



# Communicating changes in frost days and the frost-free season in the Romanian Plain to support end-users decisions in agriculture



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## INTRODUCTION

The Romanian Plain is located in the southern Romania (Fig. 1). It is one of the most important agricultural region in Romania, with 3,692 thousand ha arable land (75% of total area of the Romanian Plain, that is 39.2% of the country's total arable area), well known for its high productivity of soils and good crop yields (Fig. 2). The main crops in the region are: winter wheat, maize, sunflower and rapeseed. The structure of cultivate areas is represented in Fig. 3. Other agricultural land use categories are: pastures and hayfields (4% of total surface-area), vineyards and orchards (3%). Cultivated area and plant production were strongly influenced by the socio-economic and political conditions of the post-communist period. This influence depended on the farming practices (the absence of functional irrigation systems, fewer natural and chemical fertilizers, and poor mechanization), inadequate farm structure, agricultural policies, etc. Additionally to that, the region faces the intensification of climate change-induced extreme phenomena (drought, desertification, hail-storms, and floods). These aspects differentiate the region in terms of climate adaptation potential, the eastern side having a greater potential in this respect. In order to provide the agricultural end-users (farmers) with tailored climate information that can be used in their activity, this study presents the changes in selected climatic indices related to zero crossing temperature in the Romanian Plain.

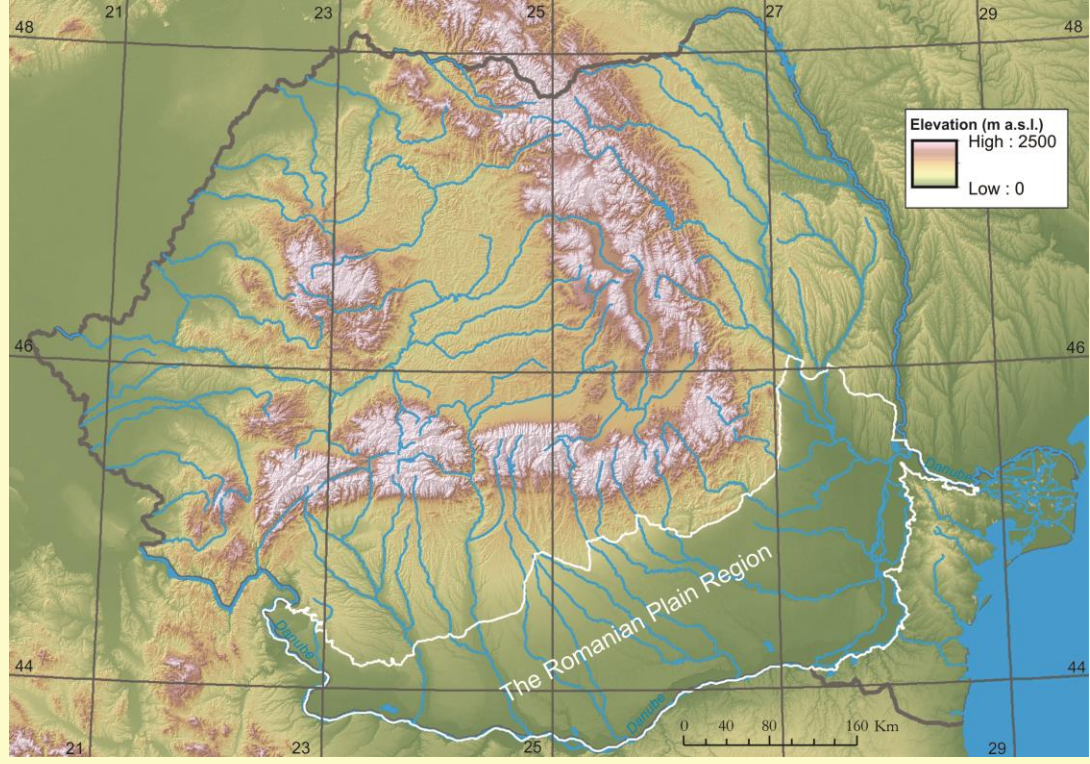


Fig. 1 Location of the Romanian Plain

## DATA AND METHODS

Daily minimum, maximum and mean air temperature from the version 1.0 of the Romanian daily gridded climatic dataset – ROCADA at spatial resolution 0.1x0.1 deg have been analysed for the period 1961-2013. The STARDEX Diagnostic Extremes Indices Software version 3.3.1 (2004), <https://crudata.uea.ac.uk/projects/stardex/> has been used to calculate a set of 57 extreme indices out of which four extreme indices related to zero crossing temperature have been selected for this study (Table 1). The trends of these indices has been calculated for the entire period and the observed changes during the recent period 1984-2013 has been calculated against the reference period 1971-2000. The results are useful for end-users in agriculture to support their decisions and adjusting their current practices for various crops under climate change threats. The interaction with the end-users has been established during the implementation of the FP7 ECLISE project (<http://www.eclise-project.eu>) and it is currently maintained. Though the majority of interviewed end-users are aware of climate change from their own observations and from the mass-media, they need more accurate information on current climate extremes events and on their future projections.

