

Strategy for Agricultural Soil Protection in the Danube Regions in the Context of Climate Changes



M. Džatko, M. Sviček, M. Nováková
Soil Science and Conservation
Research Institute Bratislava

Goal - Soil Protection in different ARGE Donauländer regions

First – preliminary draft project: „Strategy for Agricultural Soil Protection in Danube Regions in the Context of Climate Changes“

WHY ?

-long-term results of evaluation relations between the soil characteristics and weather

-As example - “*extraordinary*” results of evaluation off the relations between the soil characteristics and crops yields in extremely dry years of 2000 and 2003 in Slovakia.



So far -relevant data show “paradox”

- relatively best yields of wheat and maize in extremely dry years were registered in the areas with the relatively lowest intensity of precipitations
- ***very productive soils, are adequately able to reduce the unfavorable conditions of extreme drought***
- protection of soils and territorial units against the climate changes request relevant information on spatial differentiation of soil characteristics and also larger group of environment components, which represent the condition for the specific differences in different soil and territorial units.

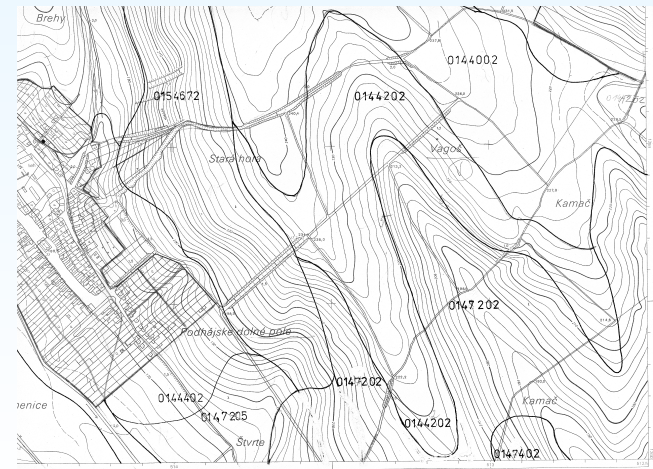
2. Present State of Information on Project Solution

2.1. The information on spatial differentiation of agricultural soil characteristics and their productive ability has sufficient quality and is available in all ARGE Donauländer member states and regions and could be used

2.2. It is proposed common approach of a new methodology and CGMS (Crop Growth Monitoring System) software application developed in EU Joint Research Centre in Ispra (Micale & Genovese, 2004), <http://mars.jrc.it/marsstat/default.htm>

The interpolation principle of the meteorological data within the framework of CGMS is based on new spatial interpretation of meteorological data concerning the centroids on climate grid network with the spatial resolution of 50x50 km. As for interpolation, the meteorological stations located within the area of 250 km (radius) from each centroid of climate grid network cell are considered. This new purpose-built method of a meteorological data interpretation provides a higher objectivity of data concerning the spatial differentiation of weather impact on crop yields also within the different territorial units and regions.

2.3. obtaining and evaluation of data concerning the yields of main crops.



3. Methodology and Project Realization Procedure

3.1. Comparison and evaluation of:

- *soil data and characteristics*
- *meteorological data -whether*
- *crop yields*
- *another data as satellite images, digital terrain model, GIS layers/ for example depth of ground water, irrigation, crop locati*

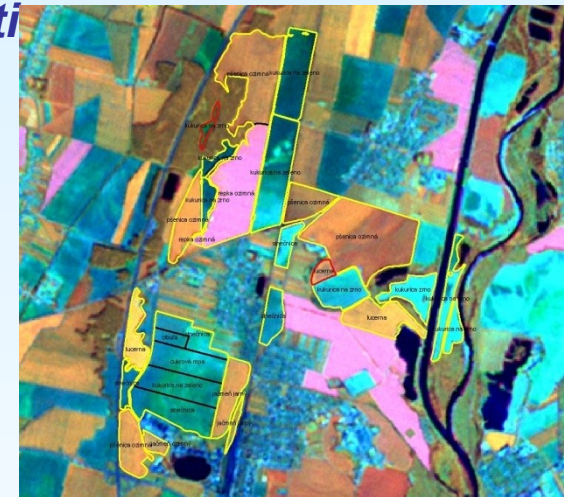
Model area in Slovakia (self-governing regions) :

