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**WATER RESOURCE MANAGEMENT ELEMENTS FOR FOOD  
SECURITY, IN THE CURRENT GEOPOLITICAL CONTEXT OF  
ROMANIA 2022**

**MANCIA Mircea Sebastian\***  
**POPOVICIU Gabriela A.\*\***  
**PAINA Liliana\***  
**MANCIA Aurora\***

\*Faculty of Civil Engineering, Cadastre and Architecture / Department of Cadastre / University of Oradea / Oradea / Romania

\*\*Faculty of Environmental Protection / Department of Agriculture-Horticulture / University of Oradea / Oradea / Romania

**Abstract:**

A state has national security when it ensures the security and food safety of its citizens. Agriculture, with its sub-branches: plant and animal breeding, agricultural products processing industry, producer-to-consumer distribution networks, can be one of the basic sources for the development of national potential. In Romania there is a high degree of dependence and vulnerability regarding climatic conditions and water resources. From a hydrological point of view, on the territory of our country, we find an uneven distribution of the water resources necessary for the population, industry and agriculture. The food security of a state - from our perspective, of Romania - can only be ensured by using all natural resources managed judiciously and with maximum efficiency. The elements that influence food security in the 21<sup>st</sup> century, in general, are: global warming, desertification, land degradation, climate changes with increasingly accepted dry periods: to these are added elements specific to the years 2021 and 2022, such as: the liberalization of prices at energy, the COVID-19 health crisis and the war waged by Russia in Ukraine.

*Key words: structural measures; natural resources; hydrological drought; water resources; water management forecast;*

## **1. Introduction**

In the current geopolitical context, with climate changes, the health crisis caused by the COVID-19 pandemic and the war caused by Russia in Ukraine, the development of agriculture in Romania represents a chance to ensure national food security [8]. The total area of Romania is 23.8397 million ha. According to the Provisional Results of the 2020 Agricultural Census [2], the agricultural land is 13.3 million ha. Of these, 62.5% is arable land, 29.9% natural meadows, 4.4% tree plantations and vines. It is estimated - according to the National Institute of Statistics (NIS) - Agricultural Census/2010 - that 92% of Romania's surface is rural: agricultural land, forests, localities and rural developments [1]. Agriculture, as the national natural resource, is made up of soil, water, climate factors and plant biodiversity. According to EUROSTAT, the rural population of



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Romania has a very large share, 44.9%, being the highest in the EU. However, there is a process of reducing the rural population by leaving for the urban environment or abroad. There is an accelerated demographic aging in these areas (villages).

## 2. The food crisis caused by climate change and price liberalization

The provisioned food crisis in the early years of the 21st century is increasingly present today [8]. The demand for food products is the result of some geopolitical factors, and the decisive element is the growth of the world's population far above the estimated figures. Consumption also changed from a qualitative point of view, especially in Africa and Asia.

The food shortage caused by climate change and the liberalization of energy prices is deepened by the war waged by Russia in Ukraine.

According to the statistical studies of the United Nations organization, worldwide, the prices of agricultural products increased by an average of 30-35% in May 2022 compared to May 2021.

Romania has a large food market, and from a financial point of view, it is the country that receives the sixth largest annual allocation in agriculture from the European Union. France, Germany, Spain, Italy and Poland received the largest allocations.

From the point of view of productivity in agriculture, this is modest compared to other EU member states (table 1).

EU member states	Direct payment	Market measures	Rural development	TOTAL
	1000 Euros	1000 Euros	1000 Euros	1000 Euros
Belgium	481.836	60.758	102.723	645.317
Bulgaria	781.855	18.386	338.990	1.139.231
Czech Republic	855.832	16.537	321.616	1.193.984
Denmark	814.070	12.212	151.589	977.871
Germany	4.768.123	117.256	1.394.589	6.279.967
Estonia	142.536	1.476	129.177	273.189
Ireland	1.201.194	59.338	312.570	1.573.102
Greece	1.982.609	59.445	698.261	2.740.315
Spain	5.125.093	599.856	1.183.394	6.908.343
France	6.909.823	550.551	1.987.740	9.448.114
Croatia	317.338	13.061	282.343	612.741
Italy	3.599.133	677.514	1.501.763	5.778.411
Cyprus	48.125	5.922	18.881	72.929
Latvia	277.306	3.048	161.492	441.846
Lithuania	480.492	3.344	264.151	747.987
Luxembourg	32.841	556	14.511	47.909
Hungary	1.266.719	40.211	486.663	1.793.593
Malta	5.117	344	13.859	19.320
Netherlands	666.190	22.583	147.976	836.749
Austria	691.597	22.298	567.266	1.281.161
Poland	3.402.201	25.553	1.187.301	4.615.055
Portugal	680.228	107.898	582.456	1.370.581
Romania	1.912.461	65.671	1.139.927	3.118.059
Slovenia	133.869	7.022	120.721	261.611
Slovakia	447.758	11.255	214.525	673.538
Finland	523.450	6.473	344.777	874.699



