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THE INFLUENCE OF WATER TRANSFER FAVORABILITY OVER THE SOIL EXCESS MOISTURE

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Abstract

The paper aims to present the influence of the water transfer favorability over the soil excess moisture. The area taken into study is the Someş Mic meadow between Cluj-Napoca and Dej, which represents an area with many degraded land especially degraded land due to excess moisture. In order to highlight the water transfer favorabilty in the studied area (Someş Mic meadow between Cluj-Napoca and Dej) was used the GIS tehnique in order to create a thematic map which represents in a more suggestive way the water transfer process in the area.

Key words*: degraded land, excess moisture, water transfer.*

INTRODUCTION

Defining soils with excess moisture is done considering the causes of excessive moisture, the frequency, extent, intensity, form and source of it (Dîrja and Budiu, 2006; Petersen et al., 2011) and also considering the consequences and unfavorable influences on plant growth, being necessary to take into account - as a whole - the climate (Li, 2007; Rohli and Vega, 2011; Karamouz et al., 2012), geomorphological, lithological, hydrographic, hydrogeological and soil conditions in which they are formed and evolve (all natural conditions and human factor), which determine moreover, the choosing of solutions for the development and improvement of these soils.
The factors that generate excess moisture (Calinovici, 2004) are:

- *Natural factors:* the climatic factor, hydrological and hydrographic factor, hydrogeological factor, geomorphological factor and pedological factor;
- *Anthropic factor.*

Taking into account the climatic characteristics of the country, the latest soil and climate complex zoning made by Florea et al. (1988) led to the division of our country's territory into four climatic humidity zones:

- hot - dry;
- moderately warm - semi-humid;
- cool - wet and
- cold - very wet.

Cluj County is part of the moderately warm soil and climate - semi-humid with average annual temperatures of between 8.0-10.5 ^{o}C, temperature sum above 0 ^{o}C values between 3400-4100 ^{o}C or temperature sum above 10 ^{o}C between 3200-3500 $^{\circ}$C.
Average annual rainfall is between 500-700 mm and the amount of rainfall during the growing season (April to October) is between 400-475 mm, evapotranspiration from the period mentioned exhibits values between 220-391 mm.
The study of climatic elements (Figure 1) (precipitation, temperature, evapotranspiration, wind, air humidity etc.) show their effects in the onset or increased excess water from the ground or above the ground.

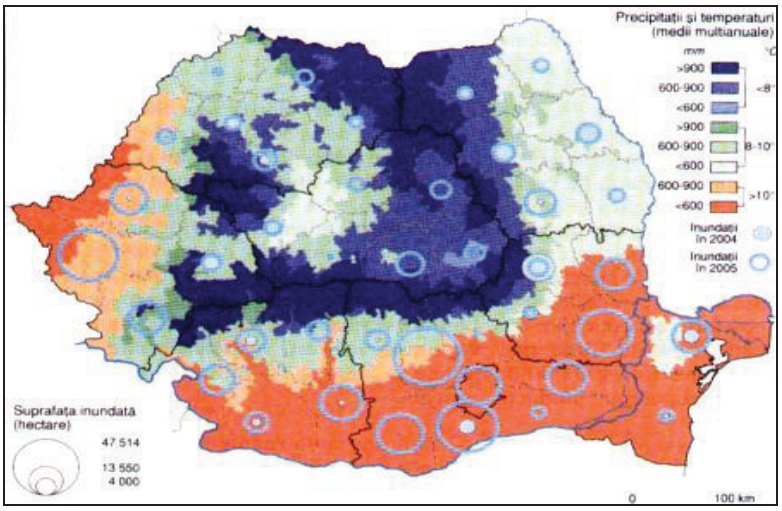

Figure 1. Cartogram of Areas flooded by Rainfall and of Average Multiannual Temperatures
Source: Ministry of Environment and Water, 2006

MATERIALS AND METHODS

Topographic documentation required to develop irrigation facilities and/or drainage comprises two phases of design, the following categories of maps and plans (Leu et al., 2003): for the phase of preliminary studies for the proposed irrigation systems are required topographic maps, scale of 1: 5000, 1: 2000, 1: 1000 with level curves and equidistances of 0.25 m respectively for drainage systems at scale of 1:25,000 with level curves and topographic plans at the scale of 1:10000 with the equidistances of level curves of 0.5 m and a density of planimetric and levelmetric network supporting at least one point per hectare and for thephase of preparation for projects execution, it is filled the terrain documentation based on planimetric and levelmetric topographic surveying, that are performed for the irrigation system at the scale of 1:500, 1:200, respectively draining system at large and very large scales: 1:2000, 1:1000, 1:500 with equidistance of level curves of 0.25-0.5 m, for preparing the route for the collection, interception and escape channels.

To achieve the primary database, the first step along the way was a data entry on a computer from cartographic products, in a digital form by scanning themat a specific scale, and then importing the data into ArcMap.

There were digitized polygon type vector elements on geological and pedological map (Figure 2) which were used in geological mapping, soil mapping and land use mapping for the study area.

