

THE EVOLUTION OF THE DESERTIFICATION PHENOMENON IN ROMANIA IN CONNECTION WITH CLIMATE CHANGE

Slave Camelia¹ 

DOI: <https://doi.org/10.31410/EMAN.2021.421>

Abstract: *The purpose of this study is to ensure a model using GIS technologies to reduce the negative consequences of the drought and to propose redevelopment of irrigation and growing plant species adapted to the climatic conditions in the study area. Such model is presented in form of three maps: hypsometric, relief and CLC. The maps can provide important information for the investigated area, and it is a useful tool for analysis of the possibilities of cultivating agricultural lands affected by the desertification – drought. Data from the National Institute of Statistics for the period 2015-2019 were also used.*

Keywords: *Desertification, Drought, Land use.*

1. INTRODUCTION

Desertification is the phenomenon that affects land in arid, semi-arid and dry areas. It is mainly caused by climate change and human activities. Desertification does not refer to the expansion of the existing desert. This is because dry ecosystems, which cover more than a third of the globe's surface, are extremely vulnerable to overexploitation and inappropriate land use. Poverty, political instability, deforestation, overcrowding and inadequate irrigation practices can undermine land productivity. [7]

The desertification, according to American Heritage Dictionary, represents:

“The transformation of arable or habitable land to desert, as by a change in climate or destructive land use”. And drought “A long period of abnormally low rainfall, especially one that adversely affects growing or living conditions”. [8]

World Day to Combat Desertification and Drought is marked annually on June 17th.

This day has been marked since June 17, 1995, to draw attention to the need to stop or slow down the desertification process and to mitigate the effects of drought, as established by the UN General Assembly by Resolution 49/115 of 1994.

At the same time, this day is an opportunity to promote the implementation of the United Nations Convention to Combat Desertification (UNCCD), the only legally binding international agreement linking the environment and development to sustainable land management.

This Convention includes 195 states whose collective effort is to improve the situation of the exposed population to areas affected by drought, to maintain and repair soil productivity and to mitigate the consequences of drought.

On the Day of Desertification and Drought on June 17, 2020, the focus was on changing the public's attitude towards the leading driver of desertification and land degradation: humanity's re-

¹ University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Mărăști Blvd, Bucharest, Romania

lentless production and consumption. According to UN Convention to Combat Desertification, globally, one fifth of earth's land area – more than 2 billion hectares – is degraded, including more than half of all agricultural land.

“If we keep producing and consuming as usual, we will eat into the planet's capacity to sustain life until there is nothing left but scraps. We all need to make better choices about what we eat and what we wear to help protect and restore the land.” Ibrahim Thiaw, Executive Secretary of the UN Convention to Combat Desertification [7]

The effectiveness and efficiency of preventing and combating desertification activity of the drought and land degradation phenomena depends largely on the existence of a legislative and institutional framework to meet the needs of those involved in this activity.

The main normative acts that directly or indirectly address these aspects are:

- Law no. 24/1994 on the ratification of the United Nations Framework Convention on Climate Change, signed at Rio de Janeiro on 5 June 1992;
- Law 58/1994 for the ratification of the Convention on Biological Diversity, signed at Rio de Janeiro on 5 June 1992;
- Law no. 111/1998 on Romania's accession to the United Nations Convention to combat desertification in countries severely affected by drought and/or desertification, especially in Africa, adopted in Paris on June 17, 1994.

The convention objective is to achieve sustainable development in areas affected by drought and desertification through cooperation and combined actions at international and regional level, and in accordance with the provisions of Agenda 21;

- Law no. 3/2001 for the ratification of the Kyoto Protocol to the Framework Convention of the United Nations Convention on Climate Change, adopted on December 11, 1997;

2. MATERIAL AND METHODS

The materials used in this study are the topographical map of Romania at 1: 25000 scales, processed through scanning and geo-referenced into the stereographic projection system 1970 and digital elevation model (DEM) with a resolution of 30 m. The DEM was downloaded free from (www://geo-spatial.org) and all used vectors were downloaded free from (<http://www.opengis.org>). [3] [5]

The first map is the hypsometric map that shows the distribution of relief in the studied area (Figure 1). The map was created from DEM with the ArcGIS 10.5 Program.

Study Area, Dolj County is the most arid area in the country, being considered the only European desert, with a rare fauna and flora and frequent sandstorms [1].

Dolj County is located in the south-southwest area of Romania, stretches between 44°00' and 44°30' north latitude and 22°00' and 23°00' east longitude, being crossed from north to south by the river Jiu, whose name it bears – Doljiu, meaning Jiul de Jos (in Romanian). The total area of Dolj is 7.717 km² and represents 3.1% of the country's surface and is bordered by Mehedinti counties in West, Gorj and Vâlcea to the North, Olt in East and the Danube River to the South, with a length of about 150 km. This distance is part of Romania's natural border with Bulgaria. The county's relief includes the Danube meadow area, the plain and the hill area, benefiting from a mild climate with an annual average of 11.5°C.