Climate extreme indices calculated for Romanian Plane

Index	Short name	Definition	Unit	Time scale
First autumn freeze	fst	The first date in autumn when $T_{min} \leq 0$ degC	Julian day	Annual
Last spring freeze	lst	The last date in spring when $T_{min} \leq 0$ degC	Julian day	Annual
Frost season length	tnfsl	The number of days between the first and last occurrence of $T_{min} \leq 0$ degC	days	Annual
Number of frost days	tnfd	The the number of days where $T_{min} \leq 0$ degC	days	Annual, seasonal

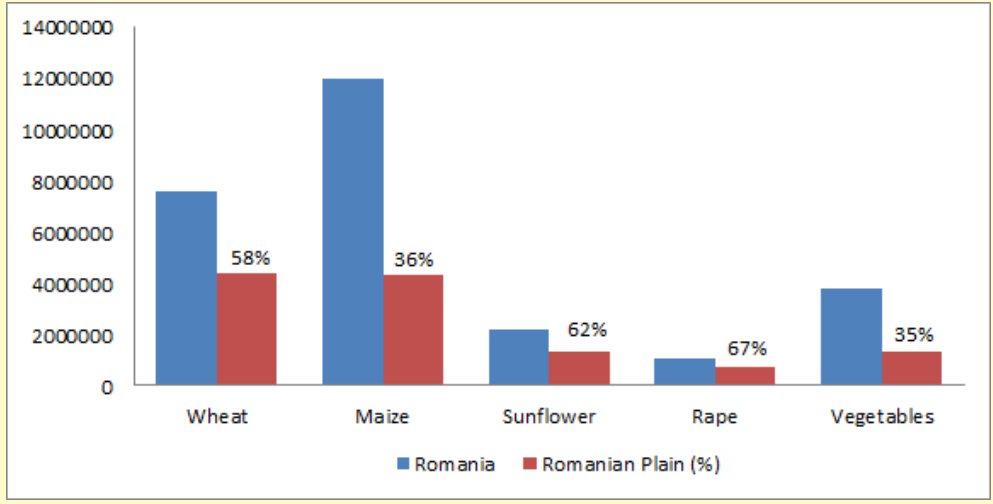


Fig. 2 Total crop production (tonnes) in Romanian Plain, compared to total country production

