

AGREEN
**CROSS-BORDER ALLIANCE FOR CLIMATE-SMART AND GREEN AGRICULTURE IN THE
BLACK SEA BASIN**

Subsidy Contract No. BSB 1135



FEASIBILITY STUDY
**CLIMATE-SMART AGRICULTURE IN THE BLACK SEA BASIN REGION OF
ROMANIA**

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The project **Cross-Border Alliance for Climate-Smart and Green Agriculture in The Black Sea Basin (AGREEN)**, Ref. No. BSB 1135 is funded by the Joint Operational Program for Cross-Border Cooperation under the European Neighbourhood Instrument "Black Sea Basin 2014-2020", under Priority 1.2 "Increasing cross-border opportunities for trade and modernization of agriculture and related sectors".



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List of abbreviations

ANIF National Administration of Land Improvements
 ANM National Meteorological Administration
 ANMP National Agency for Environmental Protection
 APDRP Paying Agency for Rural Development and Fisheries
 APIA Agency for Payments and Intervention in Agriculture
 CAP Common Agricultural Policy
 CSA Climate Smart Agriculture
 EC European Commission
 FAO Food and Agriculture Organization
 EAGF European Agricultural Guarantee Fund
 EAFRD European Agricultural Fund for Rural Development
 FFN National Forest Fund
 FND National Development Fund
 GHG Greenhouse Gases
 GR Government of Romania
 ha Hectar
 GD Government Decision
 ICPA National Research and Development Institute for Pedology, Agrochemistry and Environment protection
 INCDF National Research and Development Institute for Land Improvement
 INS National Institute of Statistics
 MADR Ministry of Agriculture and Rural Development
 NATO North Atlantic Treaty Organization
 ODA Official Development Assistance
 NGO Non-governmental organizations (civil society)
 UN United Nations
 OSPA Offices of Pedological and Agrochemical Studies
 CAP Common Agricultural Policy
 GDP Gross Domestic Product
 PNDR of the National Rural Development Program
 PNS National Strategic Plan
 SAU Used Agricultural Area
 SCI Sites of Community Importance
 SNDD National Strategy for Sustainable Development of Romania. Horizons 2013-2020-2030
 EU European Union
 USDA United States Department of Agriculture



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1. General description

Authors:

Funding Instrument: Programme funded by the European Union/ European Neighbourhood (ENI)

Date of publication: March, 2021

Copyright:

Language: EN, national language

Theme: Climate Smart and Green Agriculture

Keywords: Climate-smart Agriculture, Black Sea Basin, Europe

Target audience:

- Development Partners
- International Policy Research Organisations
- International Research Institutions
- National Agricultural Extension Representatives
- NGOs Operating at Farmer Level

Category: Report

1.1 Definitions and Acronyms

Introducing Climate-Smart Agriculture (FAO, <http://www.fao.org/climate-smart-agriculture-sourcebook/concept/module-a1-introducing-csa/a1-overview/en/?type=111>)

Reviewing the above reference of FAO on Climate Smart Agriculture (CSA), the following information or data are suggested to collect in a feasibility study to guide how to implement CSA for crop production in a specific region.

The agriculture sectors need to overcome three intertwined challenges:

- sustainably increase agricultural productivity to meet global demand;
- adapt to the impacts of climate change; and
- contribute to reducing the accumulation of greenhouse gases in the atmosphere.

FAO has developed and promoted the concept of climate-smart agriculture. Climate-smart agriculture has three objectives:

- sustainably increase agricultural productivity and the incomes of agricultural producers;
- strengthen the capacities of agricultural communities to adapt to the impacts of climate change; and,
- where possible, reduce and/or remove greenhouse gas emissions.

Climate-smart agriculture is an approach for transforming and reorienting agricultural production systems and food value chains so that they support sustainable development and can **ensure food security under climate change**.

1.2 Abstract

Agriculture is an important and strategic economic branch for all countries in the Black Sea Basin. Despite this aspect, its development did not take into account the adaptation to the new climate changes, the fact that the soil resources are finite and a strategy of conservation and maintenance of the environment in which it works and lives, respectively its sustainability, must be considered. Experience has shown that a major improvement can take place when



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participants in the process - farmers, associations, research and educational institutions, administrative institutions join forces to shape a new paradigm beneficial to the population. In this note, the AGREEN project aims to build capacities for networking and transnational knowledge transfer, the development of smart agriculture and climate in the Black Sea basin, in order to increase trade opportunities, economic and social performance of the sector as a driver of development in the Black Sea basin.

It brings together the efforts of higher education institutions and specialized bodies leading in applied research for agriculture and agribusiness:

- Dobrudzha School of Agriculture and Business (BG),
- Ovidius University of Constanța (RO),
- Tekirdag Namik Kemal University (TR),
- International Center for Agricultural Research and Education (RA),
- Business Support Organization - ELKANA (GE) and -
- Eastern Thessaloniki (GR) Development Agency.

The study included in the following will initiate this project creating the argumentation, motivation and general framework for carrying out the other activities of the project.

The feasibility study tests the viability of the idea of developing climate-smart agriculture in the Black Sea countries and a common brand / brand for green, environmentally friendly and environmentally friendly agricultural products in the Black Sea basin. The potential problems that could arise if the restructuring and modernization of the agricultural sector are applied, will be analyzed and it will be determined how, after all significant factors are taken into account, this development should be pursued. It will also describe the specific conditions for the functioning of sustainable agriculture in the BSB, the potential barriers, competition and funding needed to make this approach possible.



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2. Introduction

2.1 The agricultural sector in the Romania

This subchapter provides a brief description of the territorial scope of the study, the importance and structure of the agricultural sector for the country. The feasibility study is addressed to the region corresponding to Romania in BSB, respectively Region 2 South-East consisting of 6 counties:

- Constanta CT,
- Tulcea TL,
- Braila BR,
- Galati GL,
- Buzau BZ and
- Vrancea VN,

as shown in the map below (fig. 1).



FIG. 1 Region 2 South-East. Source: Internet

Agriculture occupies a priority place in the economic activities of the area, and is characterized by the following parameters:

- how the occupied area is used (table 1)

Table 1 Land fund, by mode of use, in territorial profile (Total land fund, by use, at territorial level). Source: INS

Macro region	Suprafața totală Total area	Suprafața agricolă Agricultural area	din care: proprietate privată ¹⁾ of which: private ownership ¹⁾	Suprafața agricolă pe categorii de folosință:					Păduri și alte terenuri cu vegetație forestieră Forests and other forest vegetation lands ha	Ape și bălți Waters and ponds ha	Alte suprafețe ²⁾ Other areas ²⁾ ha
				Agricultural area by use categories:							
				Arabil Arable	Pășuni Pastures	Fânețe Hayfields	Vii și pepiniere viticole Vineyards and vine nurseries	Livezi și pepiniere pomicole Orchards and tree nurseries			
County											
Sud - Est	3576170	2326564	2105151	1829009	329195	63809	83799	20752	565821	456730	227055
Brăila	476576	388783	307320	350964	32582	-	4568	669	28926	29390	29477
Buzău	610255	402346	389310	257719	90053	29877	14360	10337	163432	10707	33770
Constanța	707129	558153	535945	484103	58693	-	11563	3794	38258	43199	67519
Galați	446632	358311	338917	292926	43612	656	19397	1720	43814	13231	31276
Tulcea	849875	363941	307183	294568	60778	91	7732	772	98065	346309	41560
Vrancea	485703	255030	226476	148729	43477	33185	26179	3460	193326	13894	23453

According to the data contained in the table attached above, it is observed in the distribution of land (figure 2) that the arable area occupies an important place in the area, the cereal and industrial crop having a special importance in local agriculture.

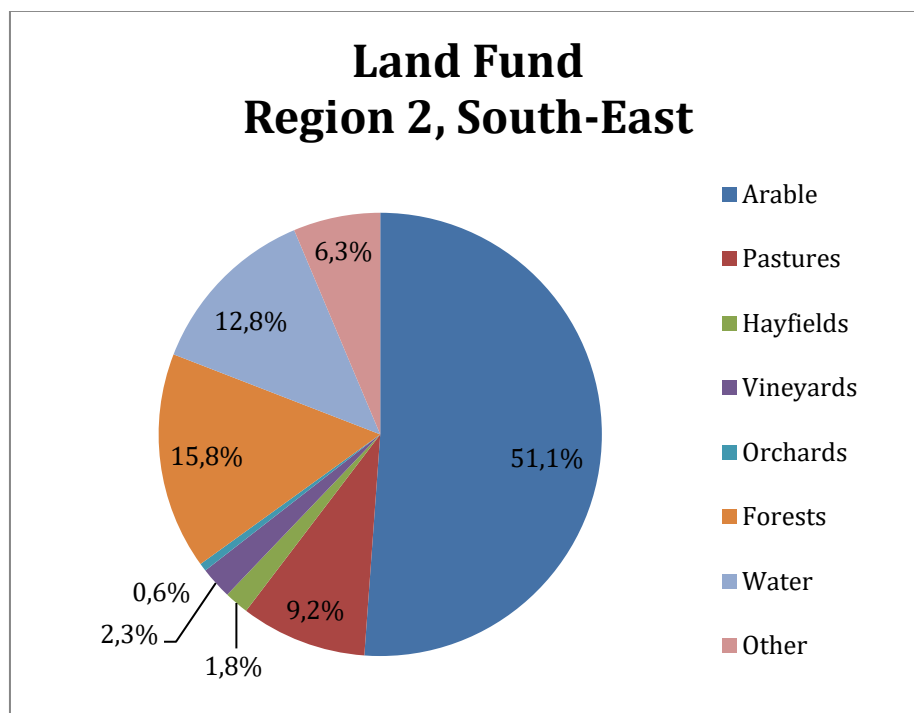


Figure 2

South - East	Surface	Percent
Arable	1,829,009	51.1%
Pastures	329,195	9.2%
Hayfields	63,809	1.8%
Vineyards	83,799	2.3%
Orchards	20,752	0.6%
Forests	565,821	15.8%
Water	456,730	12.8%
Other	227,055	6.3%
	3,576,170	100.0%

Table 2 Land fund distribution

The pedoclimatic conditions are favorable for agriculture and the ecological potential is still untapped, offering a special opportunity for development due to the fact that the intensification, chemicalization and industrialization of agriculture has not yet reached the West, the capitalization of Romanian farmers being below that of developed countries. The environment, as a result of soil fertility has suffered a lot now having only the role of support. In this way, agriculture occupies an important place in the economy of the region and has special development perspectives in the European context.

But the contribution of agriculture in the achievement of Romania's GDP has decreased from 15% in 1995 to 5% today, given that the share of the rural population has not changed.

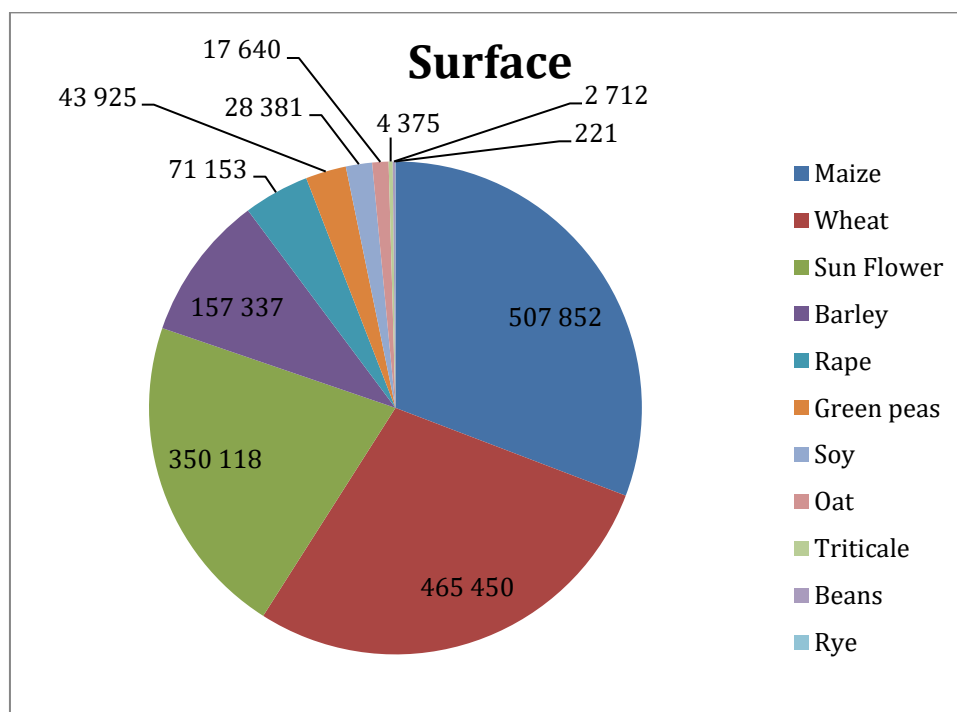


FIG. 3 The share of field crops

	Production	Mean	Surface	Percent
Maize	3,049,565	6,015	507,852	30.8%
Wheat	2,128,343	4,573	465,450	28.2%
Sun Flower	918,850	2,624	350,118	21.2%
Barley	660,026	4,195	157,337	9.5%
Rape	136,886	1,924	71,153	4.3%
Green peas	85,133	1,938	43,925	2.7%
Soy	84,704	2,985	28,381	1.7%
Oat	41,951	2,378	17,640	1.1%
Triticale	11,400	2,606	4,375	0.3%
Beans	3,215	1,186	2,712	0.2%
Rye	706	3,200	221	0.0%
Total		1,649,163		

Table 3 Importance of crops

It is observed that the plant species are limited in number, and the large share has the culture of Corn and Autumn Cereals.

This raises many concerns about biodiversity, due to the fact that intensive cultivation and profit orientation has led to the selection of a small number of plant species to be cultivated with major consequences for the ecosystem, disease incidence and pest virulence. they no longer have a natural area of development, respectively natural enemies of combat.

- rural / urban population

Recent statistics show a large share of the rural population in the area with consequences on the economic importance of agriculture, often seen as a subsistence activity due to deep fragmentation of agricultural area in plots with very small areas under 2 ha and annual incomes below 200 Euro.

This state of affairs is a consequence of low levels on all levels:

- training in the field
- capitalization
- technical and technological endowment
- ambiguity of professional status

Table 4 Permanent resident population, at territorial level, by sex and area, on July 1, 2019

Macroregiunea Regiunea de dezvoltare Județul	Total (număr persoane)	Urban	Rural	În procente față de total		Locuitori / km ² <i>Inhabitants / km²</i>	Macroregion Development region County
	Total (number of persons)	Urban	Rural	As percentage of total			
	Ambele sexe	Ambele sexe	Ambele sexe	Urban	Rural		
	Both sexes	Both sexes	Both sexes	Urban	Rural		
Sud - Est	2814599	1560727	1253872	55.5	44.5	78.7	South - East
Brăila	342663	222926	119737	65.1	34.9	71.9	Brăila
Buzău	462942	196468	266474	42.4	57.6	75.9	Buzău



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Constanța	764021	521837	242184	68.3	31.7	107.5	<i>Constanța</i>
Galați	626089	359430	266659	57.4	42.6	140.2	<i>Galați</i>
Tulcea	235441	116086	119355	49.3	50.7	27.8	<i>Tulcea</i>
Vrancea	383443	143980	239463	37.5	62.5	79.0	<i>Vrancea</i>

The share of the labor force in agriculture in Romania in general is high compared to the European Union, we are talking about 26% compared to 5% in the EU, which speaks for itself of the efficient level of activity, respectively the lack of agricultural area, We are an agricultural country, where farmers are not yet hired, 85% work in their own households compared to the European average of 72%, with the added value of activity reduced by half.

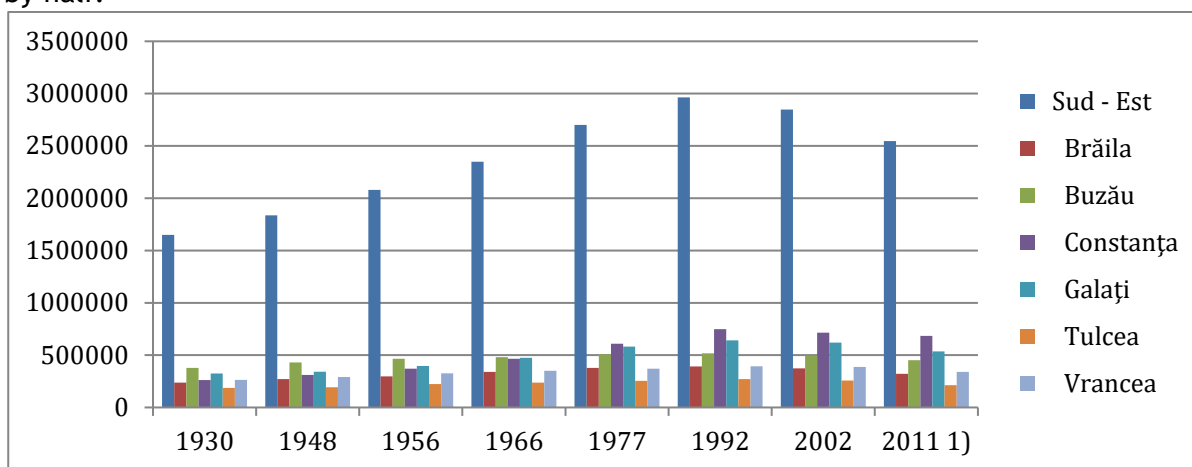


FIG. 4 Population dynamics in the area

There is a decrease in the population in the area since the 90s.