Bratislava

Trnava

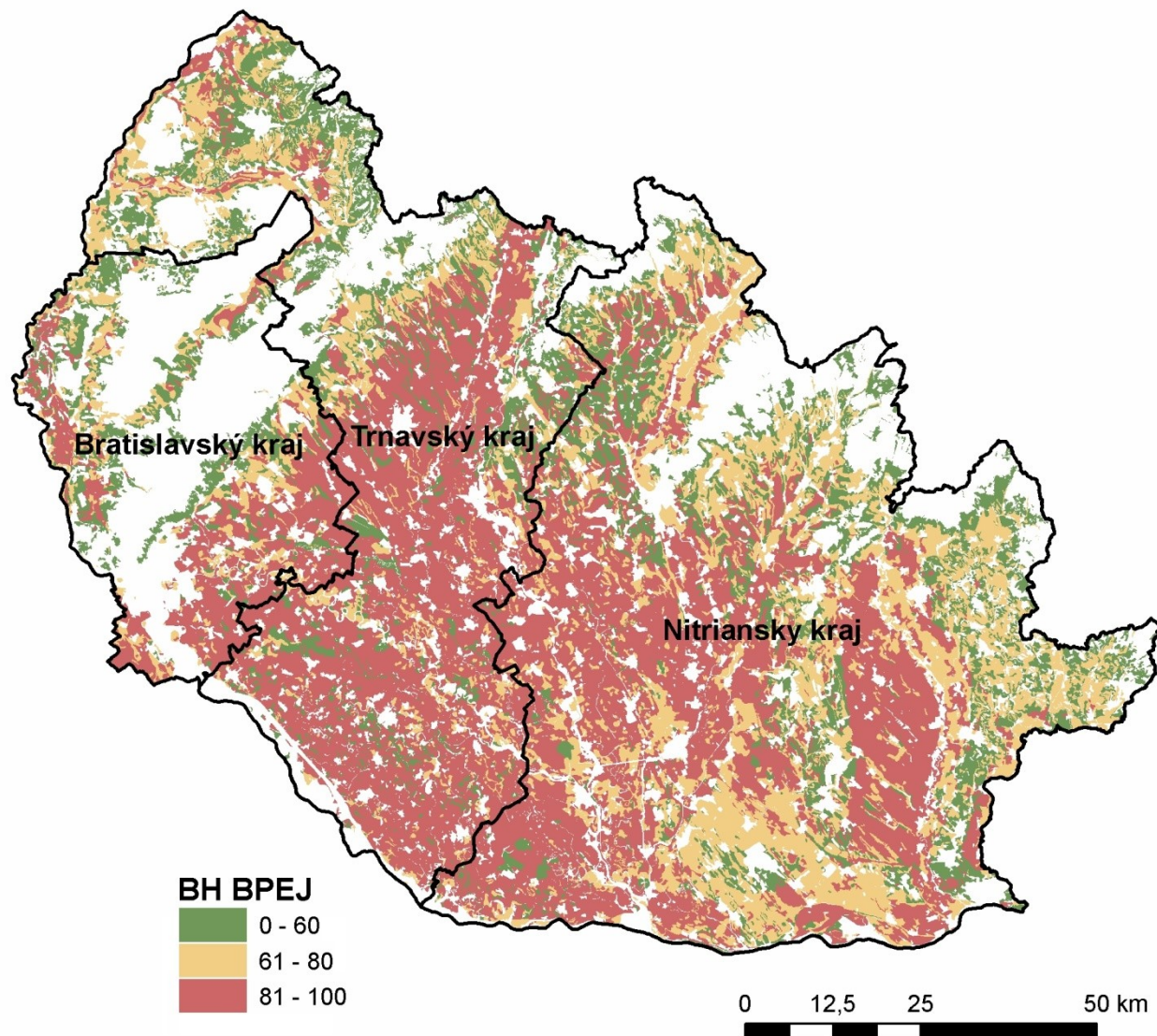
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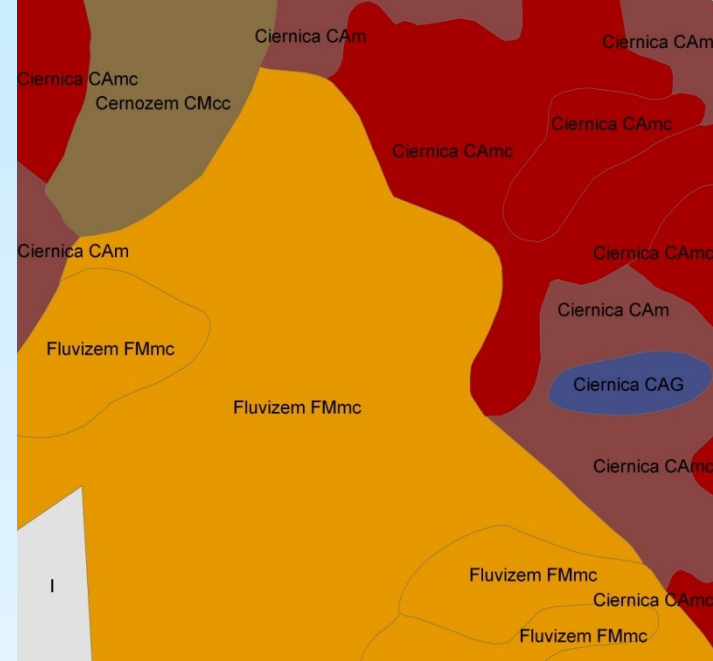
- Analysis were realized for each region independently.
- The two extremely dry years were evaluated (2000 and 2003);
- The drought impact on the amount of production was evaluated for winter wheat and corn



