THE IMPACT OF THE ENVIRONMENT ON THE SUSTAINABILITY OF FOOD SYSTEMS. STUDY REGARDING AGRICULTURE FROM THE SOUTH-WEST OLTENIA REGION

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INTRODUCTION

Thanks to the challenges humanity faces nowadays, transforming food systems by rethinking and reorganizing them on the principles of sustainability is absolutely necessary due to population growth at the global level and unsustainable production, processing and consumption patterns.

The urgent need to transform the global food system, in line with the UN SDGs projected by 2030 and the objectives of the Paris Agreement to manage global warming, is also reflected in European "sustainable food" policies, through the strategy presented in May 2020 by the European Commission and the European Green Deal, with the goal of long-term "sustainability" of the EU, by 2050. EUR 414.1 billion, or 1.3% of total EU GDP in 2020, down slightly (1.1%) from the economic peak in 2019, shows that agriculture remains central to the economy, society and the environment of the European Union.

The agreement on the reform of the Common Agricultural Policy (CAP) adopted in December 2021 focuses on a sustainable food system that ensures environmental, social and economic sustainability, and 40% of the CAP budget will become climate-relevant.

Romania, an EU member, agrees to all these measures. In this sense, the results of this research are presented as a set of useful and relevant measures for the implementation of a "sustainable food system" in the analyzed region of our country.

MATERIAL AND METHOD

Agricultural scientific research comes with concrete and viable strategies and solutions for food sustainability, in unfriendly environmental conditions, through a correlational research design.

The characteristics of agricultural crops have been correlated with environmental conditions, through multiple investigations. Subsequently, causal relationships were established between the variables of the paper, proving the existence or non-existence of such a correlation. Various research methods were used, from bibliographic study to data collection and collection techniques and techniques for analyzing identified data.

The graphical representation of agricultural dynamics and environmental dynamics, by presenting the indicators of air temperature and the amount of atmospheric precipitation, completes the research picture.

The aim was to create more prospects for agricultural land management both to reduce emissions and to improve carbon sequestration, while maximizing the value of crops obtained, maintaining the local microclimate and agricultural biodiversity of the analyzed region, increasing the degree of adaptation of crops to imminent climate change.

The research plan ended with a case study focusing on the vulnerabilities of agriculture in the South-West Oltenia Region - an area with extreme climatic events, analyzed over 10 years between 2011-2020.

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RESULTS AND DISCUSSIONS

The research addresses in dynamics, for the last 10 years, monthly and annually, climatic indicators aimed at aridity in agriculture - air temperature and amount of rainfall, in relation to the concepts of soil drought, soil erosion and desertification - extreme weather and changes climatic - the monthly air temperature in absolute maximum and absolute minimum, on the South-West Oltenia Region, but also on the other Regions of Economic Development in the South. The comparative analysis also covers the agricultural holdings in the area, by size classes of the agricultural area used, as well as the area and vegetable agricultural production in this region of economic development Southwest Oltenia - agricultural region with high exposure to climate risk.

Average monthly air temperature dynamics in the SOUTH-WEST OLTENIA Economic Development Region*)

Celsius degrees

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Ian.	-0,4	0,6	0,6	0,7	1,7	-2,0	-5,3	1,7	0,5	2,6
Feb.	0,2	-5,3	3,4	1,6	1,0	7,2	1,6	1,4	4,0	6,6
Mar.	4,7	9,2	5,1	9,6	6,6	7,8	10,5	4,1	10,4	7,5
Apr.	12,4	14,3	13,9	12,3	12,7	14,9	11,9	16,7	12,6	12,4
Mai	17,5	18,0	19,8	16,7	19,4	16,8	17,4	19,8	16,8	17,7
Iun.	22,4	24,5	22,1	21,1	21,8	23,1	24,4	22,1	23,5	21,9
Iul.	24,0	27,5	24,5	23,2	26,3	24,6	25,0	23,8	24,5	24,2
Aug.	24,4	26,1	25,4	23,2	24,5	23,2	24,9	24,8	25,7	24,6
Sep.	22,4	21,1	18,0	17,8	19,7	19,6	...	19,7	20,4	20,9
Oct.	11,7	14,3	11,7	12,0	10,8	10,6	...	14,0	13,8	13,9
Nov.	2,9	7,5	8,0	6,0	9,4	5,4	7,0	5,5	9,2	6,6
Dec.	3,5	-0,8	0,6	2,2	5,5	2,2	3,8	1,5	3,8	3,5

