# DROUGHT IMPACTS ON AGRICULTURAL PRODUCTIVITY IN DOBRUDJA

**Marius LUNGU[1], Liliana PANAITESCU[1], Anca ALBU[1], George CRACU[1], Simona NIȚĂ[2]**

*[1]Ovidius University Constanța, Faculty of Natural and Agricultural Sciences Constanța, b-dul Mamaia nr. 124*
*[2]Banat's University of Agricultural Sciences and Veterinary Medicine, Faculty of Agricultural Sciences, Timisoara,*
*Corresponding author: dumilungu@yahoo.com*

***Abstract:*** *As climatic risk or risk associated complex, drought is characterized mainly by the absence of rainfall, increased sun exposure, soil and air temperature, increased evapotranspiration process, helping reduce air and soil moisture and, therefore, to reduce the pool of productive moisture in the root system of the plant, which causes wilting crops to reduce agricultural production and even to affect the total harvest, if not taken necessary measures to combat water scarcity in irrigation. In this way, the phenomena of drought and climate hazards are drought trigger environmental hazards that affect both agricultural production and the whole geographical environment, including public health. This paper aims mainly to know both the climatic features of the drought but its implications in agriculture Dobroudja. It also is intended as a warning to a careful monitoring of crops as well as for finding the best means of defense against the risk of atmospheric phenomena. In preparing this study were analyzed weather data from the period 1965-2005 the main weather stations Dobroudja (Constanta, Mangalia, Hârsova, Cernavoda, Adamclisi, Medgidia, Sulina, Chilia Corugea, Horia, Jurilovca, Gorgova, Tulcea, Mahmudia). In this study it was examined for the first time in the territory of Dobroudja, the distribution of indicators (standardized abnormal index, standardized precipitation index), highlighting areas within the risk and the action may be taken to prevent being of real help for farmers Dobroudja*
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***Key words*****:** *Dobroudja, drought, productivity, risk*

## INTRODUCTION

The risk factors and climatology aspects in Dobroudja (including drought), have been researched on papers written by D. ȚÂȘTEA etc. (1967), I.F. MIHĂILESCU (1986, 1999, 2001), BOGDAN OCTAVIA (1978, 1996,1999), S. CHIULACHE AND NICOLETA IONAC (1995), CR. PALTINEANU etc. (2000), M. LUNGU (2009).

Water consumption of plants is soil water loss through evapotranspiration. If the balance between consumption and water supply plant is broken in a period without rain, and there is a depletion of soil water reserves, then reach a period of drought, damaging crops especially when the period is longer.

In doing so, may refer to climatic drought (rainfall deficit compared with the normal rainfall - the average during the period considered), the soil (moisture deficit in relation to field water capacity, the upper limit of moisture available) or plant (saturation deficit against water content, according to turgidity or relative turgidity). The concept of drought often involving harm the living beings, since metabolic activity is not exercised only at a sufficiently high level of hydration of living structures. For a deficit of 50% moisture, vital condition of plant tissues is slowed. For dried seed, moisture level falls below 10%. During the growing season, plant tissues can be destroyed when there is a significant and prolonged fluid deficit.

The effect of drought depends on the duration and extent, ie the climatic and soil water reserves and stage of plant development that supports this effect. A pedological drought,

even moderate, may be particularly damaging when flowering plants. Conversely, a moderate drought, during early beginning of the growing season, may encourage flowering. Also, drought may cause a greater development of roots in soil depth, forcing them to explore greater depths and increasing the resistance to any future droughts, but also allowing a better exploitation of water reserves and minerals in the soil. For example, a drought produced in September and October may be favorable for increasing sugar content in beet and several fruit species, including grapes for wine cultivation.

Unusually severe and prolonged droughts are always difficult times for agriculture and water supply to villages of Dobroudja.

## MATERIAL AND METHODS

The analysis of frost and thaw in Dobroudja is based on the data obtained from the observations accomplished in eighteen meteorological stations and twenty-three rainfall stations between 1965 and 2005 (figure 1). Its purpose is the climatic characterization of the regime, of the occurrence probability (in the representative landscape points, with relatively complete recordings) and of its territorial distribution.