PEDO-ECOLOGICAL UNITS (PEU)

Production Potential Point Values





3.2. Spatial differentiation of soil characteristics

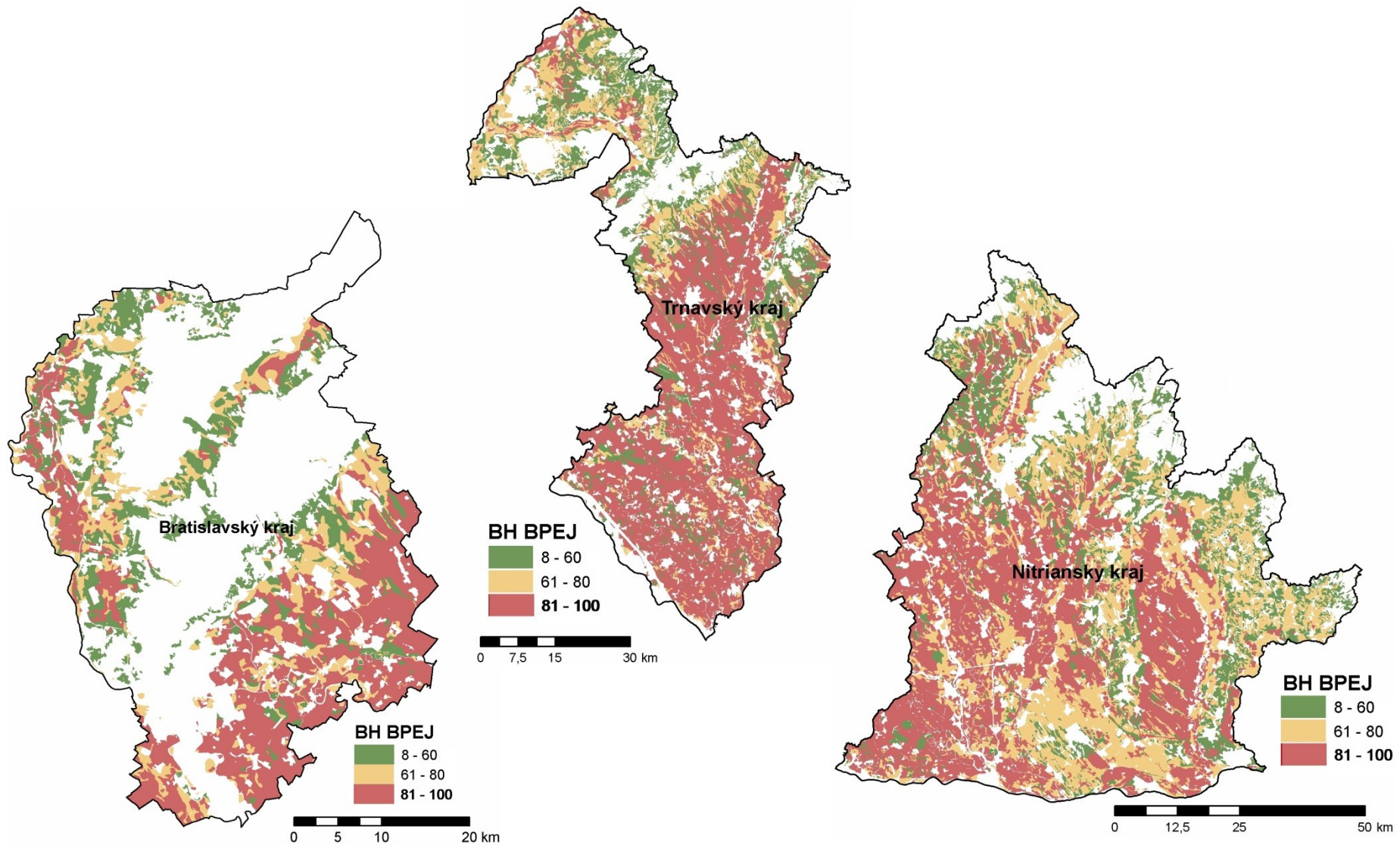
The spatial differentiation of the soil productive ability is represented by “point values of productive potential of soil-ecological units – PV PPSEU” (Džatko, M. 2002) from 100 – 1.

3.3. Spatial differentiation of the nature and development of meteorological data

was evaluated by means of interpolated climate data. For their interpolation, the methodology implemented in the European Crop Growth Monitoring System (CGMS) was applied, partially modified for the conditions in SR (SK_CGMS). Interpolated climate data were represented by means of reference grid network with the spatial resolution of 10x10 km, which was developed in compliance with the principles of harmonized representation and data exchange (INSPIRE principles), binding for European Union member states.

PEDO-ECOLOGICAL UNITS (PEU)

Point Value of Production Potential



3.4. Spatial differentiation of yields

The yield of winter wheat and maize for grain in 2000 and 2003 on district level was evaluated according to data obtained from and published by Statistical Office of the Slovak Republic.