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Sweden	686.818	11.875	249.819	948.511
EU27_2020	38.234.612	2.520.441	13.919.080	54.674.132

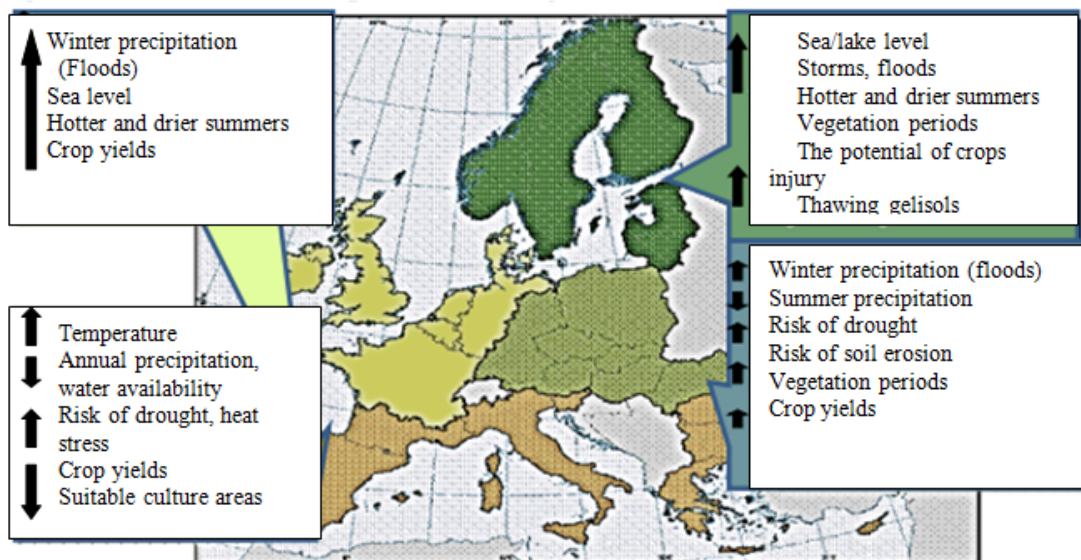
**Table 1** Amounts of subsidies received by European states [3]

Globally, the demand for food will increase by 70% until 2050, as a result of population growth, and in developing countries the demand for food will double.

Economic growth and population growth in countries such as Brazil, China or India will lead to the rapid urbanization of these regions: the need for food will also increase proportionally, that is, the global increase in food demand.

In Europe, the trend is towards the aging of the population. Romania is among the countries with negative growth from a demographic point of view - according to EUROSTAT statistics; this manifests itself more strongly in the rural population, that is, in those who work the land less and less physically, because agricultural technology is quite difficult to catch on in Romania.

Climate change will have an increasing impact on EU food security. There will be areas with water deficit, but also frequent floods and soil instability (fig.1).



**Fig.1** Projected climate effects in EU agriculture [3]

Compared to other EU countries, in Romania, the agricultural sector has a high weight in the economy, but labour productivity is still low (figs.2 and 3).



