

Climate Monitoring and Water Resources Management for the Main Crops in the Transylvanian Plain, Romania

Rusu, T.¹, D. Weindorf², B. J. Haggard², M. L. Sopterean¹, P. I. Moraru¹, H. Cacovean³

¹*University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Manastur Street, 3-5, 400372, Cluj-Napoca, Romania, E-mail: trusu@usamvcluj.ro*

²*Louisiana State University AgCenter, Baton Rouge, LA, USA*

³*Soil and Agrochemical Studies Office Cluj-Napoca, Romania*

ABSTRACT

The Transylvanian Plain (TP) is a geographical region located in north-central Romania and is bordered by large rivers to the north and south, the Somes and the Mures, respectively. TP with an area of approx. 395,616 ha, includes areas of three counties (Cluj - CJ, Mures -MS, Bistrita-Nasaud - BN), has a predominantly agricultural character, and is characterized by hilly climate floor with oceanic influences, 6-10 °C average annual temperatures and 500-700 mm/year average annual precipitations. The presence of the Carpathian mountains ring and the arrangement, almost concentric, of the relief from Transylvanian Depression, determines the development of a zonal sequence of soil types, a horizontal zonality as a direct influence of lithology and indirect of the relief, by changing climate and vegetation. The TP has generally fertile soils and is capable of large agronomic production (corn, sunflower, wheat, soybeans, potatoes). Climate of the TP is highly dynamic, with hot summers (high temperatures >25°C) and cold winters (lows ~-5°C). Moisture regimes of the TP are generally udic to ustic with moisture increasing slightly to the north. Climatic research inside the Carpathian basin has identified an increase in mean air temperatures over the last 100 years of ~0.7°C. Evidence of warming is further supported by the fact that six of the warmest years of the 20th century were registered in the 1990's.

Zoning cultures and establishing the optimum sowing periods was made after the observations arising from practice and after the results obtained in the agricultural experimental research stations. Climate changes in recent years and climate monitoring from TP offers the possibility to check the calendar for the optimum sowing period. Monitorization of the thermal and water regime from TP was performed with twenty HOBO microstations which determine the temperature (to a height of 1 m) and rainfalls, same as temperature (at 10, 30, 50 cm depth in soil) and soil moisture (at 10 cm depth). Recorded data allow us to say that towards the optimal sowing period known from the literature, during 2008-2011, for all cultures were recorded minimum temperatures for germination with approx. 5-10 days earlier. The optimum sowing period was recorded 15 days earlier at soybeans, with 10-12 days earlier at corn and beans, 2-3 days earlier at potato, sunflower and sugar beet.

The inner hydrological network contains rivers with low flow inside a semi-permanent or intermittent flow regime. River flow is not related to the surface of the water collection, being tributary to rainfalls which has an uneven character. Since the supply is pluviometrical, floods are recorded in March to April due to snow melting and in May to July after rains with torrential character.

Quantity and quality of groundwater in Transylvanian Plain represents problems that have conditioned economic and social development of rural habitats and determined the anthropic development and maintenance of the natural lakes. Groundwaters have a particular importance within the region revealing the possibility of development of settlements and location of others settlements and supporting an efficient agriculture.

Reduced volume of groundwater prints a temporary or intermittent character to the majority of surface waters during summer and early autumn. To these, is added the amount of real evapotranspiration which in the period from April to October, is 550 - 600 mm, half of these being registered in the summer months. Hydrographic organization exclusively local, lack of alternative water sources and unfortunate correlation between S-SV exhibition of the flanks with increased slopes, provides images of a region tributary to the critical term.

Keywords: climate monitoring, water resources management, Transylvanian Plain

Acknowledgments: This work was supported by CNCSIS-UEFISCSU, project number PN II-RU 273/2010.