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GENERAL ASPECTS OF THE AGRO-CLIMATOLOGIC POTENTIAL IN MUNTENIA REGION

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Abstract

As knowing the impact of weather phenomena and their effects on agriculture represents a primary necessity, at present the importance of agro-meteorological information for economy, in general, and for the agriculture sector, in particular, involves a complex approach of the relation environment–plant. The agro-climatologic resource's assessment is multi-way needed: to choose the product and to cultivate varieties; for different phyto-technical interventions used to improve soil fertility; it is also economically fundamental in order to obtain optimum yields. This article frames an analysis and a synthesis of the main agro-climatic parameters, the air temperature and the precipitation for the region of Muntenia, considering the period between 1961- 2009. As this region has the largest agricultural land in Romania, is it useful and necessary for everyone who aims to carry on agricultural business or studies to be well informed on the agro-climatologic potential that characterizes it.

Key words*: agro-climatological potential, air temperature, precipitation, crops, Muntenia*

INTRODUCTION

The role of meteorological phenomena on human and economic activities is increasingly evident. Agriculture is directly affected by these weather phenomena, so the meteorological information involves a complex approach. Romania is already experiencing an increase in intensity and frequency of droughts, floods, heat, heat wave, freeze, frost etc. and all of these meteorological phenomena are causing significant losses in agriculture, which is the economy sector mainly dependent on weather developments.

The physical, chemical and biological processes which cause the crop's growth and development are regulated by climatic requirements, and any deviation from these requirements can produce a large variability in the agricultural production [8]. The data on the climatic and agro-climatic characteristics of various regions from a country aim to arrange rationally the land in accord with the agricultural vocations, to optimize the distribution of crops and farm animals in relation to the agro-climatic conditions and agricultural diversification foundation based on introducing new species, varieties and breeds using agro-climatic in-depth studies [4].

In this context, the article proposes an analysis of the main agro-climatic factors, air temperature and rainfall, which is closely linked to the vital activity of the plants [9]. The analysis is performed for the historical region Muntenia, the region with the largest arable land in Romania, durring 1961 – 2009.

MATERIALS AND METHODS

The database used in the analysis of air temperature and rainfall is the agro-climatic data series from the agro-climatic stations of Muntenia region, time interval 1961 - 2009. The analysis of these agro-climatic elements will be in terms of average monthly and annual and frequency of dry years [1]. Statistical methods are used, with the addition of graphics and map data.

RESULTS AND DISCUSSIONS

Muntenia is the historical region in southern Romania, a part of the former Romanian Country. It is situated between the Carpathian

Mountains, the rivers Olt, Milcov, Putna, Siret and Danube. Its administrative-territorial structure includes counties of Argeş, Brăila, Buzău, Călăraşi, Dâmboviţa, Giurgiu, Ialomiţa, Ilfov, Prahova, the capital-city Bucharest and sides of Olt, Vâlcea, Vrancea and Braşov counties (figure 1).

Fig.1 Geographical location of Muntenia in Romania (processing www.google.ro)

In terms of relief, Muntenia overlaps the Romanian Plain, the Getic Plateau and the Sub-Carpathian [10]. Holding a large part of the Romanian Plain, its agricultural potential is predominantly focused on cereals, vegetables, vine and livest ock [2].

On the territory of Muntenia the weather stations are located on: Câmpulung, Argeş, Câmpina, Pătîrlagele, Râmnicul Sărat, Piteşti, Târgovişte, Ploieşti, Buzău, Brăila, Stolnici, Titu, Urziceni, Bucharest, Băneasa and Filaret, Fundulea, Slobozia, Feteşti, Călăraşi, Oltenița, Videle, Roşiorii de Vede, Alexandria, Giurgiu, Zimnicea and Turnu Măgurele (figure 2).

Fig.2 Weather stations on Muntenia (processing www.google.ro)

Air temperature influences the processes of growth and development, photosynthesis, respiration and transpiration of plants. These are produced in a heat register, and this heat register is specific for the different life periods of each vegetal species and crops.