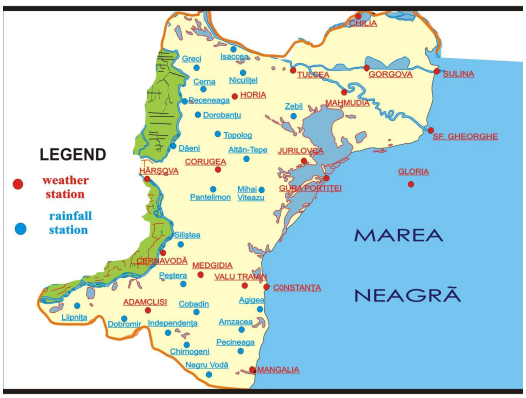


Figure 1. Repartition weather stations and rainfall stations in Dobroudja

## RESULTS AND DISCUSSIONS

As a complex climatic phenomenon of risk or risk associated, the drought is mainly characterized by the absence of rainfall, increased sun exposure, soil and air temperature, increased evapotranspiration processes, reducing air and soil moisture and, consequently, the reducing the productive moisture reserve of the plant root system, which causes wilting crops to reduce agricultural production and even affect the total harvest, if not taken necessary measures to combat water scarcity by irrigation. Thus, dryness and drought phenomena are climate risks triggering environmental risks affecting both the agro-production and the whole geographical environment, including public health.

Dryness and drought phenomena are the most complex climate risks in Dobroudja. With many natural and anthropogenic factors which contribute to their onset, they can be considered risks associated with climate, factors that define the structure of the active surface: relief features (shape, elevation, fragmentation), vegetation coverage and type of vegetation, physico-chemical characteristics of soil, groundwater depth, etc..;

Time factors defining features, which include the predominant influence of anticyclonic activity, rainfall, soil water reserves accessible to plant and soil moisture and

temperature, wind speed, potential and actual evapotranspiration etc.; defining factors of plant physiological features, such as plant variety, stage of vegetation, degree of resistance in dryness etc..; defining the influence of anthropogenic factors on the environment, such as state land (cultivated or not) agrotehnica used (type of plowing, etc. plowing depth.) which may facilitate soil water depletion (DONCIU, 1928, AGROMETEOROLOGY, 1970; DONCIU et al ., 1973, BOGDAN, 1978, 1980, 1983, 1999).

Each component of complex natural and anthropogenic factors involved in increased dryness and drought phenomena with differential weight in relation to the season, the stage of vegetation, etc. used by agrotehnica.

DONCIU (1928) grouped the main climatic causes which contribute to the onset of drought in two categories, namely: causes related to the dynamic nature of the atmospheres general circulation, the predominantly influence of stationary anticyclonic barrel extension formations that spreads on very different trajectories ( polar, meridian, Southern and sepecially ultra pole and south and south-eastern trajectories, respectively anticyclones positioned in the North-west, north or northeast, like those in North Africa and southeastern Europe, or anticyclonic ridges forming the junction between the western and eastern sectors of Europe), covering the territory of Romania, especially Carpathian regions in southeast and east of the country;

Heat-order cases that reflect the degree of heating and cooling of active surface during local geographical conditions and specific weather. So for example, winter, radiative cooling leads to increased anticyclonic formations and summer overheating leads to the development of land within its barrel hollows, which favors extension anticyclonic drought areas Dobroudja with Bărăgan Plain and southern Moldavian Plateau, is the region most affected by dryness and drought phenomena in Romania.

Dobrudja is distinguished by extreme rainfall and thermal parameters: here, the air temperature recorded the highest annual average (> 11 ° C) and rainfall, the lowest annual average (to below 350-400 mm) in the country, which giving it a very specific climatic note. Due to compete in highlighting this particular one is the influence of surface water which surrounds three sides of Dobrudja (the Danube to the west and north and, especially, the Black Sea to the east, which requires the development and direction of thermal gradient and rainfall).

Black Sea should be the "thermal barrier" that occurs in summer due to thermal inversions acvatoriului marine evaporative surface, inversions relatively stable, due to air currents that characterize offspring, they cause disintegration of cloudy systems and therefore increase the duration of sunlight, which in turn increases the air temperature, reducing the amount of precipitation, increased evapotranspiration and, finally, the appearance of dryness and drought phenomena (atmospheric and Pedosphere).

Black Sea influence is so great that it tends to fade imitate height between 50 and 450 m, so that isolines of temperature and precipitation take into account mainly the influence of the sea, parallel to shore with a character on the far eastern sea, as also in the west, along the Danube, inside altitudinal influence required in northern Dobroudja Plateau, where the shape of isolines becomes circumperiferic-closed.