3.5. Evaluation of Results

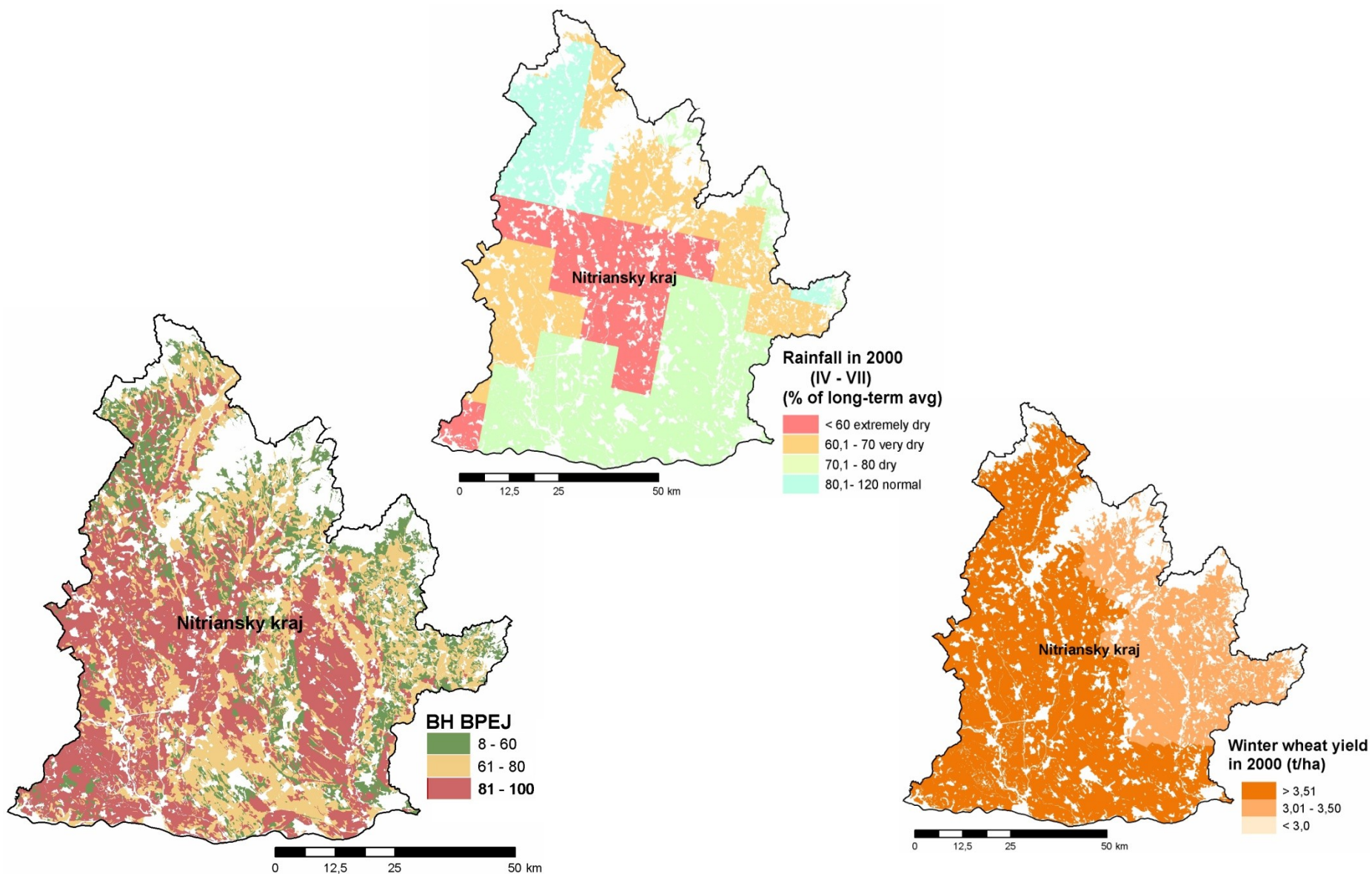
3.5.1. - evaluated area belongs to the regions with the highest crop Production

- territorial units with high productive soil ability (category PV PPSEU 100 – 81)
- with medium productive soil ability (category PV PPSEU 80 - 61)
- with relatively low productive soil ability (category PV PPSEU less than 60)