In terms of heat register, the plants' vegetation season is characterized by: thresholds at the beginning and the end of the vegetal growing period, maximum value, minimum value, the optimum temperature, a curve determined by the air's temperature variation in the vegetation season and the amount of temperatures necessary for crossing the entire vegetation period, which corresponds to most of the hot season, represented by monthly interval from April to September [6].

In the thermal analysis, the average multi-annual for the period 1961 - 2009 is 10.6˚C, by 0.2˚C higher than the reference period 1961-2000. Within this interval, the coldest year was 1985, with an annual average of 9.6˚C, and the warmest was 2007, registering an annual average of 12.6˚C.

Table 1. Air temperature process on decades (˚C) in Muntenia (1961 – 2009)

Decade	Multi-annual average
1961 – 1970	10,6
1971 – 1980	10,3
1981 – 1990	10,6
1991 – 2000	10,9
2001 - 2009	11,3

Source: own processing on the basis of data from http://www.meteoromania.ro

Considering the process by decades, there is an increase of 0.7˚C between the first decade of the period whose average is 10.6˚C and the last decade whose thermal value is 11.3˚C (Table 1).

The analysis of the air temperature considering average monthly multi-annual finds that the monthly average temperature increases since January, from -1.5°C to 22.4°C in July and then decreases until December, when it records 0.1°C (figure 3).

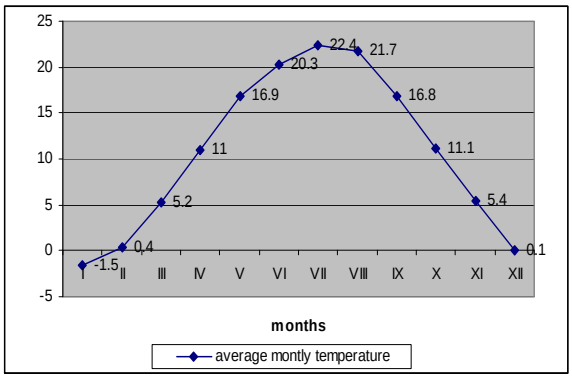

Fig.3 Average monthly annual on temperature (˚C) in Muntenia (1961 – 2009)

Considering seasons, the average multi-annual values are 11.3˚C for spring, 21˚C for summer, 11.1˚C for autumn and -0.3˚C for winter.

Precipitations show variation from one month to another, from one season to another and from one semester to another, driven by the general circulation of the atmosphere and the intensity of thermal convection [3].

Concerning average yearly precipitation for Muntenia between years 1961 – 2009, it is 592.8 l/m², which means a moderate rainfall drought. For the same period, the wettest agricultural year was 2004 – 2005, when it was recorded the amount of 886.1 l/m², which means excessive rainfall rainy, and the lowest value was recorded in the agricultural year 2006 – 2007, respective 463.9 l/m², meaning a dry rainfall.

By decades it is recorded an increase of 19.3 l/m² between the first decade of the period, when there was the amount of 609.0 l/m² and the last decade when it equaled 628.3 l/m² (table 2).

The analysis of the precipitation's distribution on the territory of Muntenia for each month highlights the rainfall potential. It was a rainfall increase starting from January (33.2 l/m²) until June, when it recorded 77.4 l/m², and after this month the quantities decrease until December up to 43.9 l/m² (figure 4).

In the warm half of the year, rainfall totals with the highest percentage of all the year, registering 363.6 l/m², with 134.4 l/m² more than in winter.

Table 2. Precipitation process on decades (l/m²) in Muntenia (1961 – 2009)

Decade	Multi-annual average
1961 – 1970	609,0
1971 – 1980	634,8
1981 – 1990	518,0
1991 – 2000	568,8
2001 - 2009	628,3

Source: own processing on the basis of data from http://www.meteoromania.ro

The amount of rainfall depends on the air temperature, being necessary to analyze the distribution of these quantities on semesters, especially since the warm semester coincides largely with the vegetation.