Table 5 Internal migration determined by change of permanent residence, at territorial level and by residence areas, in 2019

Macroregiunea / Macroregion Regiunea de dezvoltare / Development region Județul / County	Rural		
	Sosiți In-migrants	Plecați Out-migrants	Sold Balance
Sud - Est / South - East	22429	22182	247
Brăila	1948	2039	-91
Buzău	4309	4461	-152
Constanța	5572	4553	1019
Galați	4401	4696	-295
Tulcea	2152	2313	-161
Vrancea	4047	4120	-73

From the point of view of the migration of the population from the city to the village, there is a current tendency to change the meaning from the previous years, respectively an increased interest for the rural area, especially in Constanța county. There is a low income of farmers versus employees, with a large share of field work.



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In 2015, the share of labor in agriculture in Romania was 25.9%, being the highest share in the EU, whose average was 4.4%. 84% of agricultural workers in Romania fell into the category of unpaid staff, while the average share of unpaid workers in the agricultural sector in the EU was 72%, the gross value added generated at the level of the worker being reduced by about 50% compared to the average UE19. The previously presented ones attest that in Romania agriculture suffers from a reduced efficiency in the conditions of relatively small productions per hectare compared to the EU.

However, with an important agricultural area, Romania is one of the main exporters of raw materials in the food industry, respectively corn and cereals.

2.1.1 Organic farming and traditional products

Organic farming is a dynamic system in Romania, registering recently a upward trend. In 2010, the total area cultivated by production method was 182,706 ha (about 1.4% of the total agricultural area used), and at the end of 2017 of 258,470,927 ha, with a total number of approximately 8,434 certified operators in the organic farming system, an increase of about 41.5%.

In order to increase competitiveness, encourage local products and protect natural resources, a legislative framework has been created for attesting traditional products, established recipes and the use of the optional term "mountain product" - the latter for the purpose of developing mountain areas to support producers in these areas and to increase the added value of the products. The registration of products in national and European quality systems is a source of valorisation of products whose characteristics are related to the geographical origin, beneficial for the rural economy. So, quality systems focus on both the production of quality foodstuffs and food safety and security of consumers.

Research, new technologies and raw materials, as well as better use of nutrients or manure treatment can change today's agricultural production, moving to a functioning circular economy. An analysis of the nutritional quality of agricultural products is needed, as the nutrient content of certain categories of vegetables is declining due to the massive use of pesticides and non-organic fertilizers.

Table 6 Total income of main household categories, at territorial level, in 2019

Macroregiunea Regiunea de dezvoltare	Total gospodării <i>Total households</i>	Gospodării de:				Macroregion Development region
		Households of:				
		Salariați	Agricultori	Șomeri	Pensionari	
		Employees	Farmers	Unemployed	Pensioners	
Sud - Est						South - East
	lei, lunar pe o persoană / lei, monthly per person					
Venituri totale	1459.84	1918.74	1023.97	549.36	1248.59	Total income



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	procente / percentage					
Venituri bănești	92	95.5	72	90.3	90.1	Money income
din care:						of which:
Salarii brute și alte drepturi salariale	61.5	89.5	13.4	43.6	26.3	Gross salaries and other salary rights
Venituri din agricultură	3.9	0.4	45.4	0.5	1.9	Income from agriculture
Venituri din activități neagricole independente	2.5	0.2	2.6	2.7	0.5	Income from non-agricultural independent activities
Venituri din prestații sociale	21.7	4.3	8	21.4	59.9	Income from social provisions
Venituri din proprietate	0.1	***)	0.3	0.6	0.1	Property income
Contravaloarea veniturilor în natură obținute						Equivalent value of income in kind obtained
de salariați și beneficiari de prestații sociale	1.2	1	0.7	1.2	1.8	by employees and receivers of social provisions
Contravaloarea consumului						Equivalent value of consumption
de produse agricole din resurse proprii	6.8	3.5	27.3	8.5	8.1	of agricultural products from own resources

2.1.2 European funding

The implementation of EU agricultural policies has to some extent increased the sustainability of the Romanian agricultural economy by connecting to Community norms and standards of quality and competitiveness, including ecologically and financial support of large farms through direct payments under the Common Agricultural Policy (CAP) mechanisms..

However, in the 10 years since EU accession, no practical solutions have been found to support small subsistence households, so that 2.6 million traditional peasant-type units, about half of the total, have been considered ineligible. and remained outside the direct area payment system. This situation has been corrected by the corresponding adjustment of the schemes for the application of direct payments under the first pillar of the CAP, in the framework of the EU's multiannual financial cycle (MFF) 2014-2020. Also, MFF Post 2020 will continue to bring improvements to the system of direct payments dedicated to subsistence farms.

- Increasing the degree of capitalization of local agricultural production
- Increasing the share of organic farming in total agricultural production
- maintaining and making profitable some occupations and traditional methods of capitalization a medicinal plants and berries in the mountain area. Maintaining traditions by increasing the number of products with specific characteristics in terms of geographical origin

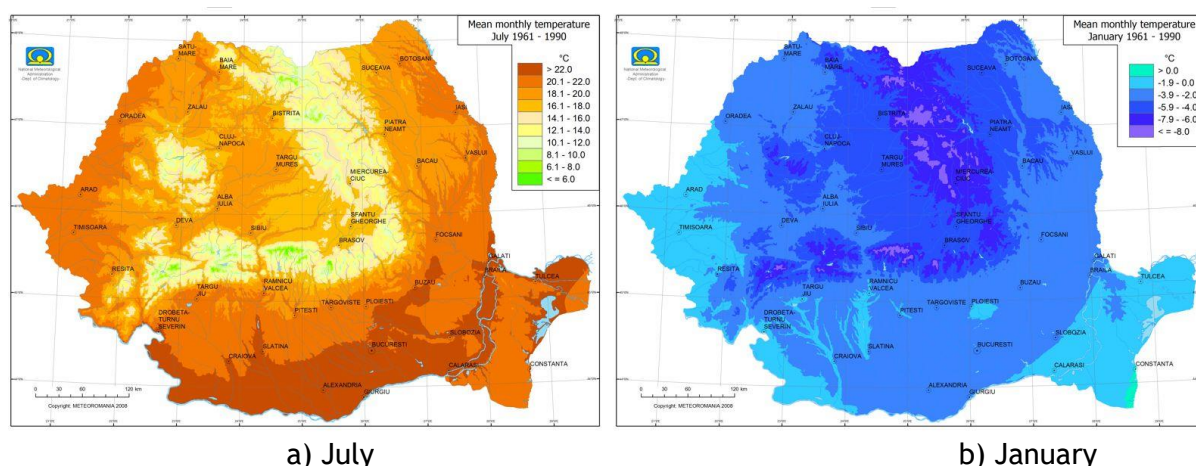


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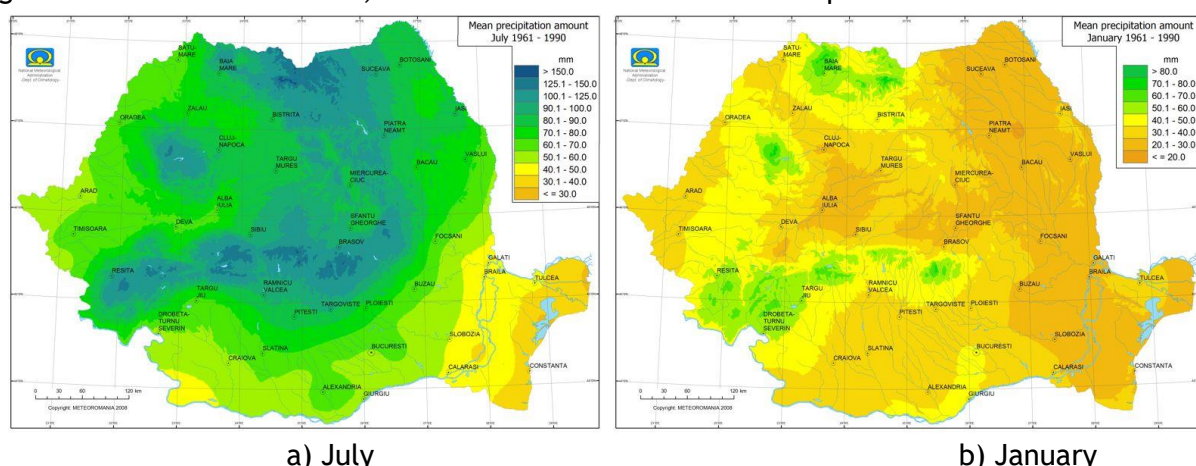
2.2 Climate change and impact on Romania agriculture

Romania's climate is temperate-continental transition, marked by some oceanic, continental, Scandinavian-Baltic, sub-Mediterranean and Pontic climatic influences. Thus, in Banat and Oltenia the Mediterranean nuance is felt, characterized by mild winters and a richer rainfall regime (especially autumn). In Dobrogea the pontic shade is manifested, with rare but torrential rains.



a) July
b) January
FIG. 5 Average temperatures between 1961-1990 (Source: INMH)

In the eastern regions of the country, the continental character is more pronounced. In the northern part of the country (Maramureş and Bucovina) the effects of the Scandinavian-Baltic shade are manifested, which determines a wetter and colder climate, with frosty winters. In the west of the country there are more pronounced influences of low pressure systems, generated over the Atlantic, which causes more moderate temperatures and richer rainfall.



a) July
b) January
FIG. 6 Average precipitation between 1961-1990



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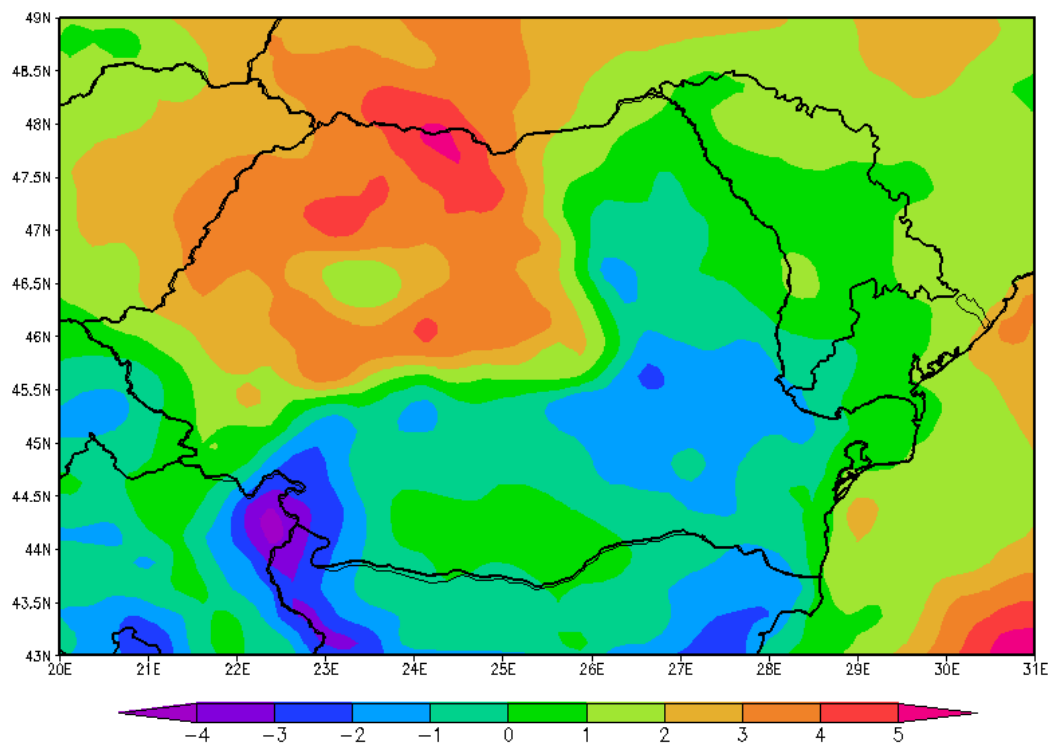


FIG. 7 Change in the estimated annual rainfall for 2001-2030 (in%) (reference range - 1961-1990) under the conditions of scenario A1B

In fig. 7 used the results of a set of 11 climate experiments with regional models conducted in the FP6 ENSEMBLE project. There is a decrease in% of the precipitation level in the South-East area with a maximum towards BR, GL, BZ and VN counties.

Statistical analysis on the evolution of meteorological parameters in Region 2 SOUTH-EAST using data collected from local stations:

Table 7 Average annual temperature. Source: INS

Weather station and years of observation	Media	Amplitudinea
	anuală	anuală
	Yearly	Yearly
	average	amplitude
Galați		
1901 - 2000	10.5	25.1
2018	12.3	25.4
	1.8	0.3
Buzău		
1901 - 2000	10.7	24.5
2018	12.4	25.0
	1.7	0.5

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Constanța		
1901 - 2000	11.4	22.1
2018	13.3	23.3
	1.9	1.2

Occasionally, in each county, there is a significant increase in average annual temperature by 16% (Figure 8), with implications for meteorological phenomena and negative impact on the current structure of crops adapted to temperate climate conditions.

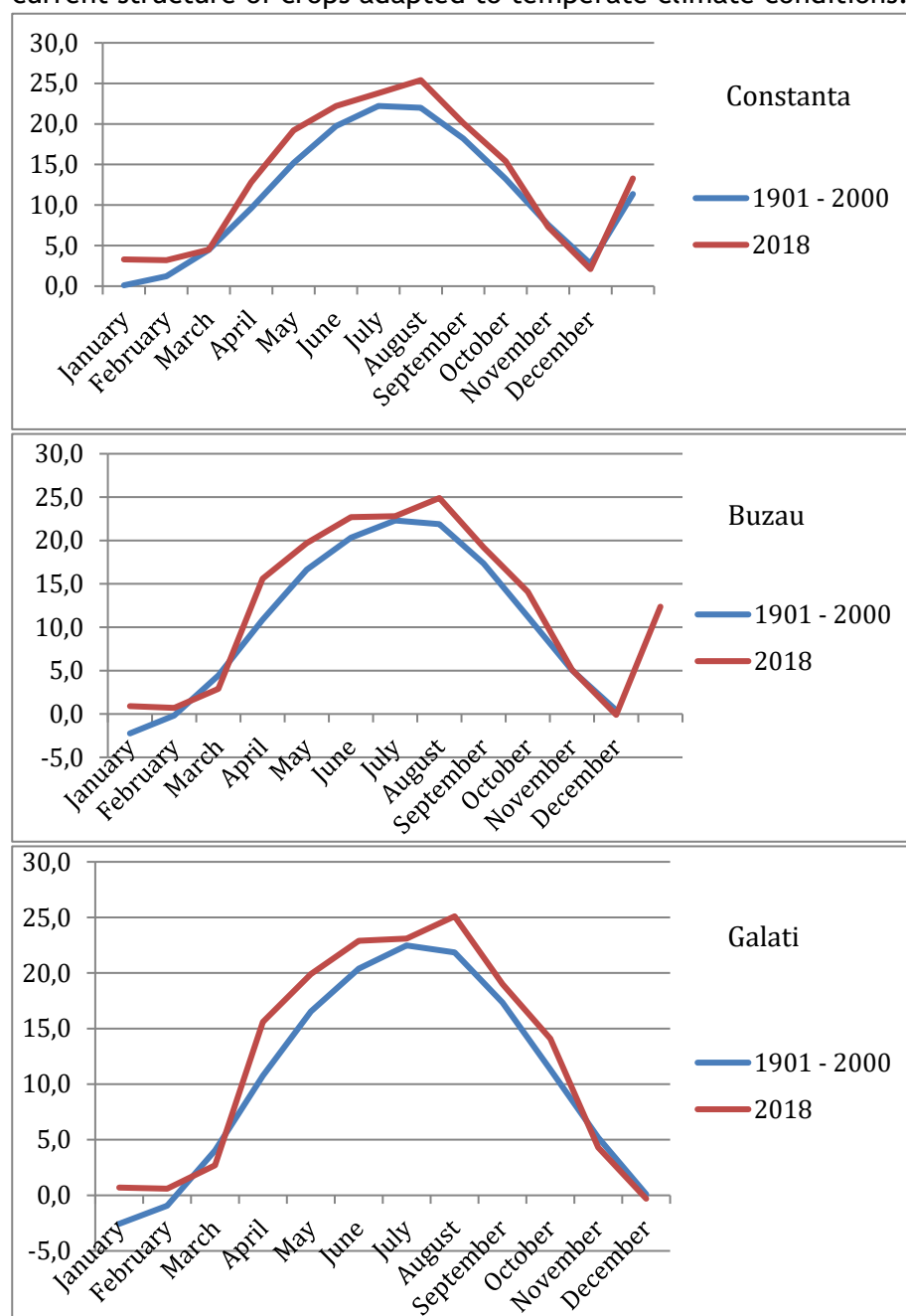


FIG. 8 Evolution of the average monthly temperature recorded at the local meteorological stations



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There is an obvious growth trend in the whole area with an emphasis on the summer and September months, correlated with periods of excessive heat having a strong negative impact on the pollination of corn crops (Table 8 and Figure 9).

