the 2015-2019 period, we find that the highest percentage obtained by comparing the two methods was recorded by barley crop, even if, of the four crops analyzed, barley is the least cultivated compared to the other crops (Table 3).
The maize crop had the largest cultivated area in the traditional system (2,605,165 ha), of the four crops subject to analysis but the smallest cultivated area in the organic farming system 23,136 ha, which represents a percentage of 0.88 % of the total area (Table 4).
In the case of barley cultivation, the ratio is reversed, the smallest area is cultivated in the conventional system (266,941 ha) but in the organic system the area is 9,215, representing a percentage of 3.54%. Wheat and sunflower grown in an organic system, occupy modest areas of approx. 2 %.

Table 4. The evolution of cultivated areas in conventional and organic system, wheat, barley, corn and sunflower, in 2015

Culture	Cultivated area		
	Conventional system	Organic system	
	ha	ha	%
Wheat	2,106,591	42,854	2.03
Barley	266,941	9,215	3.45
Corn	2,605,165	23,136	0.88
Sunflower	1,011,527	21,983	2.17

Source: Ministry of Agriculture and Rural Development [7].

In 2016, wheat grown in the organic system occupied a percentage of 2.03%, along with sunflower, which occupied areas of 2.15% compared to areas grown in the conventional system (Table 5).
This year, corn remained the crop with the fewest hectares cultivated in an organic system, but the surface decreased compared to 2015, by 0.24%.
Sunflower had an insignificant decrease, from 2.17% in the organic system, in 2015, to 2.15%, in 2016 (Table 5).

Table 5. The evolution of cultivated areas in conventional and organic system, wheat, barley, corn and sunflower, in 2016

Culture	Cultivated area		
	Conventional system	Organic system	
	ha	ha	%
Wheat	2,137,731	43,494	2.03
Barley	295,996	5,690	1.92
Corn	2,580,975	16,643	0.64
Sunflower	1,039,823	22,426	2.15

Source: Ministry of Agriculture and Rural Development [7].

The sunflower crop registers a significant increase in 2017, the number of hectares cultivated in organic system with this crop increased from 21,983 ha in 2015 to 33,712 ha in 2017, registering an increase of 53.35%.
Barley has the largest areas cultivated in an organic system, these presenting a percentage of 3.59% compared to areas cultivated with corn in a conventional system (Table 6).
If we follow, in parallel, the evolution of the areas cultivated in conventional system, in 2017 compared to 2016, we find that the areas cultivated conventionally with wheat increase, but those cultivated in organic system decrease.

Table 6. The evolution of cultivated areas in conventional and organic system, wheat, barley, corn and sunflower, in 2017

Culture	Cultivated area		
	Conventional system	Organic system	
	ha	ha	%
Wheat	2,052,917	45,686	2.22
Barley	268,826	9,669	3.59
Corn	2,402,082	19,670	0.81
Sunflower	998,415	33,712	3.37

Source: Ministry of Agriculture and Rural Development [7].

In barley, the areas cultivated in a conventional system increase, but also those cultivated in an organic system. In corn and sunflower, the same tendency of decreasing the cultivated areas in conventional system is observed and those cultivated in organic system increase (Table 7).

Table 7. The evolution of cultivated areas in conventional and organic system, for wheat, barley, corn and sunflower, in 2018

Culture	Cultivated area		
	Conventional system	Organic system	
	ha	ha	%
Wheat	2,116,154	69,684	3.29
Barley	250,757	10,234	4.08
Corn	2,439,842	26,745	1.09
Sunflower	1,006,994	36,870	3.66

Source: Ministry of Agriculture and Rural Development [7].

In year 2018, the areas cultivated in an organic system increase in all four crops, the highest increase being in the wheat crop, the percentage being 3.29%, and the smallest area occupied in the organic system is recorded in the corn crop. with 1.09%.
Regarding the trend of conventional agriculture, compared to organic, we find that three crops have an increasing trend, namely wheat, barley and sunflower and corn occupies small areas of 1.09 % grown organically (Table 8).
According to the data from Table 8, the cultivated area continued to increase in the organic system for a single crop, although it is quite small, for the corn crop reaching a percentage of 1.37 % representing an insignificant increase of only 0.28 % 2019 compared to the year 2018.

Table 8. The evolution of cultivated areas in conventional and organic system, wheat, barley, corn and sunflower, in 2019

Culture	Cultivated area		
	Conventional system	Organic system	
	ha	ha	%
Wheat	2,168,370	70,383	3.24
Barley	285,065	11,425	4.00
Corn	2,678,504	36,719	1.37
Sunflower	1,982,697	46,460	3.62

Source: Ministry of Agriculture and Rural Development [7].

The other four analyzed crops lost from the areas cultivated in the organic system, but the areas cultivated in the conventional system increased.

CONCLUSIONS

Based on the this analysis, there were drawn the following conclusions:
-The areas cultivated in the organic system are quite small, they represent an almost insignificant percentage, varying between 0.81% and 4.0% for the four crops, in the analyzed period, 2015 - 2019, these increasing very little from one year to another.
-The average area cultivated with wheat, nationally, in recent years has been allocated to a process of 2.69%, of the total area cultivated with wheat nationally.

-In the case of barley, the largest area was cultivated in 2020, namely 308,090 ha, of which 4% was occupied by organic crops.
-Regarding organic farming, in Romania, 2019 was the year with the most hectares cultivated in this system, from 1.37% for corn, followed by wheat cultivation with 3.24% and sunflower cultivation with 3.62%.
-Year 2016 was the year with the smallest cultivated areas in organic system for wheat, barley and corn.
-At sunflower, the smallest area registered in the organic system was in 2015 when 21,983 ha were cultivated, after which it doubled, reaching 46,460 ha in 2019.
- Although the European Union supports the development of this system of organic farming by providing subsidies, Romanian farmers are hard to convince to adhere to this type of environmentally friendly agriculture, because the costs are quite high with such crops and, until they exceed the conversion period, farmers do not make a profit.

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