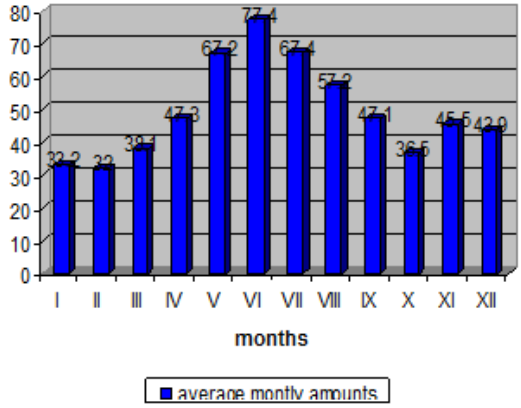

Fig.4. Average monthly annual on precipitation (l/m²) in Muntenia (1961 – 2009)

The frequency of dry years is an agro-climatic parameter that reflects the impact of agricultural drought. This impact is varied and extremely complex, and the effects on the vegetation and crop productivity are multiple.

The analysis of the dry years' frequency, as case number for Muntenia during 1961 – 2009, is 29 years, with an excessively dry year, with the annual amount between 251.0 and 350.0 l/m², 5 years dry with recorded quantities between 351.0 to 450.0 l/m², 23 years moderately dry between 451.0 to 600 l/m². The remaining years of the period under review were optimal rainfall years (11 years) with quantities ranging from 601.0 to 700.0 l/m² and 9 years with precipitation amounts between 701.0 and 800 l/m².

Extreme drought years were: 1962-1963, 1964-1965, 1973-1974, 1975-1976, 1982-1983, 1985-1986, 1987-1988, 1992-993,

1999-2000, 2000-2001, 2001-2002, 2002-2003, 2006-2007, and wet years were: 1972, 1974, 1975, 1976, 1981, 1990, 1991, 1997, 2004, 2005 and 2006.

The agricultural year 2004 - 2005 is the year excessively rainy, with an annual average amount of 886.1 l/m² registered in Muntenia, compared to the annual average of 592.8 l/m². The deviation is positive, being 49.5%. July 2005 was the wettest month, with an average amount of 168.3 l/m². For the same year, the highest annual value was recorded at the meteorological station Tîrgovişte and it was 1184.2 l/m², followed by that recorded on Curtea de Argeş with 1153.8 l/m².

On the opposite side there is the agricultural year 2006 - 2007, more precisely the monthly period from September 2006 to August 2007, whose average annual amount was for Muntenia 463.9 l/m², registering a negative deviation of 27.8 l/m². April 2007 was the driest month, registering only 8.7 l/m². The lowest annual rainfall amount for the Muntenia is registered at Slobozia, respective 276.6 l/m², followed by Griviţa with 291.1 l/m². The year 2007 was the warmest in the last 107 years in Romania [7].

CONCLUSIONS

In order to optimize an agricultural land (an operation whose value and complexity increases with the technical development), it is absolutely necessary a crops' allocation on regions depending on the weather, depending on crops' condition and the forecast for the end of the crop life cycle. The organisation of the ground consists in a set of actions (e.g. equipment works, drainage, leveling, planting, terracing etc.) in order to achieve the appropriate set of functions and destinations [5].

Concluding, in the areas with agricultural potential it is imperative to achieve agro-climatologic analysis necessary to value this potential. Regarding Muntenia region, the agro-climatologic analysis of the main elements (*air temperature* and *precipitation*), for the period 1961 – 2009, allows us to highlight: during the 2001 – 2009, the average annual temperature has increased by 0.7˚C, the amount of annual rainfall increased on average by 6% and the rainfall during the critical period, from May to June, considering the species of barley and autumn wheat, shows the predominance of agricultural areas with values below 150.0 l/m² (except for the decade 1971-1980), and considering sun-flower, soya and other kinds of such species, during July-August, the amount of rainfall indicates poor values of below 150.0 l/m² for each decade of the period, the driest decade being 1981-1990.

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