Figure 2 shows that in an average year are possible, in Dobroudja, 4-6 consecutive months with dry events (which is the prelude to drought), increasing gradually from west to east and from north to south, of which 2 -3 months of consecutive drought. In the coastal zone, these phenomena are more pronounced (more than 6 consecutive months of dryness, of which over 3 months of drought).

The distribution of dryness and drought phenomena show that, in any average year, about 7 consecutive months are possible with such events, which typically covers interval from April to October.

From one year to another, though, there is a great irregularity in the duration and intensity variability of dryness and drought phenomena. To this end were built, each year, Walter-Lieth climogrames, period 1901-2005 at two stations with full strings, respectively, Constanta - Cernavoda on the coast and the western end - the Danube. Calculations have shown, this time also, the predominant influence of the Black Sea in Constanta, where the reported period, 154 occurred only 57 times of drought and dry periods (which is 475 months of total analyzed months) compared to Calarasi, 144, respectively 152 (418 months in total). Expressed in percentage, the frequency was 50.3% on the coast and 44.2% on the southern Baragan.

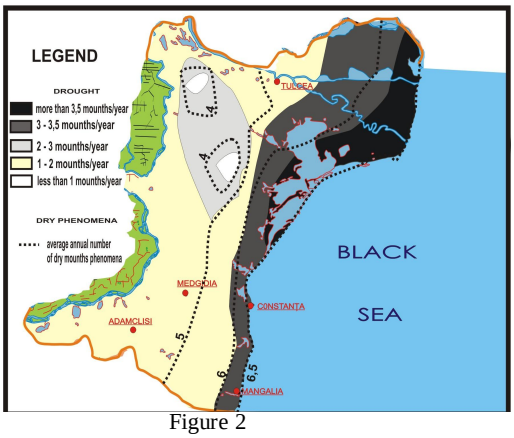

Figure 2

The phenomenon is explained by high thermal stability of coastal zone, which makes droughts are more compact and continental influences from Baragan causing greater variability in terms of time, especially front-generating atmospheric precipitation, as well as convective precipitation, which interrupt and fragment the dry periods, so they are more in number, but shorter in duration.

This shows that 45-50% of years, Dobrudja face dryness and drought phenomena, which requires correction of the rainfall scheme using irrigation efficiency.

The analysis shows that in terms of dryness and drought phenomena still occupies first place in the country, the frequency and their volatility, which underlines, once again, the specific climate of this territory.

**CONCLUSIONS**

With regard to agricultural crops in Dobroudja were established a number of sensitive and critical periods of plants to drought

Period is sensitive to water shortages during the life of a plant in the drought work on increasing vegetative organs (leaves, stems, roots) and reproductive (fruit, seed), having negative consequences on the final weight, depending on the intensity of this phenomenon

Critical period of drought is generally a short or medium in which the plant is very sensitive to soil water deficit, thus a particularly harmful effect on crops (fruits, grains, tubers, etc.).

Most severe critical period drought lies generally between the time of floral organ differentiation and the fecundation of flowers. The damage to the sensitive period is not only in proportion to the intensity of drought, but depends on time of flowering. An even shorter

drought can be very serious for a flowering plant with grouped, such as corn. Extended flowering plants (ie, spread in time), such as soybeans and sorghum, are less affected by temporary drought

In the period without precipitation, much of solar radiation and soil heat involved in air layer above as thermal energy processes in evaporative water deficit is very low. Parallel to overheating and air drying, and gradually increase potential evapotranspiration (reference). Imbalance between water uptake and disposal by plants is emphasized further if drought is accompanied by dry winds, hot and intense. In such conditions of fading phenomena may appear irreversible, partial or total destruction of the plant, drying wells, small lakes, etc..

In terms of quality of plant products, adverse effects are manifested also by changes in taste and reduction of freshness and tenderness. Can be reached where these products can no longer be consumed as a result of accumulation of alkaloids and essential oils (from carrots, kale, radish) or excessive development of mechanical tissues unfit for consumption. If drought is accompanied by high air temperatures, as often happens, there is a weak binding of the leaves and seeds, following the loss of pollen viability (the peppers, eggplants, peas, etc.)..

In situations where droughts alternate with those where there is abundant water, vegetable plants (turnip, radish, carrots, tomatoes, etc..) fruits also successively suffer from dryness and from the over moisturing, and as a result of the last trial may split.

Under these aspects, agricultural drought, which is linked to harmful effects on vegetation planted and / or spontaneous, is a complex phenomenon in comparison, "meteorological drought", which take account only of lack of rain.

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