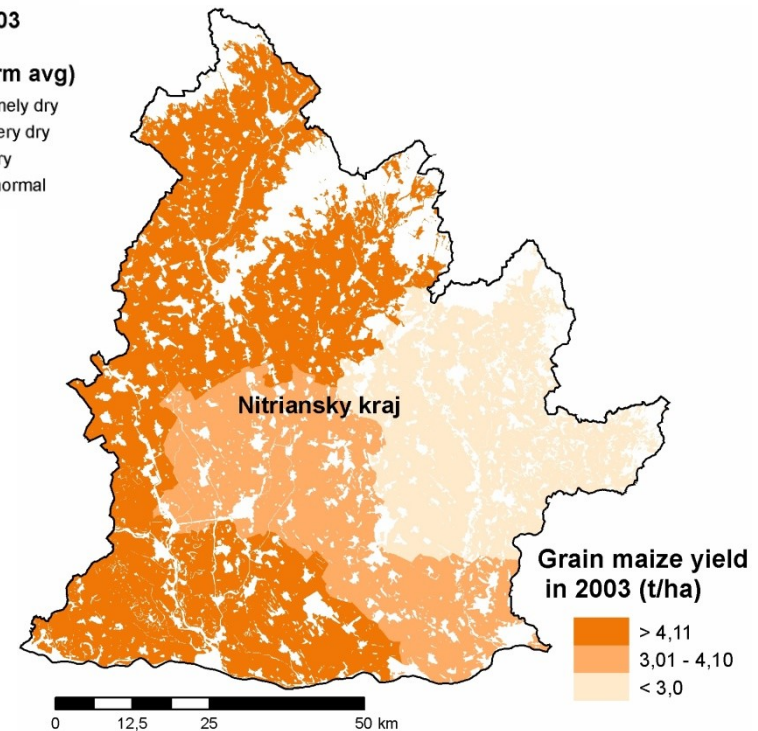
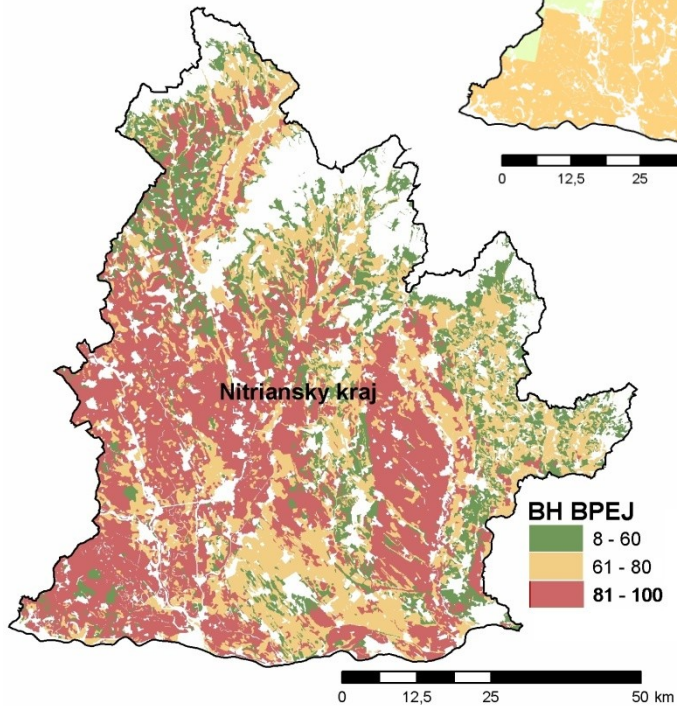
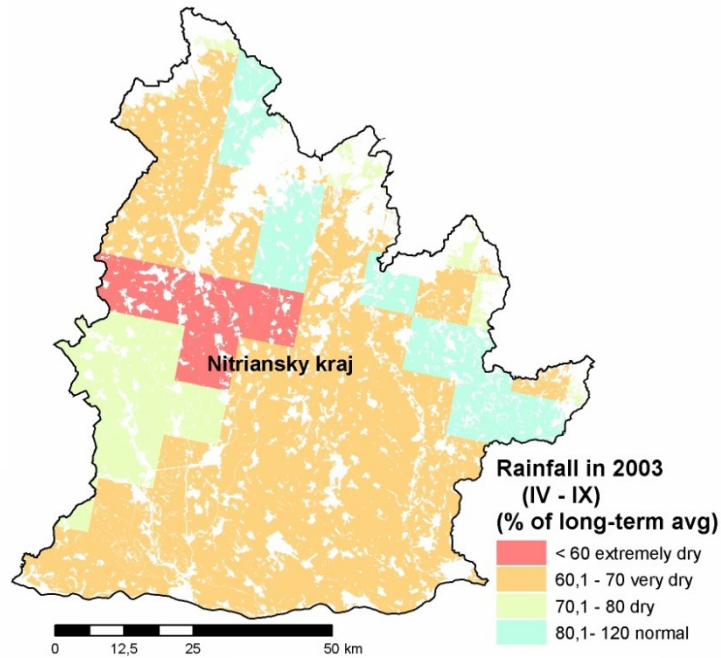
3.5.2. Response of different territorial units to the weather development/ in dry conditions :