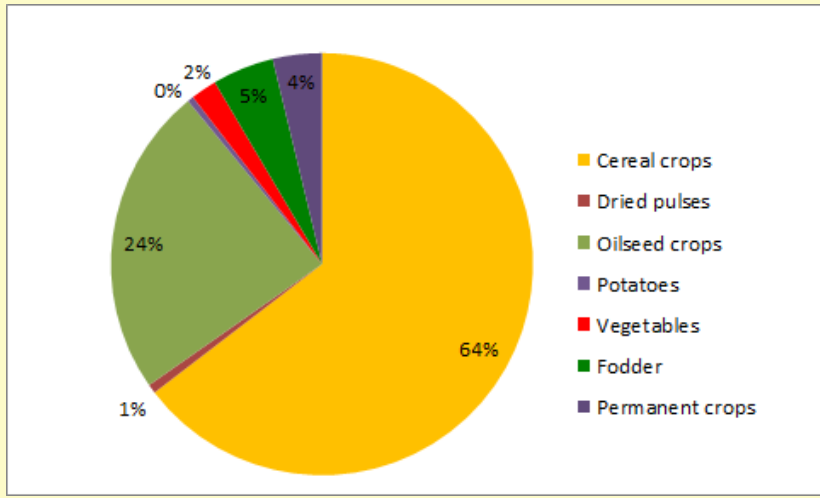
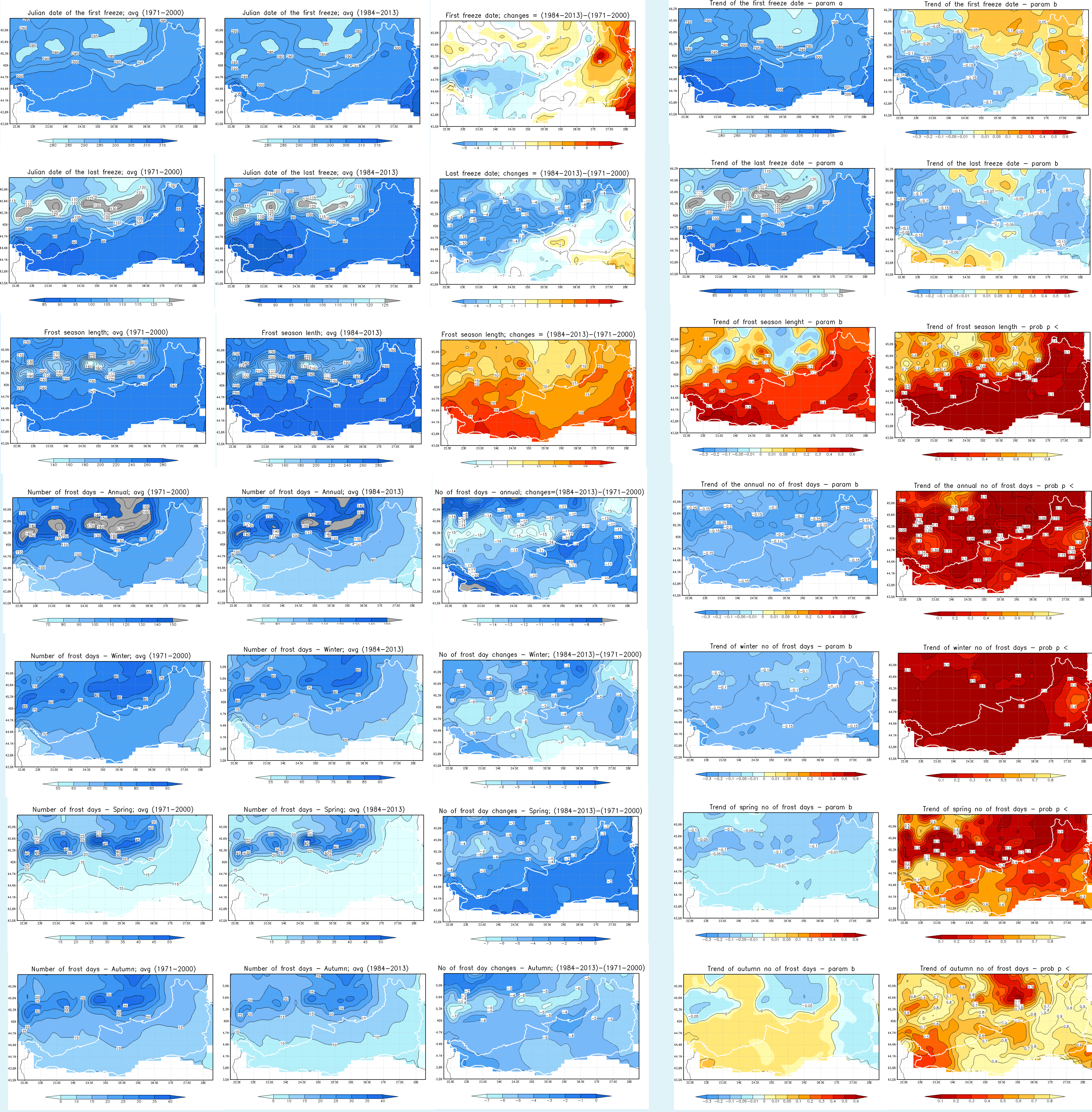


Fig. 3 Structure of cultivated area

## RESULTS



- There is little difference between the two periods in terms of the dates of the first autumn freeze (October 27<sup>th</sup>) and the last spring freeze (April 5<sup>th</sup>)  
The first freeze tend to occur earlier in the western half of the region while the last freeze tend to occur earlier in the eastern part.

- The increasing trend of frost season length is significant at 90% .
- The annual number of frost days decreased during the recent period (1984-2013) with 10-12 days, in winter with 4-7 days, in spring with 2-3 days and in autumn with 4-6 days, respectively.
- The decreasing trend of frost days is significant at 90% in winter and annual, only.

## CONCLUSIONS

- Recent observed increasing temperature trends in Romania has resulted in a decrease in the number of frost days, an earlier date of the last-spring freeze, and a later date of the first-fall frost.
- The study provides useful scientific insights which could improve the understanding of farmers and decision-makers on the potential impacts of the future climate change on crops, but also to mainstream climate adaptation actions in the agriculture policy.

## ACKNOWLEDGEMENTS

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## REFERENCES

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