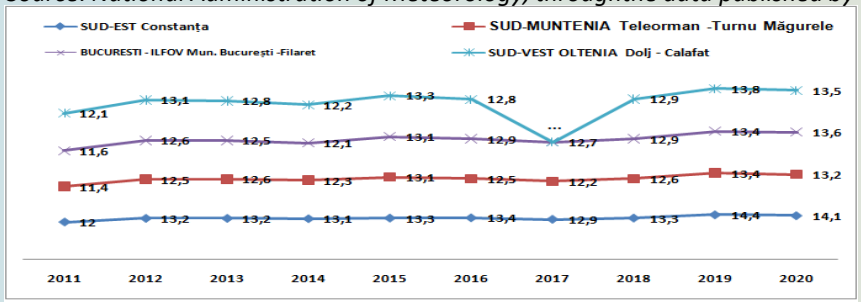
Dynamics of the monthly amount of atmospheric precipitation in the SOUTH-WEST OLTENIA Economic Development Region*)

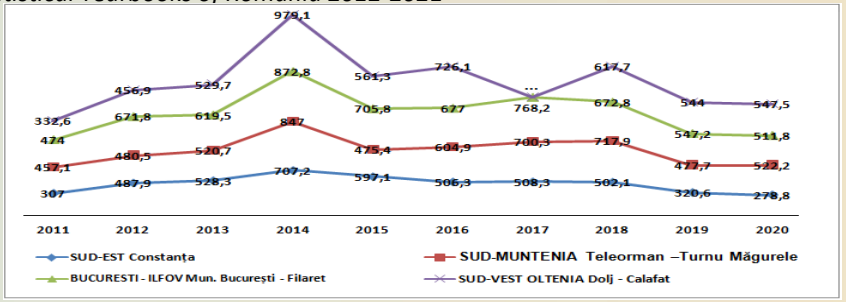
l/m²

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Ian.	33,5	64,2	30,1	54,6	29,4	68,6	42,9	26,8	68,4	8,3
Feb.	65,8	48,5	78,6	9,4	60,8	32,3	24,7	83,6	10,1	44,1
Mar.	42,0	12,3	51,3	77,3	63,5	87,4	47,5	112,1	12,2	81,2
Apr.	14,8	51,6	56,2	149,4	31,2	26,6	52,6	14,4	47,8	17,8
Mai	22,2	120,4	62,0	92,6	23,6	103,6	82,4	61,6	104,0	98,0
Iun.	42,4	9,2	47,4	65,0	79,6	49,8	4,0	103,7	90,8	40,4
Iul.	58,6	46,6	28,6	145,8	6,8	88,6	40,6	100,4	60,8	45,4
Aug.	2,6	0,0	3,2	51,2	38,2	39,8	44,6	9,2	9,8	66,2
Sep.	2,2	3,2	54,2	127,4	55,8	57,2	21,8	9,0	18,6	8,8
Oct.	23,4	25,0	62,8	45,2	81,4	88,3	...	1,0	19,9	51,0
Nov.	0,3	22,0	55,1	46,0	90,7	83,8	40,8	72,4	93,8	6,8
Dec.	24,8	53,9	0,2	115,2	0,3	0,1	78,6	23,5	7,8	79,5

*) Meteorological station Calafat (Dolj county); ... = Unknown data

Source: National Administration of Meteorology, throughthe data published by the Statistical Yearbooks of Romania 2012-2021





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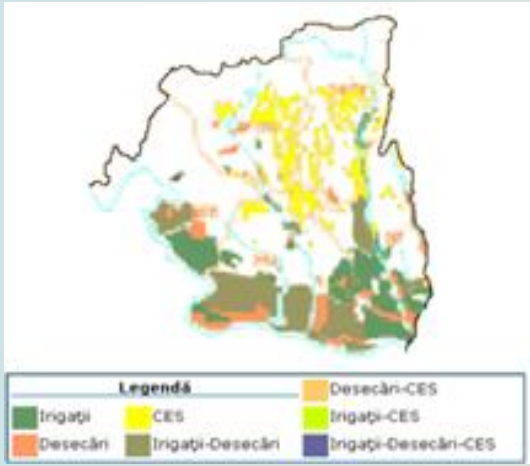
Pedological and atmospheric drought is one of the most important factors influencing soil degradation in southern areas with average annual rainfall below 500 mm (21-day intervals in which less than 30% of the usual amount of rainfall falls).