Table 8 Comparative statistics with precipitation quantities

Weather station and years of observation	Anuală
	Yearly
Galați	
1901 - 2000	445.6
2012-2018	583.0
Buzău	
1901 - 2000	501.5
2012-2018	610.4
Constanța	
1901 - 2000	368.1
2012-2018	548.2

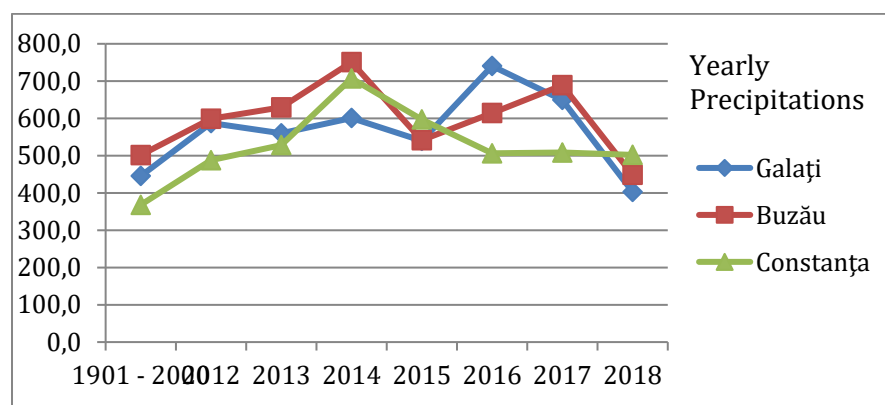
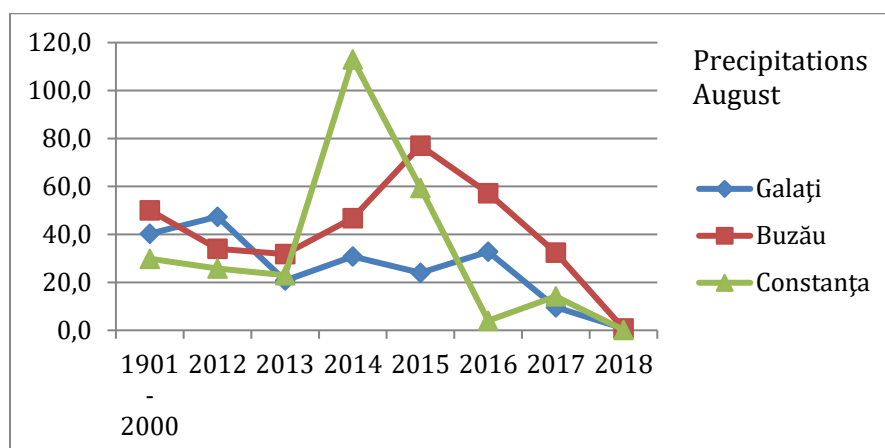


FIG. 9 History of the evolution of precipitation amounts at local weather stations



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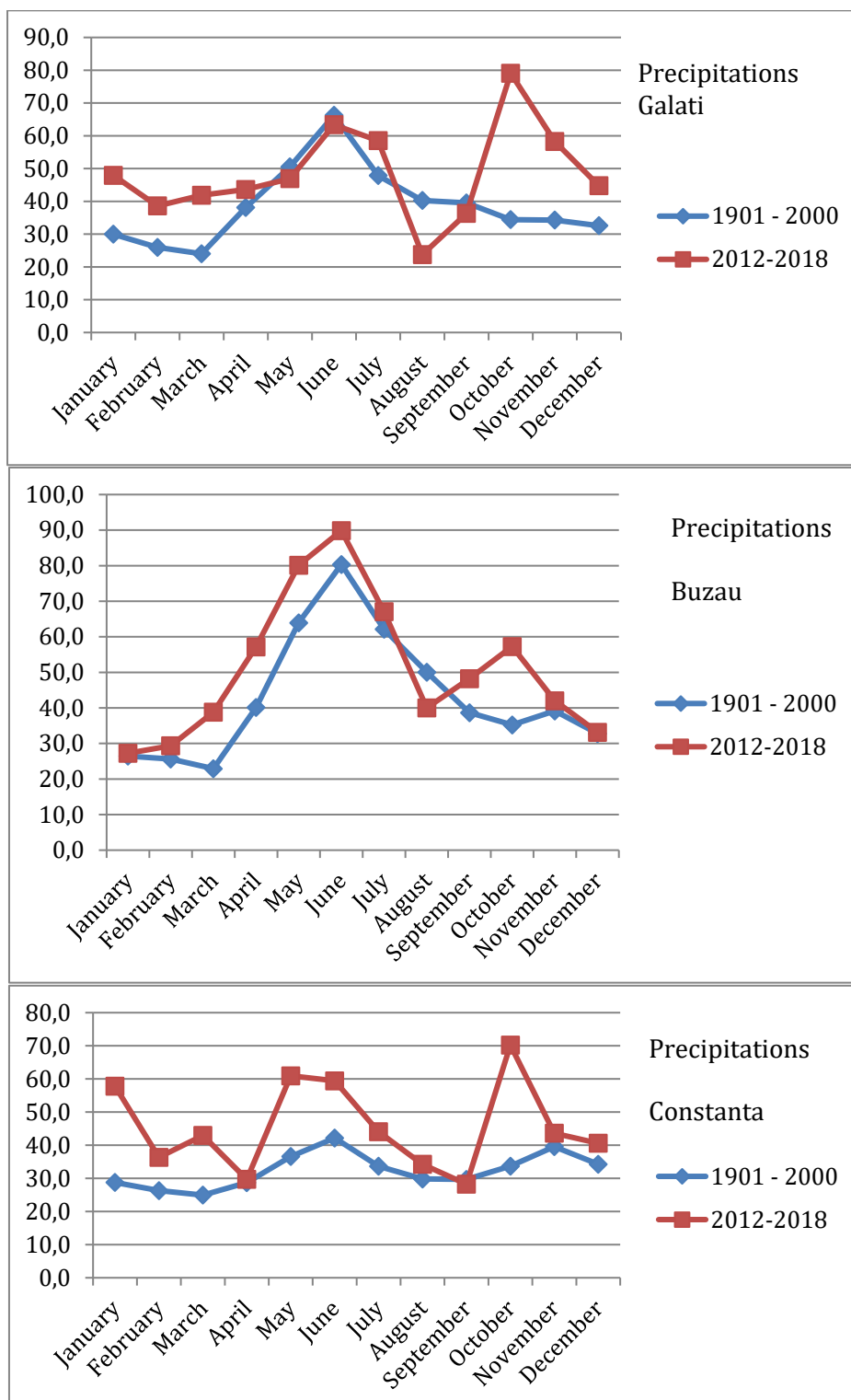


FIG. 10 Comparative history of the evolution of precipitation amounts at local weather stations

There is a tendency to decrease the amount of precipitation, especially in August, the month preceding the importance of sowing autumn crops, worsening the conditions of land preparation and optimal sowing.



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In Romania, the climate risk is high compared to the EU average, exposing agricultural crops to a high number of extreme weather events, with significant production losses affecting almost all regions of the country. The most affected regions are: South-East, South-Muntenia, Bucharest-Ilfov and South-West Oltenia. The main extreme climatic phenomenon to which agricultural crops in these regions are subjected is drought.

In the South-East Region, the Danube Delta will be severely affected by the increase in the average annual temperature and the increase in the frequency of extreme weather events. The air temperature will increase by an average of 1.5° C by 2050, which will lead to a higher level of evaporation, several extremely hot days and a significant decrease in the snow cover period. The Ministry of Agriculture and Rural Development, through its specialized structures, monitors areas cultivated and affected by various meteorological phenomena at national level. From the existing data, it is observed that extreme meteorological phenomena manifest themselves irregularly, registering years in which very important areas are affected. Moreover, an intensification of these phenomena is expected in the future.

Table 9 Area affected by adverse weather events.

Reference period	Area affected by adverse weather events (ha)			Total area affected (ha)
	Drought	Floods, hail, torrential rains, floods	Low temperatures, frost, blizzard, heavy snowfall	
2015	1.584.088	101.746	66.672	1.752.506
2016	1.040.002	140.616	5.203	1.185.822
2017	298.365	73.419	39.598	411.383
2018	187.101	172.419	6.418	365.939
2019	74503	95.999	1.218	171720
Source : MADR				

Analyzed at county level, in the years with intense manifestations, such as 2015 and 2016, the first 10 counties included in the graphs below hold over 60% of the total affected areas.

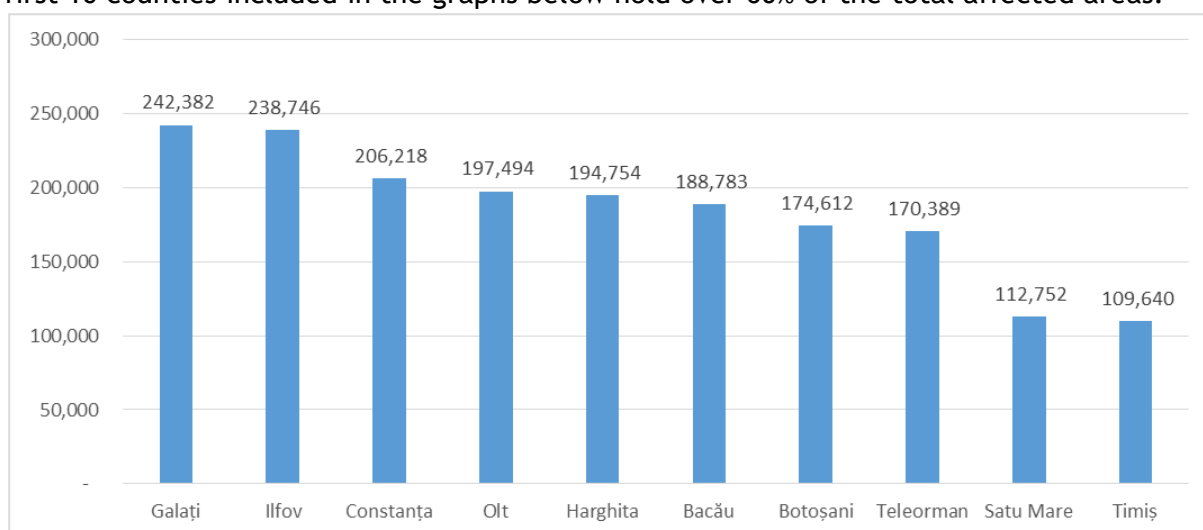


FIG. 11 Areas affected by extreme climatic phenomena at county level - 2015-2016
(Source: MADR)



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Extreme climatic phenomena profoundly destabilize incomes on farms, especially from the perspective of lack of predictability. In addition to this risk factor, farm incomes are negatively impacted by the low level of training and skills among farmers, poorly developed advisory and consultancy services, the reduced use of precision agriculture and new technologies, the low level of organization of farmers in associative structures with economic role, decreases in productivity and / or yields due to the manifestation of natural constraints and / or the reduced use of risk management tools to mitigate economic risks in agriculture.

2.3 SWOT analysis of the climate-smart agriculture in Romania

S-Strong Points

- favorable pedoclimatic conditions with a harmonious relationship of environmental factors and relief
- important agricultural area; Romania has 14 million ha of which 60% of the large crop, occupying the 6th place in the EU, positioning on leading places for export in the world, 9 for wheat and 6 for corn.
- large area and weight in the agricultural economy, under agri-environmental commitments, through which environmentally friendly, extensive technologies are applied, biodiversity is conserved, GHG emissions are reduced and solutions are sought to meet climate change in increasingly significant.
- GHG emissions due to agriculture, Methane and Ammonium are significantly lower than the European average
- carbon storage in the soil favored by the surface with an important weight of meadows, permanent crops.
- the use of relatively small quantities of chemicals for fertilization and plant protection compared to developed countries in the EU, to which contribute especially the low capitalization of farmers.
- modernization of the equipment park, especially due to the non-reimbursable European funds made available to farmers
- successful and widespread application of intelligent technologies (GPS, management software, drones, irrigation water control) especially in large farms with financial power.
- a diversity of vegetable and animal agricultural production
- a regulated legal framework with forestry planning
- various sources with potential in renewable energy

W-Weaknesses

- excessive fractionation of the agricultural area due to the existence of a large number of small agricultural holdings under 2 ha.
- the average area of a farm well below the European average, about 5 times smaller
- low productivity, low efficiency, low added value, low prices of primary agricultural products lead to insufficient income and abandonment of activity in agriculture especially by young people
- small farmers do not have access to funds and cannot afford modern technology equipment
- there are no local weather systems for analyzing, storing information and recommendations in farmers' decisions.
- the historical opposition of farmers to unite in associative forms, as a result of the old legacy of sad memory from the communist period when the former CAPs were perceived as inappropriate.



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- an insecurity and a high variability of the gains from the activity in agriculture due to the dependence of the production on the more and more adverse and variable climatic conditions.
- increased risks not compensated by the insurance system and legislation, correlated with the weak flexibility of farmers in risk management due to climate change and dependence on them.
- low appetite for knowledge and professional development among farmers over the age of 40, with a high share in farm management
- lack of local consulting and advisory organizations in the agricultural field
- low yield of activity in agriculture compared to the European average, 4 times lower
- the irrigation system destroyed and what has survived in precarious conditions, expensive to use and with little coverage of agricultural areas that would need to be irrigated, positioned in areas with drought or excessive drought.
- export oriented more on products with low or primary added value, which leads to a low yield of activity in agriculture
- relatively low productions for large crops compared to developed countries
- the average age of farm managers reluctantly advanced in introducing modern technologies and practices.
- difficult access to credit and lack of an entrepreneurial investment culture by using loans especially for processing
- the extension of the soil erosion phenomenon with landslides and desertification due to the lack of conservation and land improvement measures, respectively uncontrolled deforestation on sloping lands with potential for erosion and landslides.
- the lack of strategies for the promotion of local products, the lack of support in the formation of packaging centers and the processing of agricultural raw materials has led to a weak competitiveness of Romanian products on the world market
- low share of energy produced from renewable sources in the agricultural sector with a low degree of use in this sector of activity.
- agricultural practices still lagging behind, with aggressive tillage and large-scale transitions, intensive technology on large areas, conventional and less ecological
- the waste produced as an effect of the development of agricultural practices is not efficiently managed especially in small farms, having a large share in the total farms
- a large share of the agricultural area is under natural or area-specific constraints, resulting in a main feature of weather-dependent agriculture
- precarious information and low assimilation of knowledge by farmers regarding the production and use of renewable energy, respectively the adoption of those environmentally friendly technologies, adapted to climate and non-polluting
- an uneven distribution of water resources for irrigation
- renunciation, reduction as a share of the use in culture of local varieties and historically adapted to the climatic and environmental conditions of the area.

O -Opportunities

- the appearance of mixed farms with complete circuit in which the raw materials are capitalized superiorly and the added value ensures motivating incomes to the farmers
- surface financial support for risk mitigation and farm capitalization
- the introduction especially at the level of large farms of intelligent technologies, the optimization of inputs and the reduction of chemicalization, the precision and the modern decision, which led to the increase of the incomes and the yield of the activity in agriculture.
- strategies for the development of family and environment farms by supporting investments and incomes will lead to the development of this sector

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- consumer orientation towards niche products, healthy and clean, environmentally friendly products has led to increased efficiency and revenues in the sector
- encouraging the development of cooperation and formation of associative forms of production, processing and sale of agricultural products
- increasing the opportunities for training and development of education in the field through projects of associative and governmental forms, supported by EU non-reimbursable funds.
- non-reimbursable European and governmental funds for investments in farm modernization, in the development of primary agricultural processing activities and obtaining added value, for supporting and developing the production and use of renewable energy, the development of irrigation at association level.
- supporting the organization of education, information and specialization courses for farmers, offering consulting services through EU-funded projects.
- growing global demand for food due mainly to population growth and living standards
- the opportunity to use the local genetic fund with plant and animal species having a great adaptability and resistance to aggressive climatic factors, respectively having clearly superior qualitative characteristics
- strategies included in the CAP that support agriculture adapted to climatic, agri-environment and climate conditions, sustainable and the use of renewable energies - Increased potential for obtaining renewable energy due to the wide range of renewable energy sources
- increasing access through large-scale penetration of organic plant protection and fertilization products, with increasingly affordable prices
- lowering the price of products that incorporate technologies for the production and storage of renewable energies, becoming more and more accessible to medium and small farms.
- increasing access and encouragement, financing of innovation partnership projects, sharing modern and intelligent, environmentally friendly experiences and practices
- the introduction of more and more precision and decision technology, reducing costs, pollution and ensuring an increased efficiency of resource use, ensuring additional income for farmers and streamlining the activity.

T- Threats

- migration of the population from the rural area due to low incomes, inefficient activity in agriculture, lack of support, pricing policy that disadvantages the producer and encourages the intermediary, insecurity and income instability due to weather dependence
- year-on-year increase in inputs uncorrelated with the prices of agricultural products leading to increased costs and reduction of farmers' benefits
- Climate changes more and more visible with the worsening of the favorable growth conditions for the plants, with the accentuation of the extreme phenomena of drought and heat wave
- lack of interest of farmers due to poor training and high age for knowledge accumulation, access to training and specialization in order to form a new concept and strategy to address agricultural practices, new smart technologies, adapted to climate change and friendly with the environment.
- the negative effect on farmers' incomes of climate change, drought, extreme climatic phenomena of heat, storm and precipitation.
- the migration of young people to cities that led to the slowdown in the introduction of the new in farms by maintaining the old practices and mentalities, respectively maintaining the management of older people on farms



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- the inefficiency of the consulting services that could not have a positive impact on the activity of the farms by coming to meet the farmers at their farm and bringing local knowledge in an accessible way.
- undeveloped infrastructure in rural areas has led to a slowdown in investments in the processing of primary agricultural products
- maintaining and encouraging large farms that exploit intensive land, with high-performance equipment, with little staff. using synthetic chemicals in fertilization and plant protection with negative impact on ecosystems and social life in rural areas
- Lack of manure management leads to increased GHG growth
- the lack of interest of the authorities in encouraging and financing the local research in the agricultural field, the decapitalization of the research institutes and the migration of the accumulated experience to the multinational companies that control the inputs.

