THE IMPACT OF RECENT CLIMATE CHANGE ON LAND SUITABILITY FOR AGRICULTURE IN ROMANIA

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L'impact du changement climatique récente sur la favorabilité du terrain pour l'agriculture en Roumanie

Mots-clés : changement thermique et pluviométrique, méthodologie d'évaluation du terrain, cultures agricoles
Keywords: thermal and rainfall change, land evaluation methodology, agricultural crops

Introduction

The drastic changes in temperature and other climate variables affect significantly the land suitability for different crops. When a standard methodology for land suitability assessment has been used for a long time over a certain territory, it is imperative to know if, in the context of climate change, the respective methodology still provides sufficiently accurate results. Our study aims to point out that the land evaluations carried out in Romania, based on the methodology developed in the '80 by the National Institute for Pedology and Agrochemistry (ICPA, 1987) using the climate data for the reference period 1961 – 1990, are no longer realistic.

1. Materials and methods

We used the ROCADA climate database (Dumitrescu et Bîrsan, 2015) to map the temperature and precipitations for the reference period (1961-1990), and the CHELSA database (Karger *et al.,* 2017) for the recent period of 1990-2019. The same methodology proposed by ICPA (1987) was applied to point out the differences induced by climate change. This methodology uses 18 indicators to assess land suitability for various crops, among which 2 are climate factors, and the rest are soil and terrain factors. Our study focuses on the mean annual temperatures and precipitations, which are corrected by account for terrain slope and aspect influence, in the case of temperature, and for the influence of slope and soil permeability on water infiltration, in the case of precipitations. The climate factors were classified and suitability scores for the main annual crops of Romania were assigned to these classes.

2. Results

Figure 1 clearly shows the climate warming process throughout Romania, especially in the plain and hilly areas. The $> 12°$ C temperature class, which was very limited in the 1961-1990 period (0.12% of the country), has extended significantly and occupies now about 24% of the country. The methodology from the '80 does not evaluate this temperature class, which is a major shortcoming under the current climate conditions. The annual precipitations, generally increased, especially in the southeastern and eastern parts of the country. All these climate changes are reflected in the suitability for the main crops. In the case of winter wheat, which is one of the most widespread crops in Romania, the temperature increase has led to a decrease in suitability in the plain areas, but also in some plateau regions (southern Dobrogea Plateau) (Fig. 2). In other plateau and hilly regions (e.g. northern Moldavian Plateau, eastern Transylvanian Depression), the higher temperatures have led to an increase in suitability. The change in precipitations has generally increased suitability for winter wheat in the plain areas, especially in the south and southeastern parts of the country. On the other hand, in the hilly and plateau areas we notice a general decrease of suitability (Moldavian Plateau). The results clearly show that there are significant differences between the land evaluation results using the old 1961-1990 climate data and the recent data (1990-2019) throughout Romania.
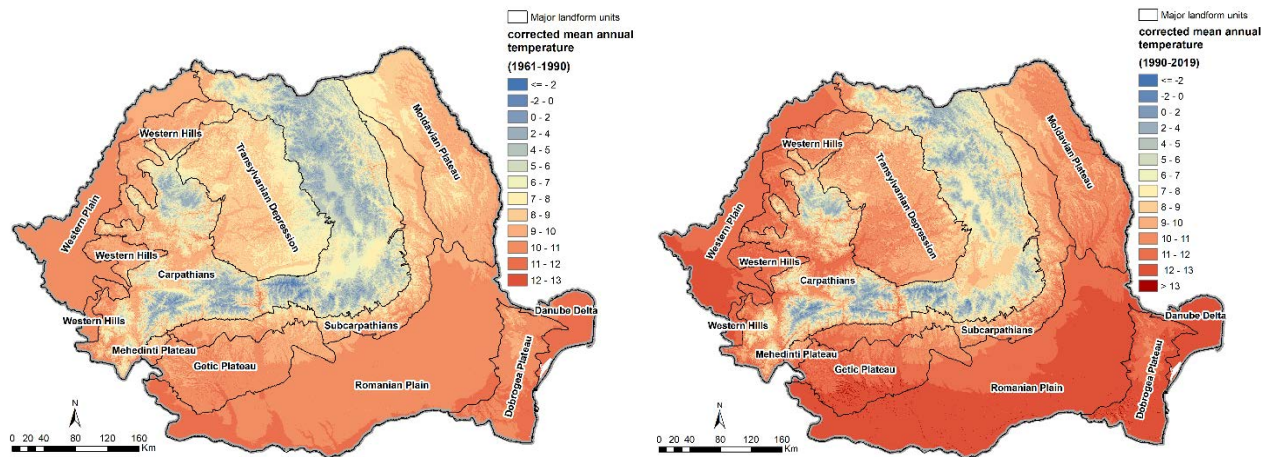
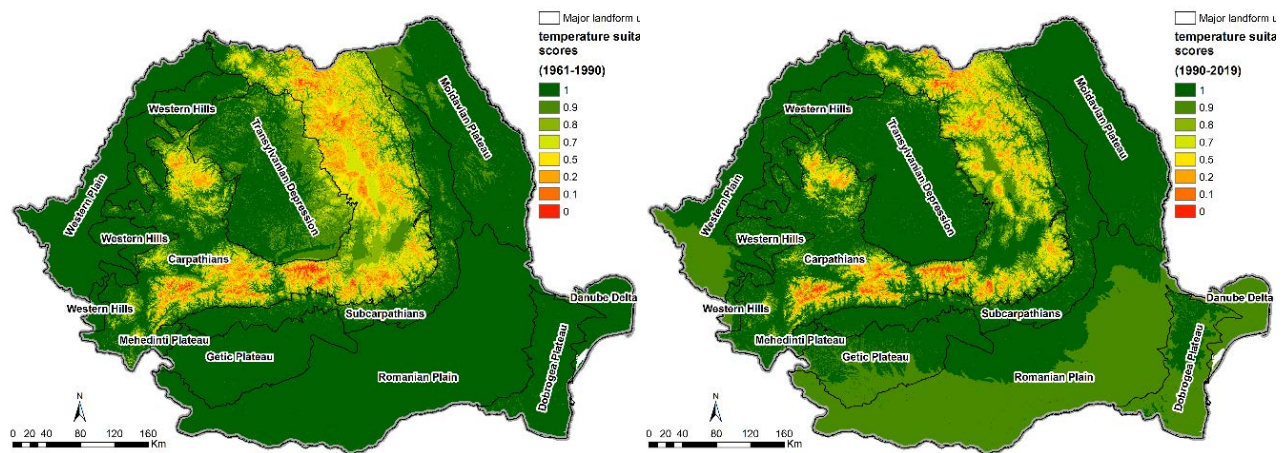**Figure 1.** Corrected mean annual temperatures in Romania for 1961-1990 (left) and 1990-2019 (right)

Figure 2. Suitability scores for mean annual temperatures and winter wheat during 1961-1990 (left) and 1990-2019 (right)

Conclusions

In view of our results, it becomes imperative that the institutions which carry out land evaluation studies use the more recent climate data, in order to achieve more accurate and realistic results. Also, un upgrade of the land evaluation methodology is necessary.

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