The Drought Phenomenon in the Moldavian Plain

Abstract

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The purpose of this research aims to assess the drought phenomenon, which is characterized by high frequency and duration in the Moldavian Plain. Although the impact of the phenomenon is far from disastrous on subsistence communities, as it used to be in the past.

Drought is a complex climatic phenomenon, with progressive manifestation. According to the United Nations Convention to Combat Desertification (1994), "drought means the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems".

Drought is primarily dependent on the presence of a type of atmospheric circulation which does not favor rainfall, in a time in which it is not typically present, or has a frequency, duration and intensity above than that of a normal period. Specific types of weather are generated, characterized by the absence of rainfall, mainly due to the predominance of anticyclones. Besides the prolonged lack of rainfall, there are other factors such as accessible water reserve to plant roots, air and soil temperature, actual evapotranspiration, wind speed etc. Drought also depends on local factors that define the subiacent surface (relief, the presence or absence of the forest, natural vegetation type, vegetation coverage, the presence of surface water, soil characteristics, groundwater depth). Plant physiology (plant type, growth stage, resistance to dryness), factors that define human influence on the environment (crop fields, agricultural technique used) are important as well. This paper presents the drought phenomenon taking place in the atmosphere, while other types of drought have been occasionally approached. Drought intensity has been determined by the length and frequency of droughts. The main climatic parameters taken into account are the absence of precipitation and air temperature.

The approach to drought phenomenon in the Moldavian Plain involved the use of two types of data:

- *qualitative data* obtained from chronicles, articles from the "Romanian Bee", the first Romanian language newspaper in Moldova, and other historical documents. They provided an overview on drought before the establishment of the meteorological network in Romania by Ștefan Hepites in the late 19th Century. For more recent times, data provided by the present-day mass media, the

statistical yearbooks, publications relevant to the subject, and data from the Department of Agriculture, has been used.

- *quantitative data* obtained from the direct measurement of the meteorological elements and phenomenas at the weather stations and gauge stations in the studied area and the surrounding areas, some being published in the Meteorological Annals and Bulletins, and, the since 1973, from various sources: the Moldova Regional Meteorological Centre, the Prut-Bârlad Water Administration and the ROCADA database: Romanian daily gridded climate datasets (1961-2013). The data has been processed through a series of indices to reveal spatial and temporal distribution, frequency, intensity and tendency of droughts in Moldavian Plain. I usually analyzed the period of time since 1961, the year when weather observations started to take place four times a day.

"The Drought Phenomenon in the Moldavian Plain" is structured into seven chapters, the theoretical aspects are justified and demonstrated by the 16 tables and 199 figures.

The Moldavian Plain, also known as the Jijia Plain is a subdivision of the Moldavian Plateau, located in the North-Eastern part of Romania, having an area of approximately 8000 km^2, a length of 160 km and a width of 40-60 km. It is a hilly region, with broad valleys and gentle interfluves, sometimes as large bridges at a general level of 150-250 m.

Plain Moldova lies in a transitional climate between the temperate oceanic, typical for Western Europe and the temperate continental specific to Eastern Europe. Being positioned to the east of the Carpathian Mountains, at the eastern extremity of the continental temperate climate, places the study area under the influence of climate aridity (Bogdan, 1983). From the bioclimatic point of view, the study area lies in the forest steppe zone. The hydrographic network is sparse, consisting of rivers mostly originating in the hilly area surrounding de plain, or inland, with low flow, and belongs entirely to the Prut river basin.

In the Moldavian Plain, the phenomenon drought is endemic, behaving like in all forest steppe/steppe regions. This thesis is a pragmatic approach to the phenomenon, summarizing previous research and using longer time series. Since it is a complex phenomenon, its assessment is based on the use of indices, mostly of those well known to Romanian climatology.

The indices and methods used for assessing droughts generally take into account the abnormal rainfall (according to Hellmann criterion, Angot Index and Standardized precipitation index) or the ratio between the precipitation and the temperature, or evapotranspiration, known as aridity indices (de Martonne, Seleaninov, Gaussen, Walter-Lieth, Hârjoabă, Soroceanu). Special cases are the Topor rainfall index, which takes into account the relationship between rainfall and the number of days with precipitation, and the Nedealcov dry periods index (the relationship between temperature and relative humidity).

Summarizing, some important conclusions arise from the assessment of the drought phenomenon in the Moldavian Plain: a growth trend in the average annual sunshine at the Botoșani and Iași weather stations, the mean annual temperature has increased on the territory of the Moldavian Plain, the number of days that are part of dry spells in Iași has increased (according to the Hellmann criterion), dry decades alternating with less dry decades (according

to the Gaussen xerothermic index and the Walter-Lieth climate diagrams), an intensification of aridity in Botoșani and Iași (according to the Nedealcov dry periods index).

To combat drought in agriculture, measures such as cultivating species depending on water requirements are recommended; selection and amelioration of plants for the production of drought-tolerant hybrids; the efficient use of the arable layer so that it can store as much water from rainfall as possible, and lose as little through evaporation as possible; measures to prevent soil compaction; retaining snow, particularly in the winters when it falls in smaller quantities; irrigation, used for lowering soil temperature and providing the plants with an adequate amount of water (in 2014, the irrigated areas of Botoșani and Iași counties were 20,325 ha and 51,681 ha).