3. Research methodology

3.1 Data sources

The results were collected using a Google form, grouped by items of interest for the study topic. The results were centralized as follows:

- Should the CSA concept be encouraged and developed?

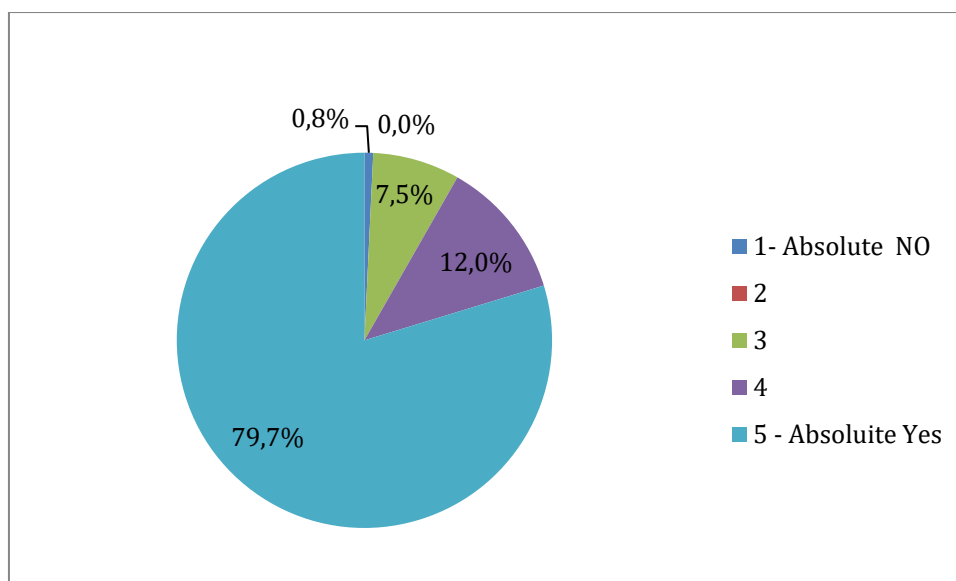


FIG. 12 Most respondents agreed that CSA should be encouraged and developed.

- What do you consider to be the main benefits of CSA implementation? (more options possible)

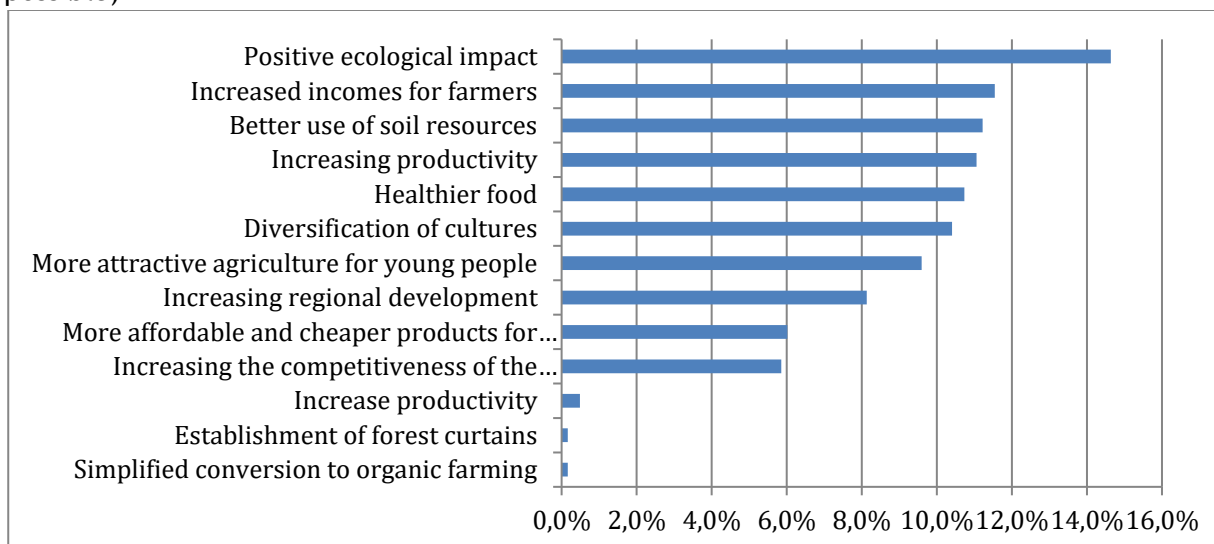


Fig.13

There is a growing concern for the environment and the motivation of farmers to practice sustainable agriculture.

- Do you agree to support the implementation of the CSA in your area?

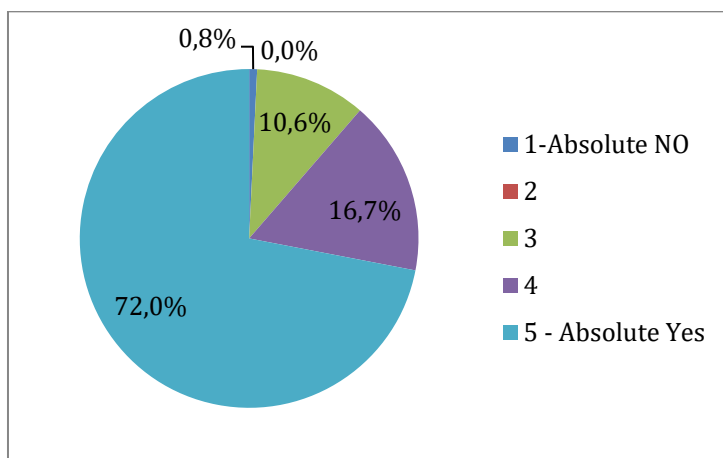


Fig. 14

The CSA is intended to be implemented by the majority of respondents.

- Do you think that products under CSA should have well-defined attributes (for example a brand or label) in order to be recognized in the market?

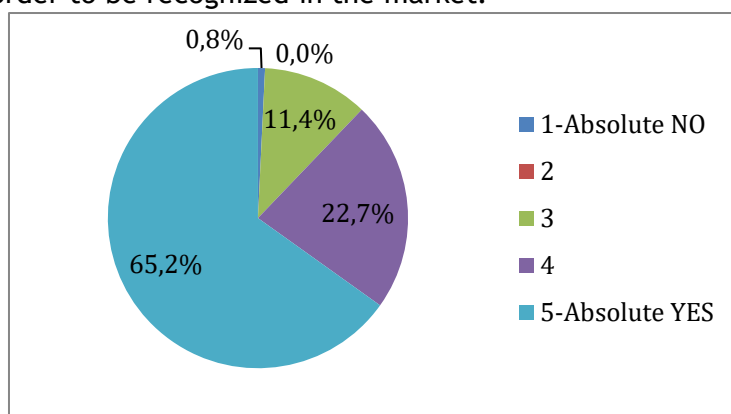


FIG. 15 The need to attribute a brand

The need to attribute a brand is a little more nuanced in the sense that more respondents would support but, fewer understand the need to introduce a CSA brand for products.

- Would you prefer to buy CSA products as a priority over other equivalent products?

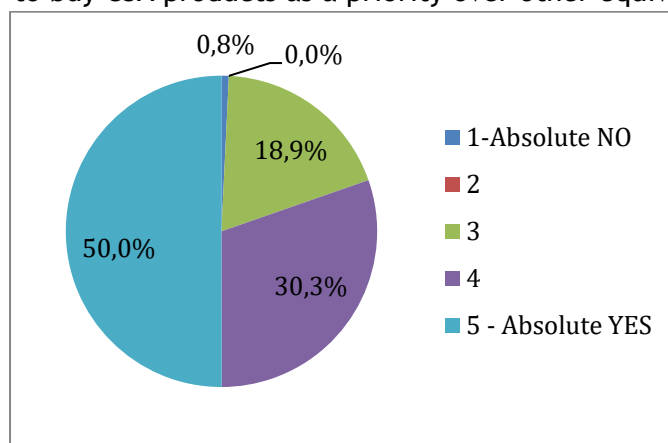


FIG. 16 CSA Product Preferences

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Preferences continue to be more nuanced when consumer action is already required to buy. However, the intention remains to choose the CSA on the shelf.

- Would you be willing to pay more for a CSA product?

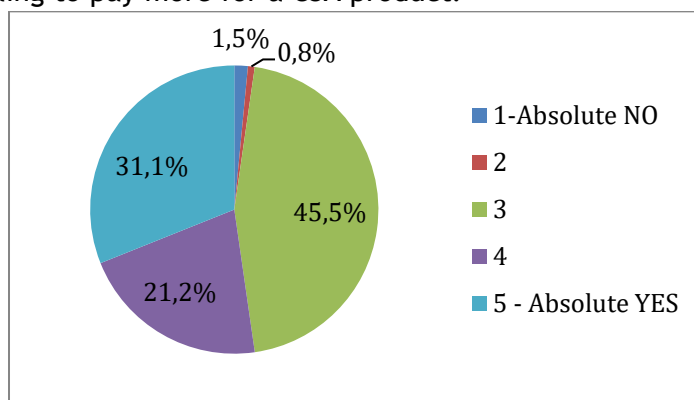


FIG. 17 Price and accessibility of CSA products

As the consumer sees himself as an actor in this CSA support action, he becomes increasingly hesitant to contribute. Everything up to money!

- What would be the main motivation to buy products / food under the CSA brand? (more options possible)

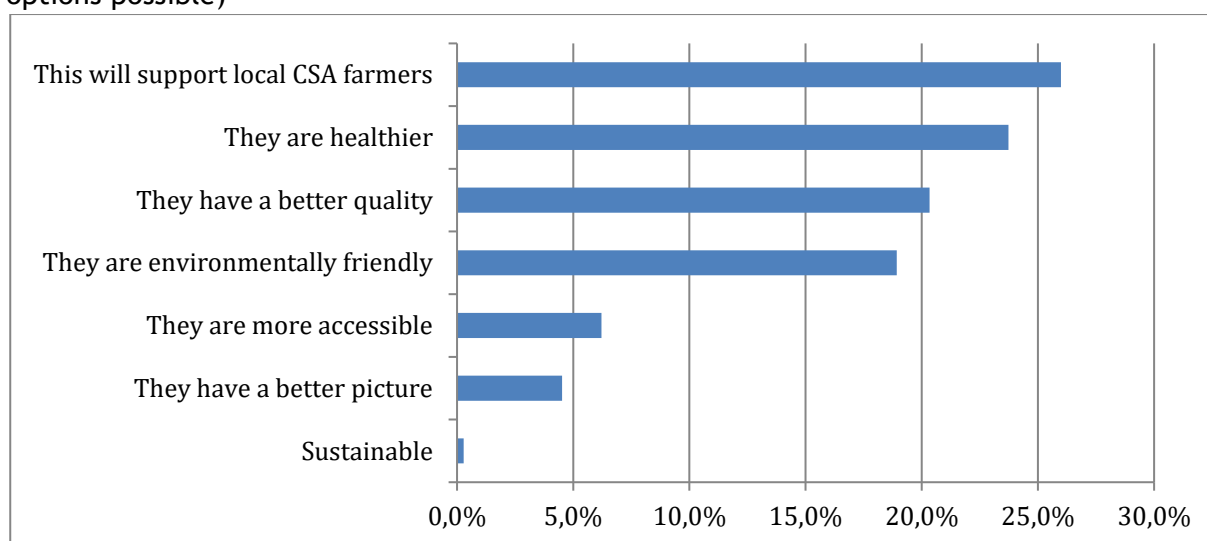


FIG. 18 Main motivation to buy CSA products / food

Once again, the concern of consumers to support the activity of producing a healthy food in a healthy environment is confirmed.

3.1.2 Results of interviews with farmers.

The interview was designed with 16 open-ended questions, grouped on the following items of interest:

- short description of the farm and the organization
- the degree of availability of farmers in the CSA approach
- examples of CSA practices already implemented
- wishes and suggestions for the future development of the concept



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The locations were chosen in all 6 counties included in BSB and the size of the farms varied from small farms of 10 ha to very large farms of thousands of hectares or cooperatives that grouped 20,000 hectares in collaboration. After centralizing and analyzing the answers, there were general elements of the answer, presented in this subchapter.

The seniority in the management of the farms is between 4 and 25 years, with an average of 10 years of experience in agriculture.

The endowment of the farms is based on tractors of various powers and sizes corresponding to the working surfaces, between 25 Ha and 300 Ha / tractor with an average of 160 ha / tractor and combine harvesters between 50 and 750 Ha / combine with an average of 430 ha / combine, modest endowment compared to that of farms in developed countries.

The main established crops are: Wheat, Barley, Sunflower, Corn, Peas and Alfalfa .

Wheat is grown on average 38%, followed by barley 22%, sunflower 21%, corn 19% and peas 4%. Peas are grown as a breeding crop for soil fertility.

For mixed farms, cereals are grown alternately with Lucerne on 70% of the surface.

- Most farmers consider that they have heard of the notions proposed by the CSA but were not aware of the existence of this integrated approach.
- They are aware of the importance of CSA in light of the particularly strong impact of environmental factors in the last period of time and consider that it will be the future, otherwise it is not possible.

CSA is perceived as bringing efficiency, performance, stable and safe production.

- From the point of view of the applicability of this approach there are 2 camps. The group of large farms that have financial possibilities and small farmers.

Most farmers are careful to work with minimum passages for water conservation in the soil, but only large farms can afford specialized equipment that performs several works in one pass.

Precision agriculture is practiced using GPS technology, variable rate and data collected from local weather stations.

The adaptation to global warming imposed the delay of 2 weeks of the sowing season in addition to cereals and in advance to weeding.

From a technological point of view, farmers are encouraged by the conditions imposed by APIA, on crop diversity, and the practice of crop rotation.

There is a great desire to use irrigation and locally this is done using deep water from wells. The hope is for the Government to implement policies regarding the redevelopment and development of irrigation systems on drought-prone areas, which have recently reached 60% of arable land.

There are concerns for organic farming, the use of organic fertilizers, a solution that has been successful lately.

At the level of associations, experimental steps are taken towards the validation of ecological technology, establishing experimental groups of crops (wheat in particular).

It is desired to establish borders for the improvement of the local microclimate and the protection of crops. There are project-funded initiatives in this regard,

- Farmers are determined to address CSA in the future motivated by pesticide economy, lower costs, safe and stable production, more affordable prices for organic inputs, stopping soil degradation and improving its fertility, product quality and healthier.
- The expected benefits are multiple:
 - large and constant productions, stable profit, high yields
 - lower energy costs, labor and inputs.



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- the quality of the products and the fact that they are healthier
 - a healthier, friendlier and more sustainable environment without pollution
 - a more fertile and renewable soil
 - Main challenges, weights and costs:
 - bureaucracy and lack of viable and applied long-term strategies
 - unskilled and unserious labor force, disinterested to dedicate themselves to this field with passion
 - large investments in equipment and facilities, lack of funds, access and guarantee, transparency of their allocation within European projects.
 - reluctance to cooperate and aggression of large farmers towards small ones
 - bio inputs are more expensive
 - no tillage technology has major disadvantages in dry areas due to pest proliferation
 - monopolizing the control of the selling prices of the products by the input suppliers.
 - fragmentation of surfaces into small properties, unprofitable to exploit, and reluctance to merge.
 - Farmers hope to be supported by organizing national and regional centers but are aware that this process is long-lasting.
 - The government only needs to create opportunities that make CSA attractive, funding programs for consulting, coupled support for those who move to CSA, without imposing conditions that would curb farmers' enthusiasm.
 - Most agree that a brand / brand would highlight the fact that in Romania the products are healthier and would ensure their traceability. There are also opinions that it is not a solution, the intermediaries will increase the price and they will collect the profit, and it is not very clear how it could be done.
 - Yes, cooperation is very good, this is the future, it increases the power and size of projects but it is not feasible now, there is reluctance. Maybe young people are more interested.
 - At this moment the implementation is in a modest phase. Large farmers have implemented modern technologies, no tillage, variable rate, GPS, computer management. A great hope of farmers is in the rehabilitation / development of irrigation systems without which we can no longer speak of a sustainable and economically efficient agriculture. We want to raise awareness by popularizing the notions of CSA, specialized courses, bringing knowledge to the farm. Turnkey solutions are expected, technologies resulting from the certification of new technologies on experimental lots and the elaboration of recipes to be applied to farmers. Investments to be accessible, European funds to encourage these CSA practices, organic fertilization, organic farming, healthy local varieties and adapted to the local climate.
- 3.1.3 Results of interviews with institutions and authorities in the field:**
- Yes, the term CSA is used, or partially by segments and not under this name.
 - Yes, there are practices under the CSA umbrella in Romania.
- In the incipient phase, there is a lack of endowment, of poverty, they do not have means, resources, they are not supported.
- It is practiced naturally by farmers facing climate change being forced to adapt, using technologies with minimal soil tillage and intelligent, in order to reduce costs, increase efficiency.



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Romanian farmers are too poor to use excessive chemicalization, implicitly the products are healthier.

It is known that the amount of pesticides used in Romania is below the European average, hence the consequences on environmental protection.

We can talk about organic farming which is stimulated, has a well-defined legislative and financial framework.