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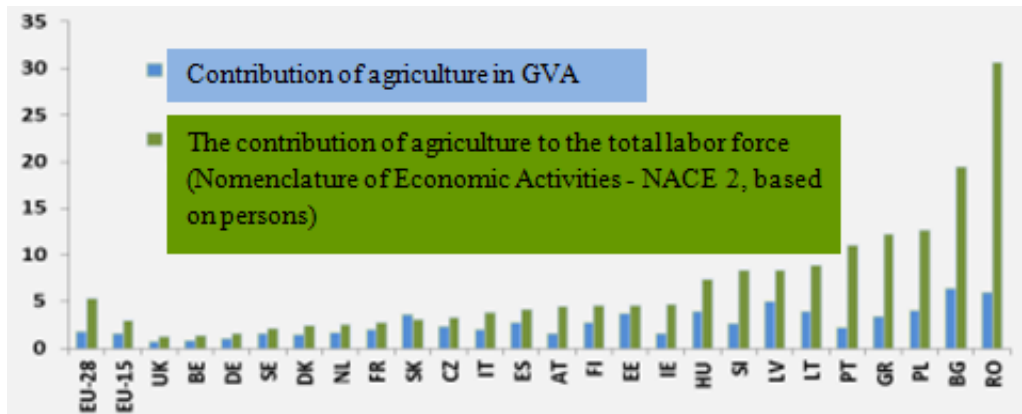


Fig. 2 Importance of agriculture in Gross Absolute Value (GVA) (percentage of total GVA and share in the total labour force, by CAEN categories in EU 28 countries - 2012) [1, 3]

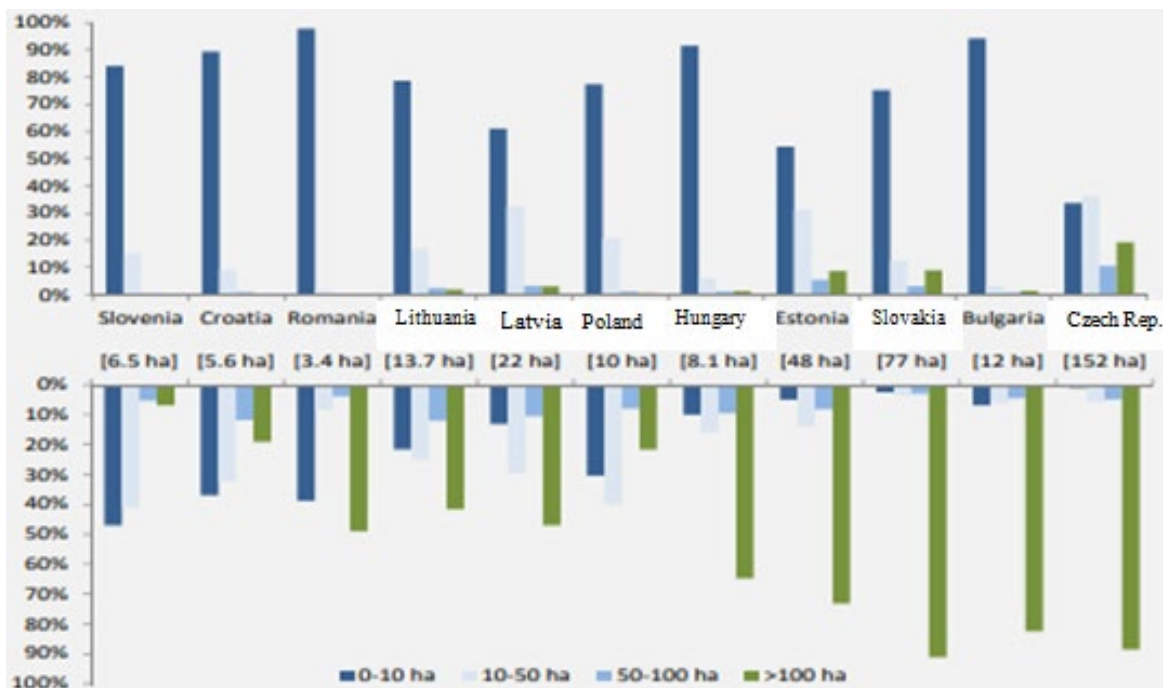


Fig. 3 Agricultural holdings (upper panel) and agricultural land (lower panel): distribution according to agricultural size (percentage, 2010) [1, 3]

At the present time, it is required to ensure increasingly large quantities of agro-food products [6]. We believe that this is why Romania needs to move to a modern, intensive agriculture that depends less on climatic and meteorological conditions. The realization of the irrigation infrastructure would allow the increase in productivity in areas with a total lack of water or a partial water deficit.