Soil fertility is affected to a greater or lesser extent by: erosion, low humus content, compaction, acidity, salting, excessive texture (sandy or clayey) deficit or excess of water and nutrients, chemical pollution.

The land improvement facilities under the administration of the National Agency for Land Improvement are composed of works for irrigation, drainage and combating soil erosion.

The surface of the arranged lands with works to improve and combat soil erosion, by land use categories, in the SOUTH-WEST OLTENIA region

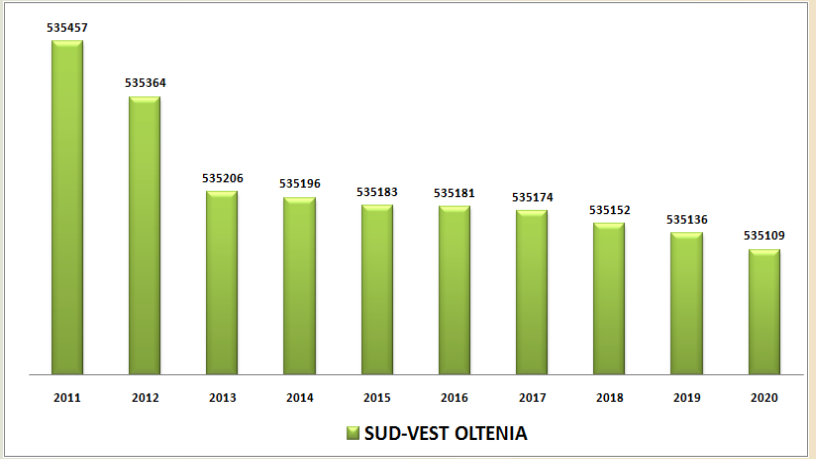
Land improvements	Land use	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Combating soil erosion and land improvement works - total	Total landscaped area	279497	279497	279497	281097	281097	281097	281097	281097	281097	281097
	Landscaped agricultural area	263368	263368	263324	264897	264897	264895	264889	264889	264887	264883



Source: National Agency for Land Improvement

Desertification in the Danube floodplain, due to lack of rainfall and extreme temperature variation that has caused radical climate change and significant material damage, has affected not only long-term crops but also the entire socio-economic activity of the South-West Oltenia region. The area between Calafat – Poiana-Mare – Sadova – Bechet – Dăbuleni and the Danube river, with a surface of 104,600 hectares, has the most typical appearance of a semi-arid area with accents of aridization and even desertification in Romania, the phenomenon being favored, especially, the presence of sandy soils. Most of the irrigation facilities are located in the southern and southwestern part of the region.

Arrangements, in total, for irrigation in arable land, in the SOUTH-WEST OLTENIA Region, 2011-2020



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Total cultivated area*) in the SOUTH-WEST OLTENIA Economic Development Region

Year	Hectares
2011	1 050 067
2012	1 038 754
2013	1 066 502
2014	1 061 470
2015	1 067 438
2016	1 182 505
2017	1 133 523
2018	1 144 855
2019	1 186 362
2020	1 206 926

Area of kitchen gardens, greenhouses, solaria, intercalated and successive crops not included.

Dynamics of cultivated area (ha) and agricultural production (t) in main crops, in the SOUTH-WEST OLTENIA Economic Development Region, 2011-2020

ha/t

Anul	Cereale pentru boabe		Grâu-total		Porumb boabe		Orz		Floarea soarelui		Cartofi-total	
	hectare	tone	hectare	tone	hectare	tone	hectare	tone	hectare	tone	hectare	tone
2011	791 649	2 836 775	350 049	1 126 897	386 455	1 569 294	14 584	44 110	102 380	178 239	18 573	253 904
2012	789 012	1 482 692	311 349	745 916	414 269	604 181	20 166	45 747	115 414	137 726	15 113	164 380
2013	819 151	2 777 506	387 170	1 096 190	346 643	1 475 745	30 304	83 780	132 247	237 429	14 090	190 202
2014	817 074	2 907 793	382 036	1 221 507	349 284	1 444 982	33 884	108 965	123 446	268 521	13 072	175 052
2015	807 712	2 524 000	363 815	1 209 997	360 465	1 066 284	34 997	130 524	128 564	209 666	12 983	152 166
2016	854 396	2 858 903	399 710	1 325 051	362 148	1 243 414	41 771	156 306	185 838	300 572	11 720	144 216
2017	816 332	4 330 567	404 784	1 916 770	323 975	2 076 777	38 705	183 764	147 811	466 272	11 732	192 441
2018	822 223	4 653 133	412 317	1 944 697	321 221	2 362 330	8 545	182 718	142 723	434 747	12 199	185 297
2019	833 352	4 197 585	408 019	1 937 152	337 175	1 924 121	40 989	193 596	208 307	629 879	12 205	156 190
2020[a)]	861 868	3 516 424	431 509	1 651 181	342 139	1 572 481	43 090	178 067	200 386	442 682	11 232	136 267