Examples of existing practices are the use of satellite imagery to optimize crop technology, fertilization, tillage, plant protection, pest control, weather warning, have been expensive in the past now using drones have become more affordable.

The solariums use the optimization of the works using the computer, the sensors located in the field and the automation systems that execute the commands.

There are concerns about reducing GHGs using CO2 reduction technologies.

Precision agriculture is practiced by large farms in conflict with sustainable agriculture, used to reduce costs, only economic profit is pursued.

Research in Romania failed to impose Romanian varieties in the organic field with genetic evaluation.

APIA encourages through its measures M10 Agri-environmental and climate measures .

Yes, there are concerns in the commissions, for approaching these concepts and finding solutions for an adequate legislative framework, there is a real interest in solving not necessarily what is seen on TV regarding health and environment, respectively pollution and environmentally friendly practices.

There is a direct correlation between nutrition (respectively healthy food) and the incidence of diseases, this can now be seen from the plane and the legislative forum is really busy folding, connecting with the real problems of society.

- There are concerns in the regional policy regarding the CSA but little applied, at the level of intention

- There is interest through the research topics proposed in the CS approach.

- Strategic plans for sustainable development.

- Anti-hail strategies.

- Rebuilding the irrigation system

- We are working at national level to harmonize the legislation with the European one in the field.

- Political leaders have taken action and are getting involved.

- The national policy is implemented through a whole series of compensatory and interest measures to motivate farmers to respect the conditions of cross-compliance, areas of ecological interest, plants, butterflies, birds.

- Concrete M10 of agro-environment and climate.

- Conditions to comply with nitrogen doses to prevent water pollution.

- The National Strategic Plan has clear directions drawn in this approach regarding ecology, water infestation with nitrogen products, biodiversity, promotion of traditional products, biodiversity.

- There are long-term strategies PNS 2021-2027.

Although the realities related to smart agriculture and the impact on the environment were discussed in parliamentary committees 2-3 years ago, only now is it seriously focused on the subject.

- The CSA definition needs a better defined conceptual framework to clearly reach farmers.

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- Regional authorities should make efforts to stimulate, disseminate and implement CSA but:

- there is no financial support
- although the authorities come to meet the farmers they will need to organize to cooperate between the responsible factors
- Civil society should be more aggressive, have initiatives, impose more firmly the search for solutions.

- Benefits and costs / challenges

Benefits:

- healthy products
- promoting local products versus imports
- a healthy environment
- motivating farmers through the support received
- cost reduction
- increasing the efficiency when applying the inputs through the variable rate
- a more natural soil, water and air
- large constant productions
- mitigating the influence of natural negative factors
- diversification of cultivated species, because species disappear
- increases the quality of life, sustainability and biodiversity.
- by observing the CSA norms, they will also meet the Apia conditions, so they will have financial benefits. Also, the rigor in observing the norms and completing the various imposed documents creates an organized, intelligent framework for carrying out the activity.

Decision makers no longer have to think hard about approaching the subject, there is no need for other experiences or information, we should stop now to continue like this.

Costs / challenges:

- to be able to capitalize on the production easily and conveniently
- to be able to equip yourself with the necessary equipment
- awareness of farmers in their midst,
- the information is available and accessible
- finding funds for activity and development
- the state to create the legal framework that encourages the development of the concept not to hinder and to slow down
- to create pilot centers, practical examples to follow
- lack of promotion of the concept, of media coverage
- requires high costs at least at the beginning
- the legislation to meet these needs not to slow them down.
- approvals, authorizations take a long time and conflict with the deadlines for project implementation
- high technological costs
- resistance from farmers to new
- outdated mentalities, education, funds
- human resources, lack of qualified and responsible labor force.
- there are no conditions for the development of the manufacturing industry.

Theoretically, we will have at our disposal in the next European exercise of 80 billion euros to finance development projects.



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This money does not come if we do not have projects. For land improvements alone, it would be 6.5 billion euros. We have good specialists but we need a long-term country strategy to be applied and financed.

The family farm must be encouraged, with areas from 5 ha upwards to ensure the continuity of the Romanian village.

Large farmers are already technological worldwide, working 4,000 ha with 15 employees.

There is a tendency to export primary products and import value-added products. For example, we export wheat and corn and import dough that could theoretically be made locally.

The pandemic also had positive aspects, it made us wake up and focus seriously on important issues, unity in diversity, it was like an awakening.

- Progress factor alliance, made in good faith.

The association has always been a factor of progress but in Romania due to past experiences farmers are very reluctant.

Despite this fact, there are successful cooperatives in Romania, Dobrogea Sud Cooperative, CAP Curtici led by Agronomist engineer Dimitrie Musca, etc.

For this there is a need to create an adequate legislative framework and must be taken into account in the case of enlargement to the European Union, the exchange of experience with farmers in the West who are more advanced in skills, funds and technology.

- The brand is beneficial

Yes, from the experience of organic and ecological products introduced in hypermarkets, these highlighted products would encourage CSA, the consumer paying for the quality of the products and the living environment.

Consumers have become sensitive to pollution, which has recently been produced by agriculture that has overtaken industry.

Buyers will be willing to pay more to help introduce this clean approach and farmers' efforts to protect labor would be recognized.

- Current status and trends

There is application but early and it will develop in the long run.

Large farmers have adapted, having financial power (weather stations, drones, satellite images).

The little ones, especially due to the past formation of conceptions, are reluctant, especially the elderly.

All the factors involved want to develop this concept

Trends:

- Extending the period of production of fresh products, in solariums, greenhouses.
- Development of the irrigation system
- Advanced technologies for plant protection during flowering
- Introduction of intelligent mechanization and robots
- international experience exchanges
- the market of these products will develop due to their quality and environmental conservation
- association for experimenting with new technologies and products
- Creating successful Cooperatives

There are great interests at the level of mature industries in the field of chemistry, energy that slows down the process but the first steps are taken.

Romania can become an organic garden of the planet, due to the exceptional pedological and climatic conditions, the harmony that exists between natural factors of plant growth and due



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to the fact that intensification, chemicalization and industrialization have not had much time for development yet.

There are already organic solutions as an alternative to current chemicalization and prices are starting to be affordable.

It is very important that all attention is focused on the land, soil fertility being the main means of production in agriculture, a soil in which micro fauna and microvegetation are protected, to create harmonious biosystems, to finally obtain a healthy and fertile soil.

There should be experimental lots in which to test the various technologies in order to provide verified practices for farmers.

Economic development, creation of local producers by providing zonal Romanian varieties.

Product traceability by setting up companies that guarantee this.

Promoting the best graduates from educational institutions to be employed in motivating positions of state institutions in order to thaw the current situation.

Generous funding will be allocated in the right direction regarding the major climate changes, now there are accentuated preoccupations in the academic environment and a good communication is needed for Romania to integrate at the level of a civilized country in the EU. It is known that the priority for agriculture is irrigation and the first urgent investment would be the completion of works on the Siret - Baragan irrigation system.

Due to the fact that the world's population is growing, organic farming with extensive production must be very carefully controlled to ensure food needs and here is the role of research to propose solutions, new plant species, new organic inputs, fertilizers and plant protection substances.

Parliament needs to be connected, the legislative framework needs to meet the needs of society, the United States has already announced that it is re-entering the Environmental Protection Program, especially due to the increasing incidence of diseases such as cancer, which occurs at an increasingly young age, constituting a signal of noise for the way we produce food. The causes must be very well researched and counteracted.

There should be strategies and research topics funded on a long-term basis and not on the period between elections.

There is a need for the education and research environment to be well funded, rewarded and provided with all the conditions for development, as the results will return with a major positive impact on solving current climate and health problems.

3.2 Background analysis

In Romania, over time, a political intention and an awareness of the fact that climate change and pollution will have a strong and negative impact on agriculture has emerged, which is why a series of strategic and political documents for prevention, mitigation or counteracting the effects:

1. Romania's national strategy on climate change 2013 - 2020

The national regulatory framework of the sector includes normative acts that refer to: the vegetal sector, zootechnical and alimentary industry, phytosanitary control, rural development, but also to the good agricultural practices and the financial support instruments promoted so far have supported the implementation of some measures. aimed indirectly at reducing GHG emissions in this sector.

2. Romania's National Strategy for Sustainable Development 2030

Through this strategy, Romania establishes its national framework for supporting the 2030 Agenda and implementing the set of 17 SDGs. The strategy supports Romania's development on

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three main pillars, namely economic, social and environmental. The strategy is citizen-oriented and focuses on innovation, optimism, resilience and confidence that the state serves the needs of every citizen, in a fair, efficient way and in a clean, balanced and integrated environment.

3. NATIONAL STRATEGIC PLAN 2021-2027

General Objective 1. Promoting a smart, resilient and diversified agricultural sector that ensures food security

General Objective 2. Strengthen actions to protect the environment and those against it

climate change and its contribution to the European Union's environmental and climate goals

General Objective 3. Consolidation of the socio-economic structure of rural areas

CROSS-CURRICULAR OBJECTIVE To promote knowledge, innovation and digitalization in agriculture

4. National Rural Development Program (PNDR) 2014-2020

Starting with 2007, with Romania's accession to the European Union, in addition to the obligations deriving from the status of Member State, Romanian farmers were able to benefit from some similar rights with European farmers. Among these, an important role was played by the funds addressed to agriculture and rural development, an important component of these funds being the financial allocations of the measures from the National Rural Development Program (PNDR) 2014-2020.

5. The National Program for Rehabilitation of the Main Irrigation Infrastructure in Romania

6. Guide to good agricultural practice for mitigating the effect of climate change on agriculture

7. CODE OF GOOD AGRICULTURAL PRACTICES, IN THE CONTEXT OF CURRENT AND PREDICTABLE CLIMATE CHANGE

8. GUIDANCE ON ADAPTATION TO THE EFFECTS OF CLIMATE CHANGE

3.2.1 CSA actual conditions

GHG emissions in 2010 in the Agriculture sector accounted for approximately 52.80% of emissions recorded in 1989, according to data provided in the National Inventory of Greenhouse Gas Emissions - INEGES 2012), respectively about 17.70 million tons, compared to 37.5 million tone.

At the same time, the emissions coming from the agriculture sector represented in 2010 a weight of about 14.28% of the total GHG emissions of Romania, excluding LULUCF.

At the level of the European Union, GHG emissions from agriculture have a share between 2% and 26% in total emissions, with an average of approx. 14% of the total.

In Europe, agriculture is the most important source of emissions of nitrous oxide - N₂O and methane - CH₄. 24

Anthropogenic emissions from agriculture are estimated with a high degree of uncertainty because agricultural activities involve a wide variety of biological processes that lead to natural GHG emissions.

Although many aspects of climate change are associated with certain levels of uncertainty such as causes, effects, forecast and the like, climate change is undoubted and requires urgent action.

Therefore, it is imperative that Romania take appropriate measures to reduce the impact of climate change on its territory and to protect the population from the negative effects of climate change.

The climate change adaptation component of the current strategy provides a strategic direction for action at national level and does not constitute an action plan itself. Its role is to substantiate the principles that will underlie the development of action plans and programs at



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sectoral level, to establish general and specific objectives to be achieved through future measures and actions established according to the specifics of each sector.

During the first decade of this century, Romania faced a series of extreme meteorological phenomena, which determined both the production of floods and the appearance of dry areas:

- a) in 2005 - the historical floods produced on the inland rivers, caused both the loss of 76 human lives and great material damage;
- b) in 2006 - the historical floods that took place on the Romanian sector of the Danube as well as the floods produced on the inland rivers caused, again, important material damages;
- c) in 2007 - the worst drought in the last 60 years.

In Romania, the areas affected by drought have expanded in recent decades and the most affected areas are those located in southern and southeastern Romania. In the last 30 years throughout the country, the effects of increasingly frequent and extensive droughts in time and space are being felt. The production of extreme weather and hydrological phenomena, floods and droughts have the effect of both loss of life and significant economic losses in all sectors of activity, such as agriculture, transport, energy supply, water management and the like, and global climate models indicate that the frequency and intensity of these events will increase. Taking into account the forecasts mentioned above, adaptation to the effects of climate change will be an important element in Romania's national policy on climate change and in the development of the country in general. As the extreme weather and hydrological phenomena that have occurred over the last decade and caused numerous floods, prolonged periods of drought and heat waves are considered by more and more specialists as the result of climate change, policy and adaptation measures will be addressed. with increased responsibility in the future.

Adaptation requires action at all levels - local, regional, national and international - and in all sectors. At European level, policy on adaptation to the effects of climate change started in June 2007 with the initiative developed by the European Commission through the Green Paper - Adapting to climate change in Europe - possibilities for action by the European Union, followed in 2009 by the White Paper - Adapting to Climate change: Towards a framework for action at European level.

The European approach emphasizes that the sooner the adaptation to the effects of climate change is addressed, the lower the costs of limiting the negative effects of climate change.

The European Commission currently intends to integrate adaptation into all climate change policies and will present, in 2013, the EU Adaptation Strategy with general recommendations for all Member States. 36

3.3 Research limitations

Being a study at the beginning of the project, it only aimed to answer general questions regarding the implementation of the CSA concept, being based only on public information and survey tools.



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4. State of art of organic farming and sustainable agricultural practices in Romania

4.1 Country-specific conditions for sustainable agriculture implementation

Sustainable agriculture involves:

- increased productivity
- economic profitability
- food safety
- environment protection

It is a process oriented towards achieving a precise goal rather than a set of well-founded and strict agricultural practices, the means of obtaining the final products depending on many variable factors, climate, relief, socio-economic conditions, etc.

In conclusion, it is assumed that through agricultural practices we protect the environment and obtain healthy products in profitable conditions.

In order to obtain healthy final products, we can think about reducing / eliminating pollution, using synthetic chemicals in plant protection and stimulating them, respectively providing nutrients necessary for growth and development.

From this point of view, we can say that due to a deficient capitalization, most Romanian farmers do not have the financial power to use chemical fertilizers excessively, which is also proved by the fact that the resulting GHG emissions are compared to Western Europe.

The following information was taken from the public document:

NATIONAL STRATEGIC PLAN 2021-2027

Romania has a very valuable dowry of soils not yet eroded, polluted or exploited intensively, good quality waters and a favorable climate for cultivating most plants necessary for human consumption.

4.1.1 The soil

The soils in Romania are of good quality but due to climate or anthropogenic factor they are subject to a greater or lesser degree of erosion.

Thus, the share of the erosion risk area is above the EU average of 6.7%, being 9.7%.

But there is a polarization of this process at the level of regions, the rate being moderately low and high only in certain specific areas of Cluj, Botosani and Iasi.

Some of these risk areas are under land improvement contracts, around 1%.

The water erosion activity produces effects at an average level of 2.86 to / ha / year close to the EU one.

The factors that can limit soil erosion from an agrotechnical point of view are the existence of crops that protect the soil such as permanent grasslands established on 34% or multiannual crops, present on 2%.

In addition, there are policies to promote and stimulate soil protection on 5% of areas through agri-environment and climate commitments, being beneficial for water resources and air quality, reducing GHGs and promoting the accumulation of carbon in the soil.

4.1.2 Waters

Romania has a wide variety of water resources but they are unevenly distributed, with very high variability during the year and ensure a relatively low flow.

The most important water resource for irrigation is the Danube river with a water volume of 85 billion m³ of which 30 are used.



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The other inland rivers together rise to the level of the Danube and the groundwater has an accessibility of less than 10%.

The good news is that most of the water quality is good.

Water quality is strongly influenced by anthropogenic activity and especially by agricultural technologies that use chemical synthesis products with a high degree of water pollution.

In Romania the use of synthetic fertilizers is well below the EU average as follows:

- Nitrogen 7kg / ha compared to 51 kg / ha EU
- Phosphorus 1kg / ha compared to 2kg / ha EU

A risk factor, however, is the raising of animals in households, which can not be conditioned and kept under control with effects on soil and air pollution.

The pollution effect is even lower as farmers practice and cultivate nitrogen-fixing plants (legumes), a significant growth phenomenon, especially due to the incentives provided by APIA for the ZIE measure.

From the point of view of water availability for agriculture, there is a decrease after the change of the political regime in 1989, the old irrigation systems being destroyed. In the past, they provided the optimal water needs in all areas affected by the drought, but from the pacts they presented a series of disadvantages that have now proved decisive.

The very high cost due to high electricity consumption and very high losses on the transmission system, made the use of irrigation water on these systems difficult to maintain and expensive led to the abandonment by farmers to use the water available in irrigation canals.

The area related to BSB in Romania is frequently exposed to the drought phenomenon and so far the irrigations have been viable on a small area below 2%, especially in Braila County.

Regarding the field of irrigation, at RO level it was decided to support this important sector in the practice of agriculture, by providing free water on the main irrigation canals owned by ANIF, based on Law 138/2004.

In the next period, given the rehabilitation of existing irrigation systems, based on the best available technologies, an increase in water demand for irrigation is expected. Thus, it will continue the process of rehabilitation and modernization of the irrigation system in areas with water shortages and where crops are affected by drought and desertification, respecting the principle of non-deterioration of the good condition / potential of surface and groundwater bodies.

4.1.3 Air quality

4.1.3.1 Reducing ammonia emissions from agriculture

The sources of air pollution in agriculture are the improper management of manure, the spread of manure and grazing, respectively the gas emissions resulting from the application of inorganic fertilizers.