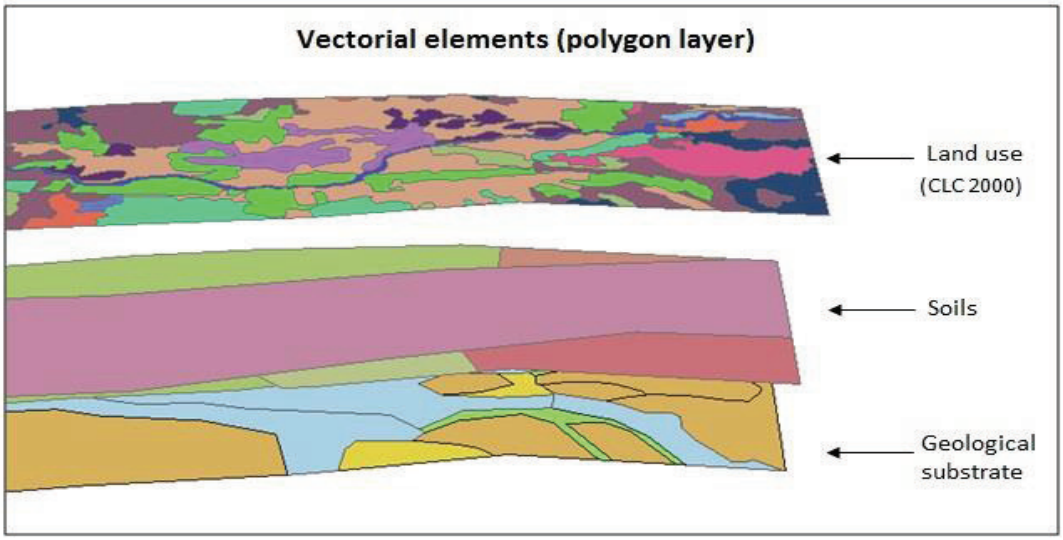

Figure 2. Elements digitized from the pedological and geological map

RESULTS AND DISCUSSIONS

The Somesul Mic River corridor, oriented from south-west to north-east, through the meadow and terraces related to it, delineates from a physical-geographical point of view the Transylvanian Plain from the Somes Platform.

The Transylvanian Plain, which includes the south and east of the territory studied, is characterized by a region of gentle hills separated by valleys relatively broad and swampy, landslides and frequent erosion processes on the slopes line with soils such as levigated chernozem, practically devoid of forests and with settlements as scattered households.

The altitude of the almost equal hills is between 400-500 m. Peaks of hills are generally sandy ridges, underneath marl and clay infiltrating. At their contact weak springs appear. The Transylvanian Plain is separated by the Somes meadow by the higher hills that reach up to 600 m altitude (Figure 3).

The area studied presents geographic vulnerability because it overlapses the north of the territory and differs from the Transylvanian Plain by higher energy relief, consisting of small plates located at 500-600 meters altitude, (Figure 3) deep valleys, intense slope processes in the lower third of the slopes, relatively small deciduous forests, road traffic, especially in the valleys. The predominant rocks are sandstones, clays and marl.

Cluj Hills exhibit also conglomerate and limestone. The predominance of softer rocks, facilitates erosion phenomena and lithological sequence of layers above and inclination favors landslides due to these clay loam deposits, drainage is unsatisfactory.