Agricultural holdings (farms) in the region of economic development South-West Oltenia, related to their size

Size	Number
Zero ha	10.680
Mai puțin de 2 ha	366.630
De la 2 la 4.9 ha	129.250
De la 5 la 9.9 ha	25.960
De la 10 la 19.9 ha	3.980
De la 20 la 29.9 ha	850
De la 30 la 49.9 ha	510
De la 50 la 99.9 ha	480
100 ha și peste	1.210

Source: CAP CONTEXT INDICATORS - update 2019, C.17 Agricultural holdings (farms)

Dynamics of cultivated area (ha) and agricultural production (t) in fodder plants, in the SOUTH-WEST OLTENIA Economic Development Region, 2011-2020

ha/t

Anul	Furaje perene		Furaje verzi anuale		Lucernă		Trifoi		Porumb verde furajer	
	hectare	tone	hectare	tone	hectare	tone	hectare	tone	hectare	tone
2011	39 835	584 014	22 929	266 373	26 257	406 148	2 869	41 822	252	3 475
2012	38 377	486 939	26 050	325 245	25 004	346 996	2 278	28 892	179	4 270
2013	37 759	533 069	13 673	194 556	24 741	383 419	2 218	33 355	190	2 541
2014	39 119	555 098	14 230	194 424	26 604	406 071	2 194	35 358	83	4 245
2015	41 763	553 008	10 157	99 133	28 260	405 129	2 324	37 643	356	5 927
2016	41 253	521 611	9 872	75 759	31 106	402 607	2 483	38 700	142	1 068
2017	39 334	530 612	9 754	86 016	29 772	401 403	2 364	39 540	178	1 575
2018	40 588	599 019	11 395	117 577	30 545	453 582	2 509	50 149	416	6 241
2019	41 560	587 885	10 181	97 227	31 234	470 416	2 385	41 695	448	9 007
2020[a)]	42 781	488 229	10 550	99 400	32 320	372 210	2 594	43 049	443	6 836

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CONCLUSIONS

The new CAP legislation - the "backbone" of European sustainable agriculture will be a key tool for implementing the European Green Deal, by achieving the objectives of the "Farm to Fork" and Biodiversity Strategies and becoming the forerunner of a sustainable and competitive future for European farmers. Agroecology has been identified as a perspective that makes it possible to use agricultural land through sustainable and resilient farming systems, without jeopardizing the profitability of agricultural activity - in line with the objectives of the EU Green Deal - "Farm to Fork" and Biodiversity Strategies.

And at the national level, agriculture plays a key role in tackling climate change, conserving the environment and biodiversity, ensuring a stable supply of safe and quality food with minimal resource consumption. In the South-West Oltenia Region, natural resources constitute, together with agricultural resources, a considerable potential, but are vulnerable to climate and environmental changes, which cannot be relocated. Against this potential and the demands of the new CAP, the future challenges for sustainable food production, sustainable management of natural resources and balanced territorial development in the face of climate change are:

- agricultural production optimization and efficient soil management through agricultural high-tech satellite,
- streamlining the use of water resources in the southern part of the region and investing in upgrading the region's irrigation system,
- adapting farm activities to new sustainable food measures,
- adapting crops to environmental challenges or creating new crops (specific to the area studied),
- development of infrastructures for the collection, processing, storage and marketing of the obtained agricultural products,
- ensuring a fair income for farmers by providing facilities and support programs for agricultural investment in rural areas,
- development of qualified human resources in biotechnologies and high-tech tools in agriculture,
- creation of information and monitoring centers for the evolution of agricultural crops.

Sustainable food systems are becoming key tools for sustainable societies!