The world water reserve has 96% salt water. Of the total fresh water, 68% is water stored in glaciers and 30% fresh water underground. The accelerated climate changes of recent years tend to modify these percentages by decreasing the volumes of fresh water.

Romania has fresh water and salt water resources.

According to statistical data published by the National Institute of Hydrology and the Ministry of the Environment, in an average year the water resources are 135 billion cubic meters





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from inland rivers, 1 billion cubic meters from natural lakes, 9 billion cubic meters from underground waters and 85 billion cubic meters from the Danube [4].

The water resources of the Black Sea present high desalination costs and it is difficult to achieve from a technical point of view.

In the last two years, it has been found that Romania's water resources may become insufficient compared to what is needed, in the conditions of extreme drought. This fact has negative economic, agricultural, social and environmental consequences.

Inland rivers are characterized by a variability of water volumes, in time and space.

The water resource must be evaluated interdisciplinary from the point of view of costs, the requirements of health protection, ensuring flows in agriculture and sustainable development.

Integrated water management is based on the principles of the Dublin Water Conference of 1991 [5]:

- Fresh water is a finite and vulnerable resource,
- The development and management of water resources must have a participatory approach of all factors,
- The economic value of water in all its uses efficiently, economically and in conditions of environmental protection.

The hydrological balance is disturbed by phenomena such as: cutting down forests, soil degradation, changing the flow regimes in the hydrographic basins.

Romania's water resources are limited in terms of quantity and quality. According to the monitoring, 57.5% of the water volumes are potable water, and 45.5% of the volumes are technically usable.

It is found that there is a high degree of dependence on the annual climatic conditions. And this is because recently extreme meteorological phenomena have increased, such as droughts, torrential rains, phenomena that represent challenges for agriculture in Romania.

The maintenance and operation of the existing irrigation systems is a way to make agriculture more efficient. According to the data published by the National Land Improvement Agency (ANIF), statistically the irrigated areas are shown as in the table below (table 2) [10]:

Area -ha-	2015	2017	2019	2020	2021	2022
Contracted area, ha	315.290	635.169	837.639	935.130	612.117	825.590
Irrigated area, ha	441.496	508.299	706.560	1.591.668	334.062	510.321

**Table 2** The irrigated areas, by reference years [10]

At the beginning of 1990, Romania had approximately 3.9 million ha of agricultural land arranged for irrigation. According to the data published by ANIF, the area of agricultural land prepared for irrigation in 2022 was 825,590 ha and 510,321 ha were irrigated until July 30, 2022. The entire country, about 75% of agricultural areas, was affected by moderate soil drought or extreme.

Drought is an extreme climatic phenomenon with periodic manifestation, characterized by the fact that a certain region suffers from a lack of water, often accompanied by heat waves.

Until July 20, 2022, 150,565 ha of agricultural land in 20 counties were affected, according to information sent by the Ministry of Agriculture; the data correspond to the records of damage



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assessment up to the respective date. Losses occurred due to unfavorable climatic conditions and the lack of an effective program to combat pedological and hydrological drought.

The prolonged lack of precipitation over a certain period of time causes deep drying of the soil and pedological drought occurs. Agricultural production is reduced and by depreciating the state of vegetation, the entire agricultural production can be compromised.

Hydrological drought refers to the lack of precipitation: water volumes decrease from natural streams - rivers - and from natural or artificial lakes. The underground water reserves are also decreasing.

Irrigations have the role of completing the water deficit in the soil during dry periods. The choice of the watering method is made depending on the water source, the water quality, the soil texture, the culture to be irrigated.

Until 1990, sprinkler irrigation was used as a watering method, with high energy costs and large volumes of captured water, on large surfaces, and with large amounts of residual water.

Currently, the land owners have small and sparse areas, which make irrigation difficult. By modernizing the old irrigation systems and upgrading, part of the water deficit can be filled [7].

In 2022, Romanian agriculture faced extreme climatic phenomena - such as drought.

Irrigation arrangements were reclassified as works of public utility, by Government Decision (GD) no. 988/3 August 2022.

Art. I of the previously mentioned GD provides: "Recognition of the character of public utility for irrigation facilities or parts of irrigation facilities [...]"