There is a decreasing trend of total ammonia emissions from agriculture in the EU, but it is slightly increasing since 2013. In general, emissions in Romania are quite stable since 2010, reaching 147.1 thousand tons of NH₃ per year in 2016. total from agriculture, respectively a share of emissions from agriculture in total ammonia emissions of 87.8%, the EU 28 average being 3,611.1 thousand tons, respectively 92.3%. Between 2015 and 2016, Romania recorded a 2.4% decrease in NH₃ emissions from agriculture in total annual ammonia emissions.

Romania is advanced in reaching the targets for NH₃ emissions for 2020 (-13% compared to 2005), as set by the NEC Directive and is not far from meeting the target for 2030



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4.2 National Capacities

4.2.1 Land resources

According to the INS data, it is observed in the distribution of land (figure 21) that the arable area occupies an important place in the area, the cereal and industrial crop having a special importance in local agriculture.

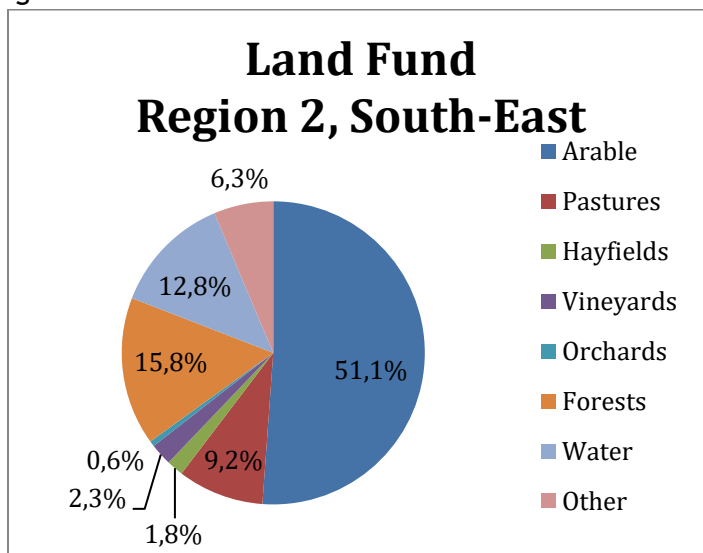


Fig. 19

South - East	Surface	Percent
Arable	1,829,009	51.1%
Pastures	329,195	9.2%
Hayfields	63,809	1.8%
Vineyards	83,799	2.3%
Orchards	20,752	0.6%
Forests	565,821	15.8%
Water	456,730	12.8%
Other	227,055	6.3%
	3,576,170	100.0%

Table 10 Land fund distribution *[3]

4.2.2 Institutions and important factors involved in Romanian agriculture

Source: MADR

League of Agricultural Producers Associations in Romania

Romanian Farmers Club for Performance Agriculture

ROMANIAN FARMERS ASSOCIATION

APPR (Romanian Corn Producers Association)

Union of National Branch of Cooperatives in the Plant Sector

Agricultural Payments and Intervention Agency,

Associates:

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1. BIO ROMANIA Organic Agriculture Operators Association
2. Romanian Association for Sustainable Agriculture
3. EcoR Partner Association
4. National Federation of Organic Agriculture
5. The Association of Bioagriculturists in Romania "BIOTERRA"
6. Romanian Bioaviculturists Association - BIOAVIROM
7. Romanian Association of Applied Bioagriculture - Family Ecological Farm
8. Association of Bioagriculturists of Moldova "BIOMOLD"
9. Proecological System Association

Public institutions financed entirely from the state budget which are subordinated to the Ministry of Agriculture and Rural Development:

Mountain Area Agency

State Domains Agency

Agricultural Payments and Intervention Agency

National Agency for Fisheries and Aquaculture

National Agency for Animal Husbandry "Prof. Dr. G. K. Constantinescu"

Authority for the Administration of the National Anti-Hail and Precipitation Growth System

Public institutions financed from own revenues and subsidies granted from the state budget which are subordinated to the Ministry of Agriculture and Rural Development:

National Phytosanitary Authority

National Agency for Land Improvement

Agency for the Financing of Rural Investments

National Office of Vine and Wine Products

State Institute for Variety Testing and Registration

Central Laboratory for Wine Quality Control and Hygiene

Central Laboratory for Seed and Planting Quality

County and Bucharest agriculture directorates - decentralized public services

Territorial inspectorates for the quality of seeds and planting material-deconcentrated public services

Other structures financed from own revenues subordinated to the Ministry of Agriculture and Rural Development:

County pedological and agrochemical studies offices.

4.3 Existing policies and instruments for funding

The information presented below was taken from the public document:

European Parliament, Fact sheets

The common agricultural policy has been financed over time from a single fund, the European Agricultural Guidance and Guarantee Fund, which was replaced on 1 January 2007 by the European Agricultural Guarantee Fund (EAGF) and the European Agricultural Fund for rural development (EAFRD).

Mission and priorities

The European Union's rural development policy was introduced as the second pillar of the CAP during the so-called "Agenda 2000" reform. It is co-financed by the European Agricultural Fund for Rural Development (EAFRD) and regional or national funds.

The EAFRD's mission is to contribute to the implementation of the Europe 2020 Strategy (EU strategy for growth and jobs), by promoting sustainable rural development.

Global priorities have been set for rural development policy:

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- promoting the competitiveness of agriculture;
- ensuring the sustainable management of natural resources and climate actions;
- achieving the balanced territorial development of rural economies and communities, including the creation and maintenance of jobs.

These main objectives correspond to the following six EU priorities for rural development policy:

- restoration, conservation and consolidation of ecosystems that depend on agriculture and forestry activities;
- restoring the potential of agricultural production affected by natural disasters and catastrophic events and establishing appropriate prevention measures;
- development of agricultural holdings and enterprises (start-up aid for young farmers, non-agricultural activities in rural areas, etc.);
- basic services and modernization of villages in rural areas (broadband infrastructure, cultural activities, tourist facilities, etc.);
- setting up producer groups and organizations;
- maintaining agricultural practices that make a favorable contribution to the environment and the climate and encourage the necessary changes in this respect (agri-environment and climate measures). The introduction of these measures in rural development programs is mandatory. Commitments should not be limited to mandatory rules;
- subsidies for organic farming (payments for conversion or in favor of maintaining organic farming practices);
- payments related to Natura 2000 and the Water Framework Directive;
- payments for areas facing natural or other specific constraints;
- encouraging cooperation between actors in the agricultural and forestry sectors and those in the food chain sector (creation of centers and networks, operational groups of the European Innovation Partnership on Agricultural Productivity and Sustainability (EIP));
- "a set of risk management tools": insurance for crops, animals and plants; mutual funds for adverse climatic events, animal and plant diseases, pest infestations and environmental incidents;

Through the Common Agricultural Policy 2014-2020, Romania implements, starting with the year

2015, a new system of direct payments for farmers, which includes:

- A basic payment for farmers;
- Single area payment scheme (SAPS), consisting in granting a uniform amount / single payments per eligible hectare declared by the farmer, payable once a year and totally decoupled from production.
- A payment for farmers who apply agricultural practices beneficial to the climate and the environment (payment for greening): crop diversification, maintenance of permanent grasslands and areas of ecological interest - organic farming automatically benefits from this payment;
- Optional payment for farmers in areas facing natural constraints, to prevent the abandonment of these areas and thus ensure the continuity of agriculture;
- A payment for young farmers starting their agricultural activity: involves granting an annual payment to young farmers (who are not older than 40) who are entitled to a payment under the Single Area Payment Scheme;



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- An optional coupled support scheme for certain types of agricultural activities or for certain agricultural systems which are facing certain difficulties and which are particularly important for economic and / or social reasons.

Regarding the Rural Development Policy 2014-2020, the main priorities on which the Ministry of Agriculture and Rural Development (MADR) will focus on in the period 2014-2020 through the National Rural Development Program 2014-2020 (with a total Community allocation of EUR 8.016 million), are:

- Modernization and increase of viability of family farms by consolidating them and opening to the market and processing agricultural products;
- Encourage the installation of young farmers. Support provided during the current period of programming will be continued in the future, in order to rejuvenate the rural population and facilitating the farm modernization process. This support will be given in pairs levels: by payments per hectare, higher and by increasing the intensity of the non-reimbursable support;
- Creation / development of local infrastructures, including irrigation infrastructure as a precondition for the economic development of rural areas;

We can conclude that financial instruments and policies exist and within them can be found the specific CAS but not the desired size.

Therefore, through a long-term promotion of this approach and the creation of paradigms in this framework, specialized measures can be proposed to stimulate CAS practices.

For this, it will be necessary to coagulate some CAS promotion factors by disseminating the information, promoting it, offering models and applying it by farmers. They are supported by this new knowledge and expertise as well as by the infrastructure proposed by the Agreen project (consulting environment, expertise and association on the Internet, collection and sales logistics centers for CAS products) understanding that only through association they will be able to impose these goals. they will succeed through various associative forms to have an increasingly strong and determined voice in imposing changes towards a sustainable agriculture. Also, the Romanian state, through its strategies and policies, came to meet the solution of the confrontations expected in the future, at the level of intention, but there is an acute need for practical sense and the application in reality of the desideratum.

4.4 Domestic and international markets for climate smart agriculture

The information below was taken from the public document:

Source: <https://financialintelligence.ro/analiza-vanzarile-de-produse-alimentare-ecologio-au-atins-65-milioane-usd/>

4.4.1 Demand

Mainly we can refer to that sensitive request to the fact that the products should be healthy, their production should not involve pollution, and the activity should be in harmony with nature, which is currently fulfilled in organic farming, a concept that in Romania was assimilated equivalent to organic or organic in Europe.

In Romania, organic, ecological or organic products are mostly imported, over 75%.

According to media sources in Romania, the consumption of organic food is much lower than in developed Western countries, compared to 3.7 Euro compared to 270 Euro.

Immediately after the important political changes of the 90's but especially after the year 2000, Romanians were more and more preoccupied with a healthy lifestyle that involves, in addition to movement, the consumption of clean, nutritious food. The media also contributed to this by promoting them, inducing a fashion, approached especially by those with above average incomes.



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According to industry sources, sales of healthy food have reached 65 million euros, with demand growing by 30% in 2 years.

However, the percentage of sales of these products compared to the total volume does not exceed 2%.

Given the fact that the introduction of VAT reduced to 5% for these types of products to stimulate sales is expected to increase by 15-20% / year.

The market of healthy and nutritious products in Romania is far below that of the leading EU member states.

Germany has the most developed market for this type of products with sales of 9.5 billion Euro / year representing almost 10% of the total EU market.

Other examples are Denmark with 9.4% of total food sales, Luxembourg with 8.6% and Switzerland with 8.4%.

Price and availability are important for those interested in organic products. 55% of survey respondents said their interest in organic fruits and vegetables will not be affected by price, while 35% said they are willing to pay for organic products more especially for the percentage of organic vegetables and fruits. . Another study of a global retail network present in Romania shows that 8% of those interviewed are interested in buying "organic" products.

Ecological certification, i.e. the one that gives the comparator the security that a product is in accordance with its requirements, is important for consumers, 52% being concerned about this aspect.

Regarding the availability of products 61% of respondents prefer to buy in modern trade (supermarkets and hypermarkets) while 59% believe that such products are in the markets.

Modern retail is the main channel through which sales of organic products develop; the national networks of these players in the retail market are the engine of sales growth to consumers and give them the availability of organic products. It should be noted that all foreign players present in modern retail promote organic products.

On average, the basket of a consumer who also buys organic products is substantially higher than the basket of a non-organic consumer and for this reason retailers will support the promotion of such products.

The total area used for organic production has increased from about 182,706 hectares to 258,471 hectares.

4.4.2 Offer

The production and consumption of organic food in Romania has followed a positive trend in the last decade, but the growth in this field is still very small compared to the European average.

Thus, between 2010 and 2017, the total area used for organic production increased from about 182,706 hectares to 258,471 hectares, according to a study published in 2019; this growth has been helped by the consumption trends of Western European markets, which have become a customer for some of the local producers.

At the same time, the number of environmentally authorized operators has increased from over 3100 to over 8400, with improved access to technical information. However, organically cultivated areas represent only about 2-3% of the total cultivated area in Romania and is one of the lowest among EU Member States, well below the EU average of about 7%.

4.4.3 Competition

The areas cultivated with organic cereals and organic industrial crops are the most important, of 84,926 hectares, respectively 72,388 hectares in 2017. In the same year, the organically harvested plants registered an impressive growth of over 40%, up to 20,350 hectares. The areas

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cultivated with permanent crops of vineyards, fruit trees and walnuts also exceeded 10,000 hectares.

Among the largest organic grain growers in Romania are: Orgapic (over 3600 hectares), Agricola Alba (over 3600 hectares) and Emiliana West Romania (over 2000 hectares).

Other companies active in the production, processing or distribution of organic food are:

Primagra is a manufacturer and exporter of sea buckthorn fruits

Ecofruct collects organic berries, medicinal plants and mushrooms in the flora of the Carpathian Mountains in Romania

Apiprodex specializes in the production and processing of organic honey and apiary products

Premium Fruct produces organic fruit juices under the Profructta brand

Agri Mondo distributes organic cereals and organic oil seeds

Biochem Organics distributes organic agricultural products (wheat, barley, corn, sunflower, coriander, etc.)

According to analysts, Romanian organic agriculture remains based on exports, farmers wanting to take advantage of higher margins in export markets, a trend that is accentuated by the fact that the domestic market lacks processing facilities.

According to a USDA (United States Department of Agriculture) study, the main export markets for Romanian organic products are Austria, USA, Japan, Germany, France, Italy and Denmark.

Growing demand for organic food

The growth of the organic market in Romania in recent years is the result of various factors, starting with increasing the purchasing power of the population and continuing with better consumer information, growth and diversification of retail channels that offer organic food.

Increasing consumer demand and a limited variety of products on the domestic market lead to imports, especially for value-added products. According to industry sources, 80% of organic products sold in Romania are imported. The main suppliers of organic food are Germany, Great Britain, Italy, Austria, France and Spain, according to the same industry sources. The remaining 20% organic products locally consumed in Romania are milk, eggs, honey, rice and corn.

The value of sales of packaged organic food by category between 2012 and 2018 is presented in the table below, which is based on Euromonitor data (developed by the USDA study). Dairy products represent the largest category in terms of value, USD 7.4 million in 2017, which is twice as high as in 2012. Organic baby foods have grown at an even faster rate (+ 137%) , representing sales of USD 5.7 million in 2017.

According to the USDA study, the sale of packaged foods will increase by 45% in the next 5 years. Organic beverages accounted for sales of \$ 3.2 million in 2017, of which organic coffee and tea accounted for \$ 0.7 million, with the rest being organic soft drinks (fresh and concentrated). Organic beverage sales are expected to double in the next five years, according to the USDA study.

Modern retail is the dominant distribution channel for organic products

Modern retail is the dominant distribution channel for organic products, and its share has grown steadily in recent years, to 69% of sales in 2018 (according to Euromonitor data). In Romania, the large retail chains replicate the European trend of increasing sales of organic products. According to several industry sources, there is a lot of pressure on the Romanian subsidiaries of the large modern international retailers in order to increase the sales of organic food in their networks through an adequate and continuous promotion.

Large retail chains have created a separate section of organic products in their stores offering an ever-widening variety of organic products. Many retailers strive to position organic products

as affordable, to encourage customers to buy organic products, as price is perceived as the main barrier to consumption.

An analysis shows that hypermarkets have increased their share of organic food distribution from 23% in 2012 to 33% in 2018, while supermarkets have had a slower growth rate from 29% in 2012 to just over 30% in 2018. In 2018, discounters represented only 6% of the organic products market in 2018 (from 2% in 2012); This can be explained by the fact that their customers are much more price sensitive than those of the other two types of chains.

The USDA study considers that specialized organic stores are not yet widespread in Romania. It should be noted that the growth of the organic market is also occurring in the food services sector, some restaurants serve organic food in Bucharest and other large cities.

Both the studies we had access to and the profile sources indicated that the organic products market in Romania, although still at an early stage compared to those in Western countries, is connected to European trends in the sense that it will have significant potential. growth in the coming years.