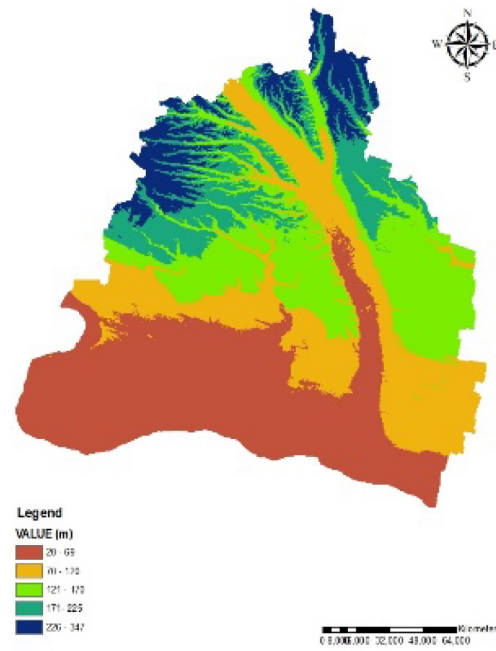


Figure 1. The hypsometric map of the study area

In Dolj County the altitude is 30-350 m above sea level and the variation is from south to north. The relief appears as flat steps that rise in the pyramidal shape from the Danube meadow to the Amaradia Hills. In the south of the county, there are the largest sandy surfaces in Romania, along with many lakes formed by the Danube overflows or by rain accumulations. (Figure 2)

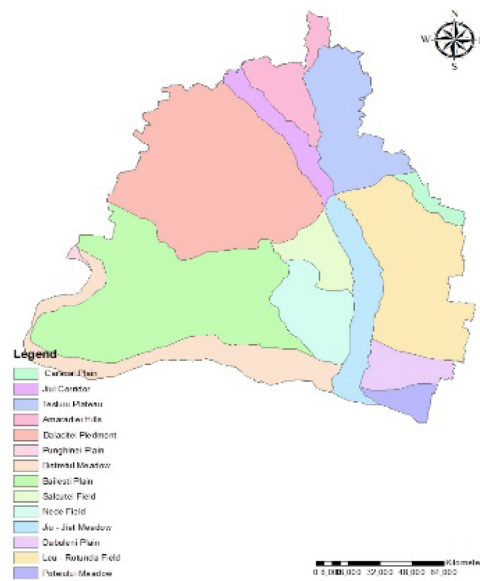


Figure 2. The relief map of study area

On the lower terrace, in the Danube Meadow, the Calafat-Rast and Bechet-Dăbuleni sector, affected by sand accumulations, there is a mosaic of soils with slight domination of sandy chernozems. The class of undeveloped soils, present in the Danube and Jiu meadows, is grouped in alluvial soils, which in many parts have evolved into alluvial chernozems. In the Danube Meadow, the presence of sandy alluvium and wind-blown sands determined the predominance of sandy soils in different degrees of evolution, as well as unsolved sands. Five percent of Dolj's soil is desertified.

The CORINE Program was established by the European Commission to create a harmonized Geographical Information System on the state of the environment in the European Community (Figure 3). [2]

CORINE Land Cover 2000 (CLC) is a source of spatial data that was produced by photo – interpretation, the images provided by Landsat ETM+. These data are widely used in monitoring and evolving the geographical space both urban and rural. [4]

In figure 3 is represented CLC – Dolj, and from the analysis most of the studied territory represents unirrigated land areas.

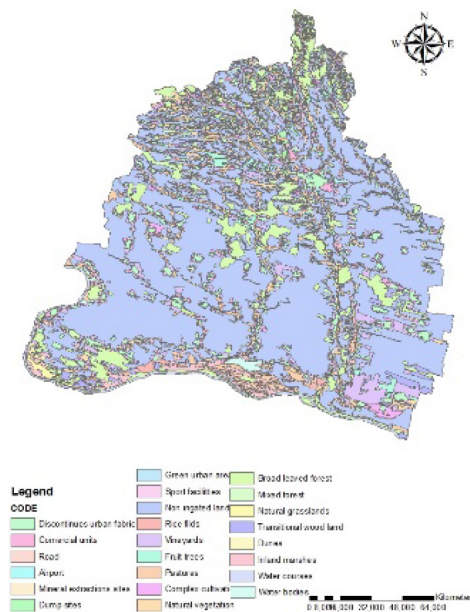


Figure 3. The CLC map of study area

Drought is mainly a meteorological problem, which depends on the level of precipitation, but its intensity depends to a considerable extent on the soil characteristics of the affected territory. Thus, the effects of drought can be intensified with the loss of part of the water from precipitation on soils with a reduced capacity of water retention (sandy, skeletal or low-thickness soil profile soils), with low permeability or compacted, or located on sloping terrain. The effect of drought can also be reduced by the presence of shallow water, supplementing it with the amount of water accessible to plants. Drought can be operationally defined as the state of water deficit in relation to the needs of the population and of the branches of the national economy, which create discomfort and disruption of socio-economic activities, as well as negative impact on other environmental factors. [9]