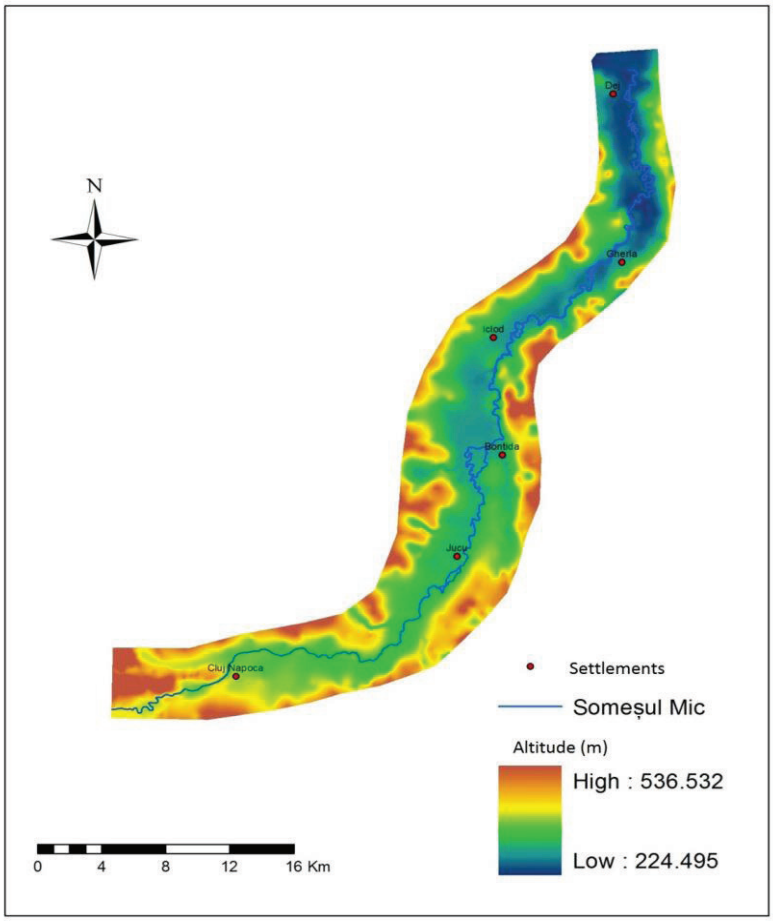

Figure 3. Elevation model of Somesul Mic river between Dej and Cluj-Napoca

Elevation model, created based on the interpolation of the elevations from an area, underpins the obtaining of a high number of thematic maps, being the reference raster to the geographical arrangement on vertical. On the map (Figure 3) it can be observed the gradual descent altitude to the confluence area of the

Someş Mic river and the arrangement of the peaks which delimits the river valley.
Depending on the texture of the surface and the manner in which the water enters and accumulates in the profile, by calculating the texture in the profile can lead to the transfer of water favorability map. In the studied area is noticed the predominance of accumulation structures which are specific for the valleys of sedimentary areas, with predominantly a sand-rocky structure.
On the map of favorability transfer of water (Figure 4) it can be observed the areas that retain more water in their profile, with high values and stable areas, the areas with less water retention are represented with light colors.

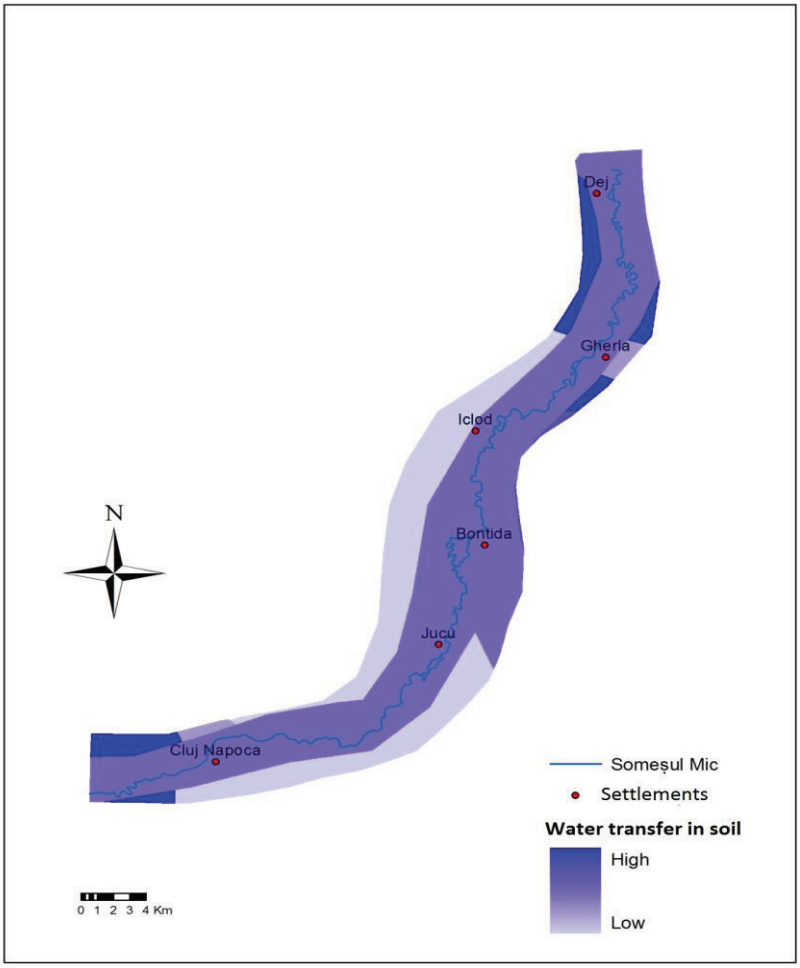

Figure 4. Favorability of the water transfer in soil, for Someşul Mic river between Cluj-Napoca and Dej

The land affected by excess moisture is 15.4% of degraded land in Cluj county, respectively 1.60% of the total land area of Cluj County. The total area of degraded land in Cluj county is 10.45% of the county's land of 667,440 ha (after the values obtained from statistical database with reference to the land fund, INSSE, 2011).

CONCLUSIONS

In order to formulate proposals and recommendations on the hydro-ameliorative works specific for the conditions of the studied area (Somes Mic meadow between Cluj-Napoca and Dej) were taken into account the realization of field studies and creating a GIS from which it can be obtained data about the weather or the development of the area.
By creating the GIS it is permitted to consider, permanently, the changes of natural factors, succeeding concomitant an adaptation of the irrigation and drainage works to the new conditions, whether it is changing the land use or climate change which are characterized by extreme phenomena which occur more often (very long periods of drought or rainfalls of high intensities).

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