Table 11 Dynamics of operators and areas in green agriculture. Source: MADR

An	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Number of certified operators in green agriculture	3,155	9,703	15,544	15,194	14,470	12,231	10,562	8,434	9,008	9,821
Total area in green agriculture [ha]	182,706	229,946	288,261	301,148	289,251	245,923	226,309	258,470	326,259	395,227

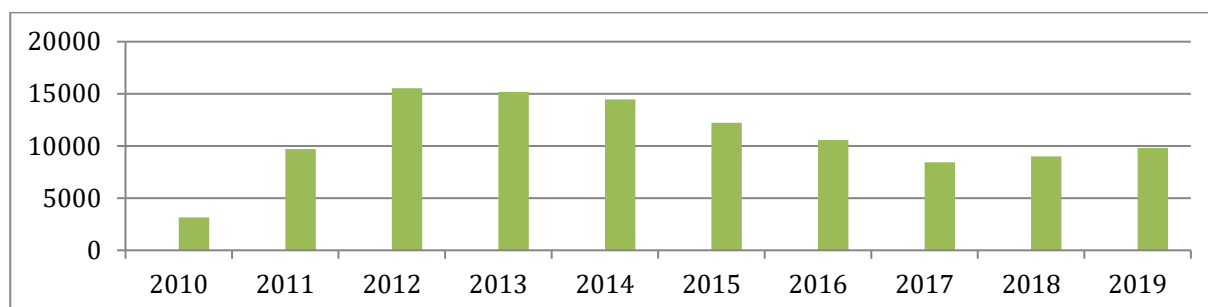


Fig. 20 Dynamics of operators in green agriculture

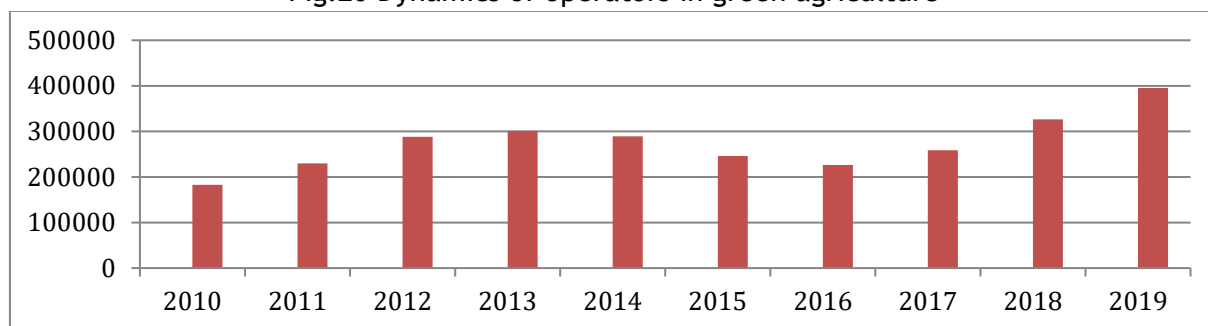


FIG. 21 Total area in green agriculture *[3]

There is an increase in areas cultivated with green technologies, so an increase in supply correlated with a maturation of operators who as a number had a maximum, followed by a decrease, their selection and now we are witnessing an increase.

Table 12 Organic crop areas. (Area under organic farming.% Of utilized agricultural area (UAA)).
Source: Eurostat

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Romania	0.7	0.8	1	1	1.2	1.3	1.6	2.10	2.06	2.09	1.77	1.67	1.93	2.43

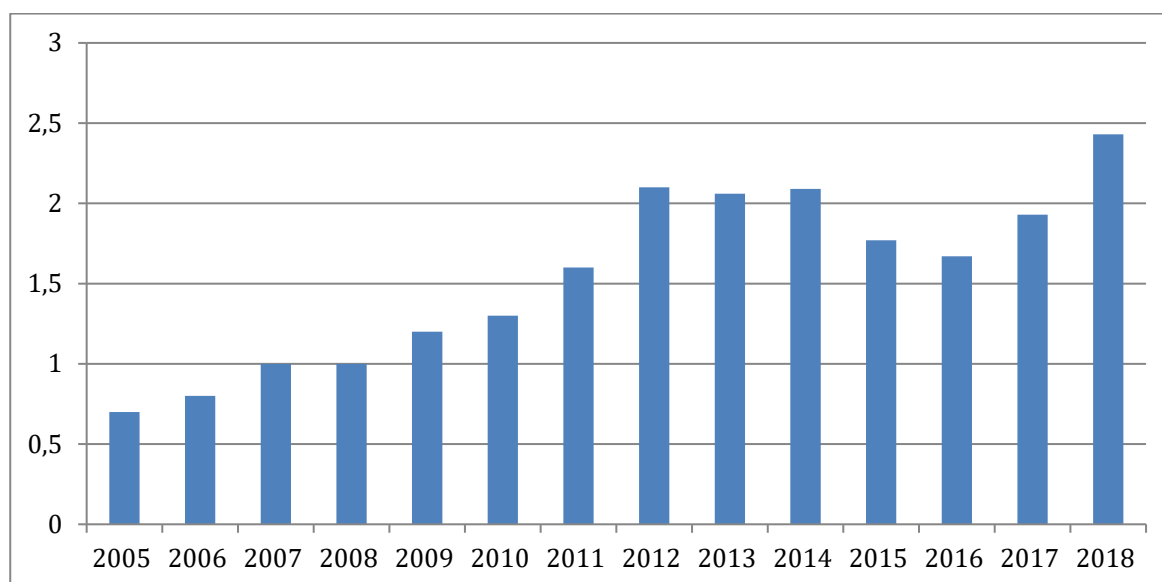


FIG. 22 Agricultural area used *[3]

4.5 Benefits of Climate Smart and Green Agriculture practices

1. Reducing pollution through environmentally friendly practices and the use of bio inputs, with multiple implications and mitigating the effects of pollution seen as the main cause for:

- climate change, respectively global warming
- water pollution with implications on the health of life on earth
- the incidence of diseases due to unhealthy diet due to the consumption of food produced in industrial conditions, intensively using synthetic chemicals

2. Restoration of soil fertility which has become in developed countries only a support for growth and support without having a supply of nutrition for plants, this being replaced by chemical fertilization

3. Restoration of living ecosystems through environmentally friendly agricultural practices and the use of organic pesticides. In this way the natural enemies of the pests are not decimated with them and can contribute to the regulation of their impact. By applying agri-environmental measures, we also intervene on protected areas for protected animal species, birds and insects, farmers being rewarded for their application. The environmental and climate measures of PNDR 2014-2020, both in the case of permanent natural and semi-natural meadows, and in the case of traditional orchards used extensively or arable land, promote the practice of agriculture which involves avoiding or limiting the use of heavy machinery and avoiding chemicalization. together with the application of the traditional agricultural techniques used (which are basically reduced to non-intensive grazing and the establishment of data and methods of mowing) will promote the maintenance of priority habitats and important species, the traditional cultural background and a use rational use of natural resources.



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4. Healthy food for the population, not necessarily more handsome but tastier and more nutritious than the variants full of chemicals and forced to grow in unnatural controlled conditions.

5. Renewable energy that can come from the intelligent use of waste resulting from agricultural activity, biogas, biomass, biofuel leading to a reduction in the use of conventional fossil fuels and nuclear energy, thus contributing to reducing pollution with adverse consequences for the environment.

6. Improving the quality of life through a cleaner environment, more jobs by promoting family businesses, increasing the motivation of young people to stay in villages and creating an attractive and healthy socio-economic environment.

Other benefits:

- availability of food with special quality and healthy nutritional properties;
 - restoration and maintenance of natural ecosystems as well as biodiversity, conservation and development of genetic diversity;
 - practicing on a wide range of biological cycles within agricultural technologies taking into account the living things of the soil, microflora / fauna and microorganisms;
 - improving the soil qualities as a nutritious environment for plants by using organic fertilizers, manure, vegetable waste, incorporated green crops, fertilizers made in oxen;
 - creating sustainable, renewable cycles in the use of energy by using natural and renewable resources in nature (wind, water currents, solar energy) as well as arrests in agriculture;
 - environmentally friendly practices that lead to an increasingly less aggressive impact, leading to the restoration of severely affected ecosystems and the creation of a healthy and safe environment for humanity.
 - efficient and intelligent use of water resources leading to the conservation of efficient drinking water reserves while avoiding the crisis of their depletion through intensive use practices, ex irrigation;
 - the development of ecotourism in the conditions in which the products consumed in boarding houses will be produced locally and organically and the environment will be healthy and clean.
- In conclusion, CAS agriculture, which is intended to be a green, sustainable agriculture, adapted to the climate and using the latest technology as well as the latest scientific knowledge from research centers, becomes an imperative alternative to replace industrial agriculture, strongly chemicalized.

It uses practices and algorithms adapted to the environment, with minimal impact or in harmony with natural ecosystems, thus ensuring the conservation, restoration of the destroyed ones and offering to the long-term future the possibility to attract healthy and fulfilled.

Sustainable agriculture will lead to the development of economic activities in rural areas, leading to obtaining financial benefits for the local population, respectively increasing living standards with modernization of infrastructure (water, electricity, gas, sewerage) and living conditions, reducing major differences in past and encouraging the rural population and especially the young people to stay here, satisfied with what the social and economic environment offers them, motivating and assuring them the satisfaction of a fulfilled life in the conditions of a healthy and clean environment.

4.6 Challenges before the implementation of CSA practices

The main challenges in the development of a sustainable agriculture type CSA that make the implementation of ideas and concepts to be achieved in agricultural practice are:

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- the half-century history of intensive and super-intensive technology with the exclusive use of pesticides and fertilizers produced in the chemical, synthetic industry
- national discrepancy between the different regions of the country in terms of investment and economic level
- accelerated process of worsening climatic and environmental conditions caused by scientific and industrial progress with the aggressive and uncontrolled development of polluting industries including the practice of industrial agriculture, with irrational exploitation of soil, its drying and declining fertility, industrialization and chemicalization of industry agri-food with exceeding the biological safety zone.
- leaving the rural area due to the lack of offers on the labor market and very low and inconsistent incomes, unsafe in agriculture by the middle-aged population and especially by young people causing major crises in the social and family environment in the rural area.
- poor funding and encouragement of research and education centers for the development, testing and dissemination of knowledge and practices of sustainable agriculture
- forgetting and disregarding the true traditional values of the villages and replacing them with those of industrial type of consumption and lack of respect for the environment
- the profitability at least in this phase of the sustainable agriculture that no longer necessarily proposes large quantities as the quality of the products, in organic conditions, implying higher costs and labor.
- due to the lack of information and training as well as due to the old conceptions of the past assimilated by the generation that now runs the farms, the producers are not interested in change and taking new risks that come with the decrease of winds.
- lack of investments in the field of irrigation, destruction of existing systems in the past, lack of perspective in this field in which only small businesses were made but without investment involvement.
- the non-existence of a cohesive system for taking over and processing the products produced in an ecological, sustainable regime, CSA leads to the lack of interest of the producers in orienting towards this type of approach. The products are obtained with higher expenses and if they are not found in the final price and in the availability of convenient and easy purchase, the producers give up making efforts in this direction.
- equipment that could apply CSA practices (0 tillage), with low steps in tillage, are expensive and generally large capacity at prices inaccessible to small and medium farmers, but also due to the association list in associative forms
- organic products fail to effectively cover and successfully replace synthetic herbicides,
- organic insecticides and fungicides are at the beginning of technology, sold in relatively small quantities so at significantly higher prices than synthetic ones.
- excessive fractionation of the agricultural area due to the existence of a large number of small agricultural holdings under 2 ha.
- the average area of a farm well below the European average, about 5 times smaller
- low productivity, low efficiency, low added value, low prices of primary agricultural products lead to insufficient income and abandonment of activity in agriculture especially by young people
- small farmers do not have access to funds and cannot afford modern technology equipment
- there are no local weather systems for analyzing, storing information and recommendations in farmers' decisions.



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- the historical opposition of farmers to unite in associative forms, as a result of the old legacy of sad memory from the communist period when the former CAPs were perceived as inappropriate.
- an insecurity and a high variability of the gains from the activity in agriculture due to the dependence of the production on the more and more adverse and variable climatic conditions.
- increased risks not compensated by the insurance system and legislation, correlated with the weak flexibility of farmers in risk management due to climate change and dependence on them.
- low appetite for knowledge and professional development among farmers over the age of 40, with a high share in farm management
- lack of local consulting and advisory organizations in the agricultural field
- low yield of activity in agriculture compared to the European average, 4 times lower
- the irrigation system destroyed and what has survived in precarious conditions, expensive to use and with little coverage of agricultural areas that would need to be irrigated, positioned in areas with drought or excessive drought.
- export oriented more on products with low or primary added value, which leads to a low yield of activity in agriculture
- relatively low productions for large crops compared to developed countries
- the average age of farm managers reluctantly advanced in introducing modern technologies and practices.
- difficult access to credit and lack of an entrepreneurial investment culture by using loans especially for processing
- the extension of the soil erosion phenomenon with landslides and desertification due to the lack of conservation and land improvement measures, respectively uncontrolled deforestation on sloping lands with potential for erosion and landslides.
- the lack of strategies for the promotion of local products, the lack of support in the formation of packaging centers and the processing of agricultural raw materials has led to a weak competitiveness of Romanian products on the world market
- low share of energy produced from renewable sources in the agricultural sector with a low degree of use in this sector of activity.
- agricultural practices still lagging behind, with aggressive tillage and large-scale transitions, intensive technology on large areas, conventional and less ecological
- the waste produced as an effect of the development of agricultural practices is not efficiently managed especially in small farms, having a large share in the total farms
- a large share of the agricultural area is under natural or area-specific constraints, resulting in a main feature of weather-dependent agriculture
- precarious information and low assimilation of knowledge by farmers regarding the production and use of renewable energy, respectively the adoption of those environmentally friendly technologies, adapted to climate and non-polluting
- an uneven distribution of water resources for irrigation
- renunciation, reduction as a share of the use in culture of local varieties and historically adapted to the climatic and environmental conditions of the area.
- migration of the population from the rural area due to low incomes, inefficient activity in agriculture, lack of support, pricing policy that disadvantages the producer and encourages the intermediary, insecurity and income instability due to weather dependence
- year-on-year increase in inputs not correlated with the prices of agricultural products leading to the increase of costs and to the reduction of farmers' benefits



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- Climate changes more and more visible with the worsening of the favorable growth conditions for the plants, with the accentuation of the extreme phenomena of drought and heat wave
- lack of interest of farmers due to poor training and high age for knowledge accumulation, access to training and specialization in order to form a new concept and strategy to address agricultural practices, new smart technologies, adapted to climate change and friendly with the environment.
- the negative effect on farmers' incomes of climate change, drought, extreme climatic phenomena of heat, storm and precipitation.
- migration of young people to cities that led to the slowdown in the introduction of the new in farms by maintaining the old practices and mentalities, respectively maintaining the management of elderly people on farms
- the inefficiency of the consulting services that could not have a positive impact in the activity of the farms by coming to meet the farmers at their farm and bringing in an accessible way the local knowledge.
- undeveloped infrastructure in rural areas has led to a slowdown in investments in the processing of primary agricultural products
- maintaining and encouraging large farms that exploit intensive land, with high-performance equipment, with little staff. using synthetic chemicals in fertilization and plant protection with negative impact on ecosystems and social life in rural areas
- Lack of manure management leads to increased GHG growth
- lack of interest of the authorities in encouraging and financing domestic research in the agricultural field, decapitalization of research institutes and migration of experience gained to multinational companies that control inputs.

5. Climate-smart agricultural practices and crop models in Romania

1. Name of the organization: SC AGRO GHEORDUNESCU SRL
Region of operation: Com Mereni, CONSTANTA County.



Fig 23 - Storage spaces

The company AGRO GHEORDUNESCU S.R.L. is a relatively young company that appeared on the local and zonal market in the field of cereal cultivation, the year of its establishment being 2003. The company started its activity with smaller works, but which through the quality of execution and the seriousness with which the contractual commitments with clients, have brought at least the trust capital to recommend it for new collaborations. The company's management understood from the first moment that one of the key elements of the operation of the processes is the adaptability to the market requirements. The company has adequate resources to be able to demonstrate that the products are made according to its quality objectives.

The company carries out its activity using an agricultural area of 1000 Ha, having as object of activity the cereal culture; transport, storage and trade in cereals; production, processing and marketing of certified cereal seeds for setting up new crops.

This activity is mostly supported by 4 permanent employees. The technical equipment of the company mainly includes 3 John Deer tractors with high capacities and powers, having at its disposal the whole range of equipment related to field work (combine harvesters, complex seed drills with single-pass field processing in stubble cultivators, spraying machines and fertilizer performance), 2 Combine harvester and high performance weeder manufacturer John Deer.



Fig. 24 - Modern equipments

The company practices large crop technology by annually establishing the following species of agricultural plants: wheat, barley, rapeseed, corn and sunflower.

Crop rotation is done using the following indicative distribution:

Wheat 40%, Barley 15%, Rapeseed 20%, Corn 10%, Sunflower 3%

Beyond these classic crops, the company is concerned with the introduction of new drought-resistant and profitable crops.

Thus, the chickpea culture was established on 7% of the surface, a culture that gives satisfaction in drought conditions. The sale is ensured by concluding firm contracts with companies that purchase chickpeas, produced relatively by the niche and with a market not yet covered.

As a technology, the practical society:

- environmentally friendly agriculture, minimum tillage and reduced crossings, using complex equipment that can execute multiple works at the single crossing
- use of GPS technology for the accuracy of the works
- fertilization in turn for both cereals and straws to optimize the quantities used

The average yields obtained are 6 tons for wheat, 7 tons for barley, 3.5 tons for rapeseed, 8 tons for corn and 2.2 tons for chickpeas.

Having the experience of practicing in the past and of the intensive intensive agriculture with the return of the furrow, the conclusion of the specialists from the farm is that the modern applied technology is sustainable and comes together with a series of major advantages:

- reduction of fuel costs, inputs and labor
- increases the service life of the equipment by reducing wear
- water conservation in the soil
- its preservation and even the improvement of the soil fertility

Although other farmers complain about the disadvantage of more complex and expensive weed management, experience on this farm has shown that there are no major disadvantages and they can be compensated. The company is determined to promote and encourage minimum tillage technology in the future.

As sources of financing, the company uses commercial banks and approaches to projects partially financed from European funds.



Fig. 25 Variety of wheat crops

2. Name of the organization Micul Agricultor SRL,
Representative name: Aezin Celzin
The operating region is Osmancea village, Constanta county



Fig. 26 Rapeseed harvesting

The company's staff consists of 28 employees on various levels of qualification and positions. The technical equipment consists of 4 125 hp Tractors, 4 Claas combines, the equipment related to the execution of the works in the field, TIR means of transport, storage spaces with a capacity of 15000 tons.



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Fig.27 & 28 High capacity agricultural machinery

The company exploits a large area of 3000 Ha on which it establishes crops of Barley, Wheat, Sunflower and Corn.

