Geophysical Research Abstracts
Vol. 13, EGU2011-2690, 2011
EGU General Assembly 2011

Soil Moisture and Temperature Monitoring for Sustainable Land and Water Management in Transylvanian Plain, Romania

Teodor Rusu (1), David Weindorf (2), Beatrix Haggard (2), Paula Ioana Moraru (1), Horea Cacovean (1), Ileana Bogdan (1), and Mara Lucia Sopterean (1)

(1) University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania (rusuteodor23@yahoo.com), (2) Louisiana State University AgCenter – Baton Rouge, SUA (dweindorf@agcenter.lsu.edu)

The Transylvanian Plain (TP), Romania is an important region for agronomic productivity. However, limited soils data and non-use of best management practices hinder land productivity. Transylvanian Plain, with an area of approx. 395,000 ha, has a predominantly agricultural character, and in the past, because of the large areas of agricultural land, with fertile soil, produced large quantities of grain, for economic and social needs of the country. Cereal and steppe character (or anthropogenic steppe) of the area, led to widespread of the popular term "plain", as over 30 villages, located in mid-southern region, wears, along with their name, the addition "plain". In time, however, because of rugged terrain, deforestation, fixation of the public lakes on quick slopes and irrational agrotehnics for the crops, large areas of productive agricultural land were turned into degraded land, with reduced productivity or unproductive. After Ministry of Agriculture and Rural Development of Romania data, about 1954 hectares of the Transylvanian Plain area, are aside agricultural production and tens of thousands of hectares are with productivity greatly reduced under the normal. Another feature of the TP is that, although it is lower than the surrounding region, no major river valleys, no major roads, do not converge to its center, but it surrounds it on the periphery. So it is a poor area in water resources, avoid by the heavy traffic, and so it partly explains its rural character and layout of cities around the edges.
The last research upon the evolution of the climate inside the Carpathian basin, pointed out an increase of the air temperature in the last one hundred years with about 0.7 C. This fact is also shown by the fact that, six of the warmest years of the 20th century were registered in 1990's. Contrary to its name, the TP is not a geographically flat plain, but rather a collection of rolling hills approximately 300 to 450 m above sea level in the south and 550 to 600 m above sea level in the north. Climate of the TP is highly dynamic, ranging from hot summers with high temperatures of >25 C to very cold winters with lows -5 C. The southern TP generally has a xeric moisture regime with steppe vegetation while moisture increases somewhat in the northern TP as an udic moisture regime. Twenty datalogging stations have been deployed across the TP on divergent soil types, slopes, and aspects. The location of each site was recorded using Garmin eTrex Vista (Olathe, KS, USA) handheld GPS units. Ten datalogging stations were installed in March of 2008, with an additional ten stations installed in March of 2009. HOBO Smart Temp (S-TMB-M002) temperature sensors and EC-5 (S-SMC-M005) moisture sensors were connected to HOBO Micro Stations (H21-002) at each site (On-set Computer Corp., Bourne, MA, USA). Additionally, at 10 of the 20 sites, tipping bucket rain gauges (RG3-M) were deployed (On-set Computer Corp., Bourne, MA, USA).
At sites with a tipping bucket rain gauge, the following data were recorded: soil temperature at 10, 30, and 50 cm; soil moisture at 10 cm; surface air temperature; and precipitation. At sites without a tipping bucket rain gauge, the following data were recorded: soil temperature at 10 and 50 cm; soil moisture at 10 cm; and surface air temperature. Data is downloaded from the Micro Stations every two months via laptop computer using HOBOware Pro Software Version 2.3.0 (On-set Computer Corp., Bourne, MA, USA).
Calculation of soil temperature regime according to the Soil Survey Staff (2006) consists of averaging soil temperatures at 50 cm between summer (June, July, and August) and winter (December, January, and February). The Soil Survey Staff defines mesic soil temperature as a "mean annual soil temperature that is >8 C, but <15 C where the difference between mean summer and mean winter soil temperatures is more than 6 C at 50 cm or at a densic, lithic, or paralithic contact, whichever is shallower." Year 2 data from sites 1-10 show that all sites have a mean annual soil temperature of 10 C at 50 cm with more than 6 C variation between summer and winter. Thus, it appears as though mesic is the appropriate soil temperature regime for soils of the TP.
However, differences in seasonal warming and cooling trends across the plain were noted. These have important implications for planting recommendations.