In Dolj County the total arranged surface is 314931 ha; for the landscaped agricultural surface there is a decrease from 299581 ha in 2015 to 299572 in 2019. At the irrigated area there is a constant increase starting with 2019. [6]

Table 2 shows the production per hectare for the period 2015 – 2019 of different agricultural crops. The table specifies the most important agricultural crops in this south Romania. It is noted that during this period there is an increase in production in the private sector and in individual agriculture holding.

Table 1. The arranged irrigation works area and irrigated agricultural area

Land improvements	Land use	Macro-regions, development regions and counties	Year				
			2015	2016	2017	2018	2019
			UM: Ha				
			Ha	Ha	Ha	Ha	Ha
Irrigation arrangements – total	Total landscaped area	Dolj	314931	314931	314931	314931	314931
-	Landscaped agricultural	Dolj	299581	299579	299577	299574	299572
-	Arable land	Dolj	280780	280778	280776	280773	280771
Agricultural area effectively irrigated with at least one watering	Landscaped agricultural area	Dolj	7475	5256	13763	18518	17679
-	Arable land	Dolj	7475	5256	13763	18518	17679

Source: Romania's Statistical Yearbook, 2015, 2016, 2017, 2018, 2019

Table 2. Cultivated area with the main crops, by ownership forms

The main agricultural crops	Ownership forms	Counties	Year				
			2015	2016	2017	2018	2019
			Kg/ ha				
			Kg	Kg	Kg	Kg	Kg
Total grey	Total	Dolj	3319	3357	4510	4521	4491
-	Private forms	Dolj	3310	3355	4510	4525	4492
-	of which: Individual agricultural holdings	Dolj	3132	3122	4531	4539	4359
Corn grain	Total	Dolj	3471	4025	6856	7779	6332
-	Private forms	Dolj	3467	4027	6862	7794	6333
-	of which: Individual agricultural holdings	Dolj	2977	3681	7197	7220	5683
Sunflowers	Total	Dolj	1659	1697	3027	2765	2946
-	Private forms	Dolj	1661	1693	3036	2773	2947
-	of which: Individual agricultural holdings	Dolj	1558	1435	3757	2902	3363
Rapeseeds	Total	Dolj	2336	2605	2724	2148	1856
-	Private forms	Dolj	2338	2604	2721	2178	1845
-	of which: Individual agricultural holdings	Dolj	1783	2555	2812	2155	1390
Watermelons and yellows melons	Total	Dolj	22662	27538	28786	34521	30835
-	Private forms	Dolj	22662	27538	28785	34521	30839
-	of which: Individual agricultural holdings	Dolj	22556	27536	28852	34609	30834

Source: Romania's Statistical Yearbook, 2015, 2016, 2017, 2018, 2019 [6]

3. CONCLUSION

Based on the data and facts presented in the paper, the following conclusions and recommendations can be drawn:

The major problem in Dolj County is land degradation, subject of natural and anthropogenic factors. The largest unproductive areas are in the south Dabuleni, Calafat and Bailesti. The solution would be to afforest them with acacia species;

A significant increase in non-agricultural areas as a result of the removal of some lands from the agricultural circuit, was registered in Dăbuleni, a locality with specificity in watermelons cultivation;

The agricultural lands located in the southern part of Dolj County manifest a strong water and drought deficit.

REFERENCES

- [1] Achim E, Manea G., Vijulie I., Cocos O., Tărlă L., (2012) Ecological reconstruction of the plain areas prone to climate aridity through forest protection belts. Case study: Dăbuleni town, Oltenia Plain, Romania, *Procedia Environmental Sciences* 14 pp. 154 – 163
- [2] Yilmaz R. (2010) Monitoring land use/ land cover changes using CORINE land cover – a case study of Silivri coastal zone in metropolitan Istanbul, *Environmental Monitoring and Assessment*, Volume 165, pp. 603 -615
- [3] [www://geo-spatial.org](http://www.geo-spatial.org)
- [4] <https://land.copernicus.eu/pan-european/corine-land-cover/clc-2000>
- [5] <http://www.opengis.org>
- [6] <http://www.insse.ro/cms/>
- [7] <https://www.unccd.int/actions17-june-desertification-and-drought-day/2020-desertification-and-drought-day>
- [8] <https://www.ahdictionary.com/>
- [9] https://proceedings.esri.com/library/userconf/proc06/papers/papers/pap_2346.pdf