The crop rotation is balanced annually, the distribution of the cultivated area is indicative as follows:

30% Barley, 30% Wheat, 20% Sunflower and the rest of the surface is cultivated with Corn.

The average productions obtained are 8 tons for Barley, 7 tons for Wheat, 4 tons for Sunflower and 12 tons for Corn.

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The experience gained on the farm led to the conclusion that CSA brings performance by:

- Precision agriculture GPS, drones, management software
- minimum tillage
- wells for irrigation
- protective edging curtains
- adaptation of technology to optimal temperatures

The impact on the social and economic environment being very favorable, achieving constant productions, profit security, food for the population and jobs,

The financing sources are represented by the commercial banks and the European Funds by applying projects on the development measures in agriculture.

The difficulties and challenges facing society are bureaucracy and frivolous and low-skilled workforce.

As objectives for the future, it aims to bring responsible and motivated personnel from Asia and as a development, important investments will be made in irrigations based on the use of groundwater.



Fig 29 Barley crops

3. Name of organization: Cooperativa Agricola Dobrogea Sud
Name of representative: Bogdan Rosca
Region of operation :
South of Constanta county, Topraisar, Mereni, Cogealac, Tortomanu



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Fig. 30 Office

The cooperative gathers under its organization an area accumulated from the member farms and farmers of 20,000 Ha.

The staff that ensures the functioning and management of the cooperative's activities is constituted

out of 6 permanent employees.

The number of members represented by agricultural companies and farmers is 48.



Fig.31 Seed analysis

Cooperating members apply a modern technology in large culture ensuring the rotation and diversity of species according to the following indicative model: 45% Wheat, 15% Barley, 5% Rapeseed, 5% Corn, 20% Sunflower and 3% Peas.

The average productions obtained are 6 tons for Barley, 9 tons for Wheat, 2.5 tons for Sunflower, 6 tons for Corn, 1.5 tons for Rapeseed and 3 tons for Peas.

Pea cultivation is also used as an ameliorating crop to enrich the soil with humus and nitrogen.



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Fig. 32 Mash

They will apply CSA due to the impact of climate change, drought, heatwave.

The practices used in this direction are:

- delaying the sowing season by 2 weeks due to adaptation to climate change
- minimum works,
- precision agriculture using GPS technology for 30% of farmers
- software applications and crop / farm management for 10% of farmers, especially young ones.
- organic and ecological agriculture - 2 farmers

Organic technology is being tested on experimental batches of wheat for the feasibility of large-scale implementation, understanding that in the medium term they will have to do so due to the increasing ban on synthetic pesticides.

Organic farming is starting to gain momentum, prices have become affordable for both inputs and products.



Fig.33 Wheat experimental batches

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However, the perspective will be only medium-long term, especially.

It is desired to continue the activity in conditions of major climate change, drought, heat, heat wave, reduction of pollution and GHG generation and increase productivity in the application of smart agriculture.

The financing sources are represented by the commercial banks and the European Funds by applying projects on the development measures in agriculture.

As challenges can be mentioned:

- investments in CSA adapted equipment
- no tillage technology in dry areas does not convince due to diseases, pests, plant debris that accumulates in the soil.

CSA is already applied in 10% of farms and in the future will develop in the medium and long term due to climate pressure.

We want the emergence of communities of practice, financially supported government programs (precision, organic, ecological)

4. Name of the organization: PFA Stefanoiu Danut

Name of representative: Stefanoiu Danut

Operating region: Satu Nou, Tulcea county



Fig.34 - PFA Stefanoiu Danut - sunflower crop

The farm is small in size but due to this fact it can apply a technology more adapted to climate change and more attentive to the environment.

Exploits an area of 89 Ha in the family using as technical equipment 2 tractors (Fendt 120hp + JD 90 HP) + the set of equipment and Combine Lexion 420 Claas.



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Fig.35 - PFA Stefanoiu Danut - farm

The crop rotation is balanced annually, the distribution of the cultivated area is indicative as follows:

60% Wheat, 30% Sunflower or Rapeseed, 10% Corn and 5% Alfalfa for animals.

The average yields per hectare obtained are 4 tons for wheat, 2.5 tons for sunflower, 8 tons for corn and 300 bales for alfalfa.



Fig.36

- PFA Stefanoiu Danut, wheat

The area being with low precipitation, it is necessary:

- minimum tillage,
- low costs,
- narrowing of the optimal epoch
- use of GPS technology for fertilization and treatments,
- irrigation.

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"We try not to do agriculture according to the pattern, but to respect the requirements of the plants from every moment of the vegetation. We make decisions at the head of the field, as they say, because we have a small area and we can monitor it perfectly.

The costs are high for no tillage in terms of crop maintenance, at first it will be harder but over time there will be a balance of harmful predators that will regulate the situation. "

The financing sources are represented by the commercial banks and the European Funds by applying projects on the development measures in agriculture.

The challenges facing the farm are the purchase of specialized equipment and increased costs of pest control.

The desideratum in the future is for the research to ensure efficient solutions and practices, verified again encouraging farmers to do so through effective policies.

5. Name of the organization: SC Visan Martrans SRL

Name of representative: Visan Ion

The operating region is Tintesti locality, Buzau county

The company's staff consists of 4 permanent employees.

The technical equipment consists of 3 Tractors, 1 Claas combine, the equipment related to the execution of the works in the field.

The company exploits a large area of 500 Ha on which it establishes crops of Barley, Wheat, Sunflower and Corn.

The crop rotation is balanced annually, the distribution of the cultivated area is indicative as follows:

60% Wheat, 20% Sunflower and the rest of the surface is cultivated with Corn.

The average productions obtained are 5 tons for Wheat, 2.5 tons for Sunflower and 7 tons for Corn.

They trust the CSA approach and practice:

- low number of passes
- manure fertilization
- crop rotation

There is a belief that the CSA approach will bring safe and efficient production.

Additional financing in difficult times or in case of investments is provided by commercial banks.

The main desideratum in the further development of the farm are:

- irrigation from wells, water in the foreground
- electricity supply infrastructure
- investments in high-performance equipment

6. Conclusions

The CSA approach is in the incipient phase confirmed by the answers of the farmers, of the education and research units and of the administration:

1. Large farms with financial possibilities are already addressing the use of intelligent technology in the operation and management of farms

- use of GPS technology and associated maps for precision agriculture, sowing, fertilization, treatments at variable rates depending on the synoptic maps obtained when harvesting with drones or satellite

- the use of drones to obtain synoptic maps containing information on the state of culture, vegetation, diseases, pests.

- use of satellite information to obtain data on the state of soil supply and the state of vegetation, diseases, crop pests

- the use of communication channels provided by mobile telephony and data operators for the collection of field information related to weather parameters, soil humidity, soil temperature, air, wind speed, etc. information collected and used by farm management programs and by the decision center

- the use of state-of-the-art wireless sensors for collecting field data

- the use of automation systems for the control of the environmental parameters necessary for the plant growth

- using the management systems of the fleet of equipment and tractors with the registration of all parameters at the time of execution of agricultural works, area, amount of inputs used, amount of harvest, amount of fuel used, number of operating hours, etc.

- management and decision-making programs on the farm using all the data collected by the systems listed above.

- decision-making agriculture by creating communities in the field using the Internet and data networks. Here they can be informed, they can bring their contribution with their own experience, they can be advised by experts or research and education institutions.

2. Most farmers are affected by climate change, especially drought, global warming with unusually high temperatures in winter and extremely high, hot, summer, for longer and longer periods of time.

Their response as a local adaptation:

- modification of sowing seasons, later autumn for cereals by 2 weeks, to avoid the proliferation of foliar diseases and pests and earlier spring for weeding, in order to avoid the period of burning during pollination, respectively drought during development.

- soil works with minimum passages, with minimal interventions for water conservation in the soil and avoiding destructuring, soil erosion. This is within the limits of the possibilities of each farm to have access to specific equipment

- desires or projects initiated for the establishment of irrigation systems, Here are many difficulties, from very large investments unbearable by farmers in Dobrogea for example, to problems of farmers who want to revitalize the old irrigation systems but have blockages due to refusal to provide access by neighboring farmers, the lack of interest of farmers for collaboration.

Irrigation is the solution with the maximum weight of all farmers, it is the only truly salutary action to ensure a functional, long-lasting and hop-free agriculture. It is the ideal dreamed of



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by all farmers, promised by the authorities in implementation strategies but which remained in the office phase, each time the funds being redirected to other activities considered priority. There are farmers who have done their homework and have already initiated deep drilling projects to ensure irrigation water. The solution they saw was through their own efforts, they bought drilling equipment, have gone through all the necessary legal steps and are now in the implementation phase.

Others dream of resuming the Siret Baragan irrigation system project, but do nothing to associate and be a strong voice in defending the interests of farmers and ultimately practically for the construction of a sustainable agriculture with multiple resonances in all areas, especially social, to keep and continue this occupation that can bring healthy food to everyone's table. For existing irrigation systems, although water may be available on farms, operating costs are so high that they exceed profit, so farm managers give up these services.

It is discussed whether groundwater can be used in irrigation and whether this is allowed in the conditions of the drinking water crisis. Only in Romania is the problem like this, in developed countries it is difficult to irrigate exclusively with groundwater.

For example, under the Dobrogea plateau there are enormous amounts of water stored in underground lakes in the aquifer, at reasonable depths depending on the relief and the area of 80-250 m. This water is completely untapped by agriculture. Here it would be necessary to have a well-documented and realistic study (ie it is easy to ban the use of this water but responsible to look for a solution) to identify resources and exploitation solutions with the encouragement, advice of farmers to achieve that much desired desire to use irrigation.

Another option discussed is the use of inland running water to supply irrigation systems, rivers, the Danube River.

The most thorny issue occurs when it is necessary to create the infrastructure to bring water to the farm level in the form of canals, pipes. The investments are very large and a viable strategy is needed in which the Romanian state will initiate the start of this project.

Historically, it is found that the budget cannot support these investments and at a first analysis a year of drought or several years of drought which at the level of the country means the reduction of crops by 50%, does not justify the investment given that this production ensures domestic needs. The problem that arises is in fact social, abandonment of farms, migration of young people to urban areas and depopulation of rural areas. As with this aspect it is found that you can live, it does not bother the authorities, then we have reached this crisis in which if nothing is done it does not bother those who lead, and those affected resign, it is the sense that if you do nothing to those who should do something.

So at the moment we can not talk about irrigation systems as a share in the range of solutions to counteract the effects of climate change, let alone water management technologies, its optimal economic use, without waste with maximum efficiency and as a means of transporting substances. nutritious and curative.

If we were to refer to the way in which the state of Israel approaches the problem of agriculture, then we see that in the case of Romania it is not a lack of funds but a lack of vision and responsibility. Given that most land areas benefit from only 90 liters of rainfall annually, the soil is sandy, infertile, and groundwater is salty and warm, what can be less conducive to plant development? And yet the state of Israel is an exporter of vegetables, those cherry tomatoes on the New Year's table come from their solariums. They considered that agriculture has strategic importance for the population, made strategies, development plans, invested in infrastructure, research, encouraged entrepreneurs to invest in agriculture, facilitated / subsidized the necessary funds and the result is a miracle of human intelligence. Considers it



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appropriate to use solar energy to obtain energy and the fact that they do not need to heat solariums, treat salt water, recycle domestic and industrial water so that it can be used in agriculture or look for varieties that can use it directly (eg cucumbers, tomatoes and olives).), the soil is seen as a beneficial support in the sense that it does not favor the development of pests and all nutrients are transported by water managed in a super-intelligent way.

Here that a country with zero agricultural potential exports vegetables and fruits to Romania, the paradise of fertile soils imports 80% of the food needs. We complain that we don't have conditions ... They make food out of sand and they don't care about food at all.

Another solution would be to use the local genetic potential, well adapted and tried for hundreds of years in local conditions, a potential that has been neglected and is now on the verge of extinction.

There are conservation efforts in gene banks in Suceava and more recently in Buzau where kind people try to collect, preserve and disseminate these varieties. Here there are concerns about genetic analysis of varieties with the discovery of valuable genes that can be used to create new varieties better adapted to new climatic conditions.

Yes, there are concerns from farmers, especially at the organizational level for organic crops, testing organic technology on experimental lots of wheat for the feasibility of large-scale implementation.

We can also discuss the concerns of farmers and research centers to address other cultures than the classical ones, thus increasing biodiversity.

One can speak of relatively small areas of lavender with the probing of technology, fruit bush crops, raspberries and especially blackberries, roses, medicinal and aromatic plants, strawberry and fruit tree nurseries, mushroom, root and vegetable crops. These efforts fall within the area of moving interest in large-area crops with low incomes / m² to smaller areas, easily irrigated and with very advantageous incomes / m².

Why aren't these ideas addressed? Because it is easier for us to practice the safe experience verified so far, we do not want to take the risk of change, we are not encouraged to do so, we are afraid of change.

After all, it is a matter of inner transformation rather than support from the authorities. Let's see that the solution to the problems is in us and the fact that we have not succeeded so far is due to laziness, convenience and fear of change and experimentation. That is why a solution would be to change this generation from farm management and bring young people to the forefront with foresight and vision, of course tempered by responsible counselors.

Here you can optimize a lot but again the vision intervenes, the strategy to create a friendly development environment. What would that mean? First of all, access to easy and convenient markets directly and easily without many intermediaries.

It mean:

- creating organizations such as cooperatives for processing and selling products. It is necessary, because the vast majority of farmers do not have large areas and the small productions obtained fail to justify large investments in machinery, processing, packaging and sales.
- as it is desired in Agreen the creation of environments of exchange of experience and consultancy for concrete and very applicative farmers with models of cultures and turnkey technologies.
- encouraging farmers to approach these crops and supporting the purchase of equipment through European funds in collaboration.



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7. Recommendations

The analysis of the data considered by this study shows that the practices approached in CSA in Romania are already implemented, but at an incipient level. So:

7.1 Manufacturers

Smart agriculture is practiced by most large and very large farms, with financial resources available and being interested in maximizing profits, increasing production and reducing costs with the following results:

- the use of software applications in farm management, which use an integrated sensor system for making correct decisions and satellite images as well as those collected by drones
- the use of GPS systems for precision agriculture with variable rate of input quantities using previously collected maps regarding the previous crop and the fertility status of the soil
- investments in local weather stations related to the farm and more the creation of a network for farms located in several counties, the data collected being managed by analysis programs that offer warnings and recommendations related to environmental conditions.

- all large farmers are thinking of investing in an irrigation system or already have one, rainfall being the big problem in the area

All farmers are aware that climate change is already very important and affects the activity on the farm and their great pain regardless of the size of the farm is the lack of water or its uneven distribution over time, ie it does not rain when needed.

Both the authorities and the farmers are aware of the danger and the crisis that is intensifying and there are signals at the management level that it will move from plans, strategies to facts, because the effects are already very visible.

Sustainable and green agriculture is found in Romania, especially in the form of organic agriculture, which has gained new areas of culture every year, more and more farmers being interested in this approach, also seen in terms of fiscal facilities and encouragement by allocating non-reimbursable European funds.

Input prices have started to be reasonable and comparable to synthetic ones due to the increase in volume of their use, they are becoming easier and more convenient.

The acquisition of ecological products as well as infrastructure and organization begins to take shape the farmers who decide to take the step towards ecological have a place to place their goods.

7.2 Consumers

They are encouraged to consume organic and ecological products by introducing special stands in supermarkets as well as by projects initiated by distribution networks such as the Carrefour Vărășt Agricultural Cooperative in which a financially and educationally supported associative development environment is created.

7.3 Administration

The Parliament and the Government of Romania have developed over time long-term strategies to counter climate change, encouraged and made available to farmers non-reimbursable funds for investments in this regard.

Unfortunately, the strategies have remained at the project level and the funds are absorbed with great difficulty.

7.4 Research and education centers

In Romania, faculties and departments of ecological agriculture were established.



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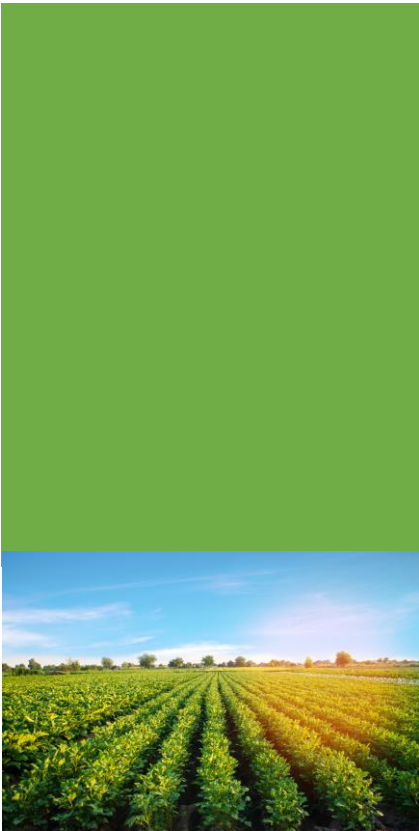


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Joint Operational Programme Black Sea Basin 2014-2020

“Ovidius” University Of Constanta

April 2021

Joint Operational Programme Black Sea Basin 2014-2020 is co-financed by the European Union through the European Neighbourhood Instrument and by the participating countries: Armenia, Bulgaria, Georgia, Greece, Republic of Moldova, Romania, Turkey and Ukraine.

This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of “Ovidius” University Of Constanta and do not necessarily reflect the views of the European Union.