- the areas with high productive potential point value (PV) maintain relatively high yields, comparing to long-term average production
- the territorial units with low productive potential PV - considerable decrease of yields

RAINFALL – PRODUCTION POTENTIAL – WINTER WHEAT YIELD in 2000

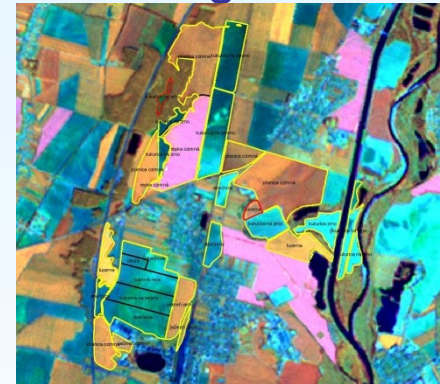


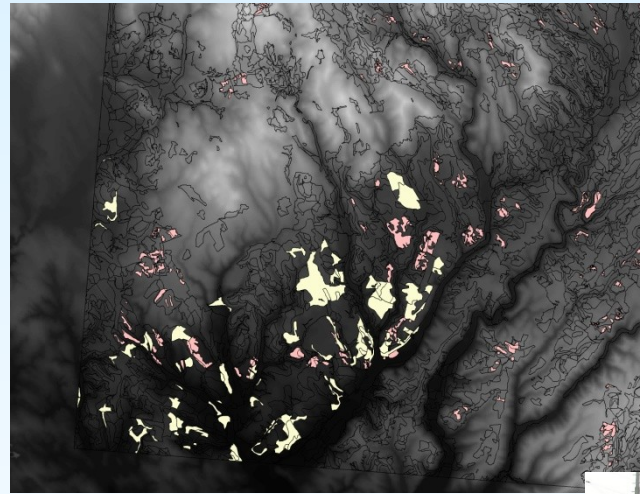
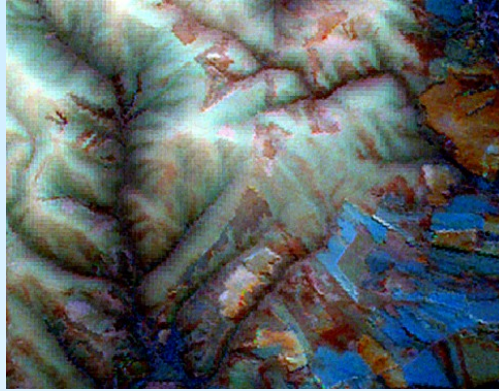
RAINFALL – PRODUCTION POTENTIAL – GRAIN MAIZE YIELD in 2003



Possible usage of new methods

1. Modeling of climate changes and effects in landscape and soils
3. Statistical evaluation
5. Further GIS layers (regarding soil, water, landscape, vegetation cover meteorological)
7. Remote sensing methods satellite and aerial images including VHR, multispectral, radar
9. Digital terrain model
11. Exact GPS measurement on the ground
13. In situ measurements for validation and control of results





4. Summary

Presented results:

- the soils of good quality are able to particularly adapt to unfavorable conditions
- they should be above all protected, not built-up,
- requirements to develop concrete projects for protection of soil and landscape against the climate changes as well
- Comparison between reached results and new technologies is needed

The question if these projects are to be realized jointly within ARGE Donauländer or just according to effort of individual regions is open.