The lack of rains in semester I/2022 negatively affected agricultural crops in our country. Because of this, the European Commission's agriculture specialists have reviewed the forecasts for wheat, barley and rape crops with percentages down from 15 to 25% compared to 2021.

It is found that the rehabilitation of existing irrigation systems and the construction of new ones that ensure the water requirement in periods of climatic calamities are essential in the current world geopolitical context.

The amount of precipitation in June 2022 was below 10 mm, according to the National Meteorological Agency (ANM). Compared to the average precipitation from 1991-2020, the deviation of precipitation values was negative in the current year (according to ANM - Information).

According to the advanced research by the Euro-Atlantic Center for Resilience (E-ARC) [11]: "our country is not in danger of going through a deep food crisis, like other vulnerable states of the month; Romania can capitalize on its enormous agricultural potential. "

Our country can and must participate in strengthening European resilience by:

- increasing the production capacity;
- the expansion and modernization of irrigation systems;
- the development of own storage capacities of agricultural products;
- the development of own capacities for processing food products from all categories.

### **3. Conclusion**

In the context of the war in Ukraine, it can be seen that inflation is increasing at the same time as economic growth is decreasing.

According to the Financial Times [9], the estimate of the impact of the war in Ukraine is presented as follows in the table below (fig. 4):



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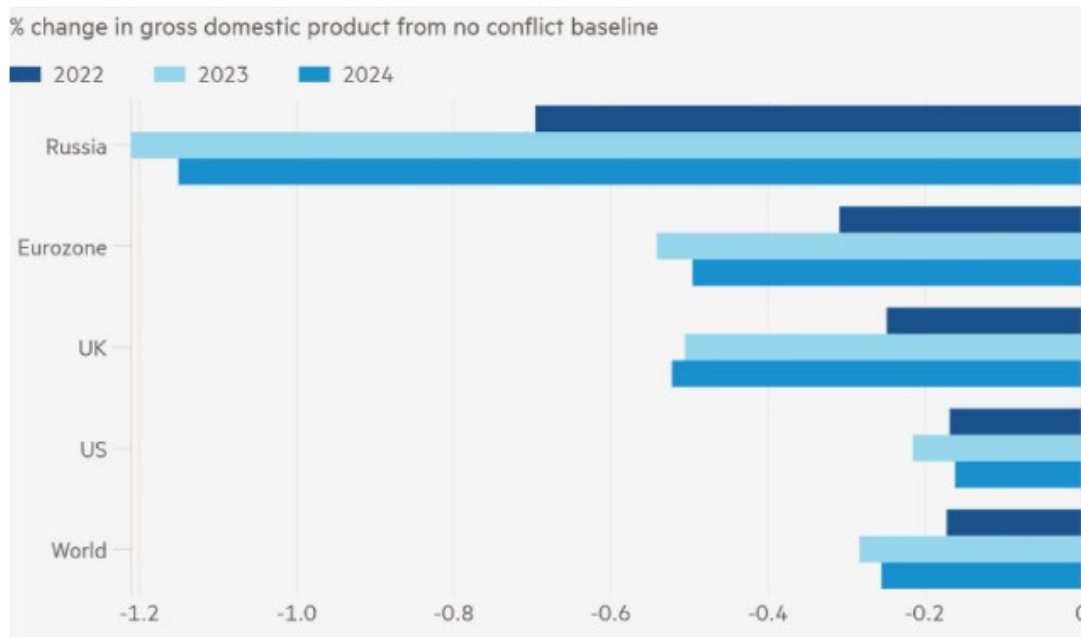


Fig.4 The estimated impact of the war in Ukraine for global economic growth [9]

Romania became the leader in the export of cereals with the explosion of international cereal prices. The food crisis that the UN anticipated with the growth of the world's population and climate changes, started much earlier than the initial estimates.

The rehabilitation and expansion of the infrastructure for the irrigation of agricultural surfaces will result in:

- increasing the competitiveness of Romanian farmers,
- ensuring the necessary water in the conditions of climate change,
- ensuring the food security of the country's citizens,
- the application of modern methods to achieve energy savings and expenses as low as possible in its execution and exploitation.

Irrigation reduces the dependence on climatic, hydrological factors and geopolitical conditions existing at a given time.

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