RESULTS IN THE RG AGROINFORMATICS

THEMATIC EXCELLENCE PROGRAM 2019
INDUSTRY AND DIGITALISATION
APPLICATION DOMAIN SPECIFIC HIGHLY RELIABLE IT SOLUTIONS

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Agroinformatics

- Agro-informatics is the application in agriculture with innovative ideas, techniques and scientific knowledge to expand the horizons of the Computer Science.
- It covers the diverse areas ranging from artificial intelligence, artificial neural networks, decision support system, expert system, geographic information system, information system related to agriculture, genetic algorithm, programming language with backend tool to develop software programmes.

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Agroinformatics

- There is a high demand for agricultural information at global, regional, national and community/sub-national levels.
- Agricultural information can be seen as an important factor which interacts with the other production factors such as land, labour, capital and managerial ability. The productivity of these other factors can arguably be improved by the relevant, reliable and useful information and knowledge.
- There are still a limited number of IT experts on this field.

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Negative environmental effects

- Global warming
- Population growth
- Limited size of arable lands

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Research Group members

- István Elek, Assoc. Prof., Dept. of Cartography and Geoinformatics
- Gáspár Albert, Assoc. Prof., Dept. of Cartography and Geoinformatics
- Tamás Horváth, Assoc. Prof., Data Science and Engineering Department
- Márta Angyalné Alexy, Assist. Prof., Data Science and Engineering Department

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István Elek

- Development of Giwer (GeoImage Workflow Editing Resources).
- This is a program package, which consists of many image processing functions, tools and gadgets.
- It can be used interactively, or in batch mode, when any combination of functions is supported.
- Not only the traditional image processing methods were implemented but many mathematical statistical methods will also be available to interpret the image (preferably satellite image or aerial/UAV photograph) content.

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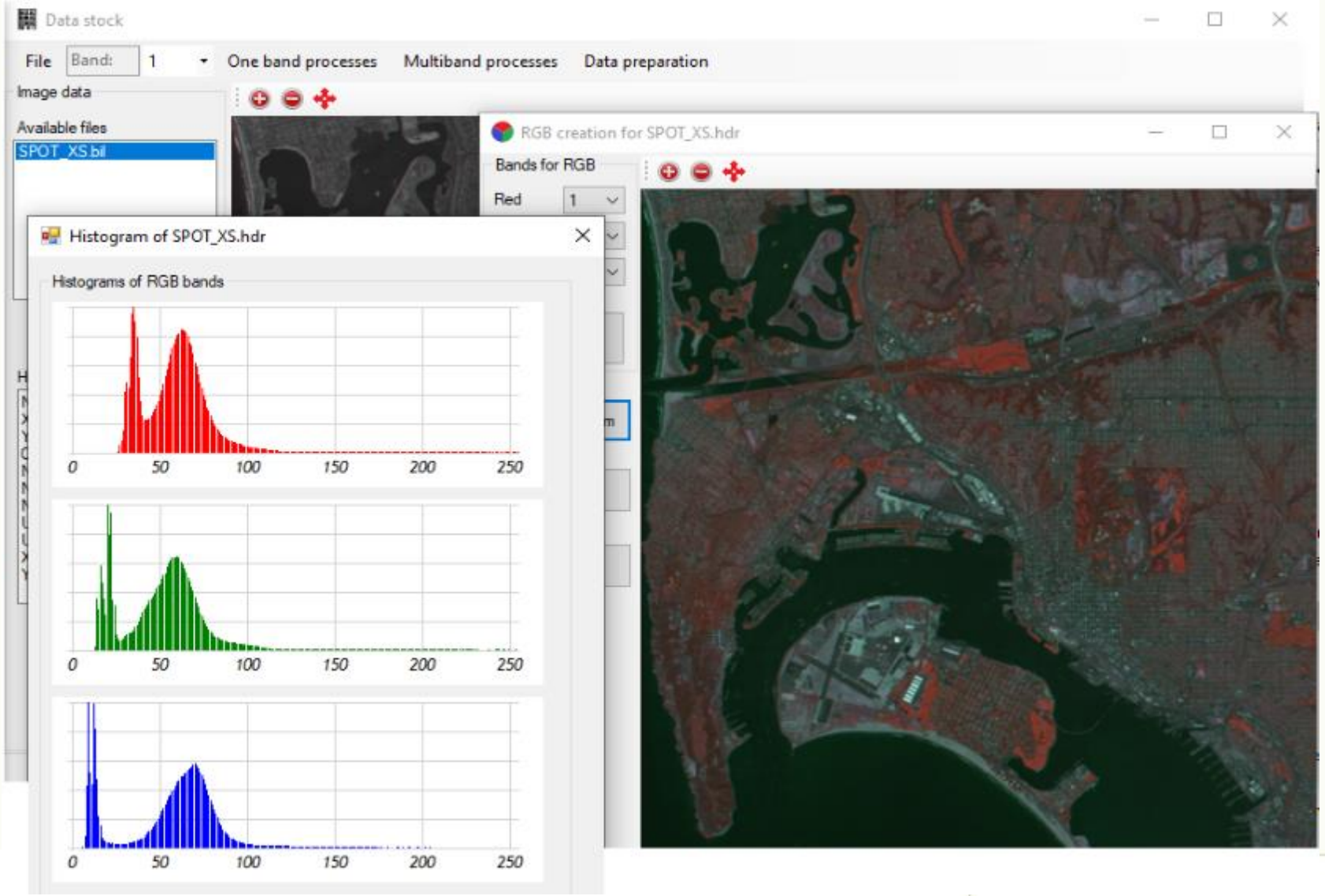

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Gáspár Albert

- Erosion protection and soil monitoring with precision terrain modelling
- The models can be used to identify locations where modifications of vegetation cover / tillage are most effective in preventing soil erosion (eg. sowing grass between rows of grape vines).
- Regular (quarterly) monitoring provides information on the dynamics of soil surface change. Seasonal difference was already detected in the pattern of soil erosion.
- Landslide modelling methodology using Machine Learning (ML) is also involved.

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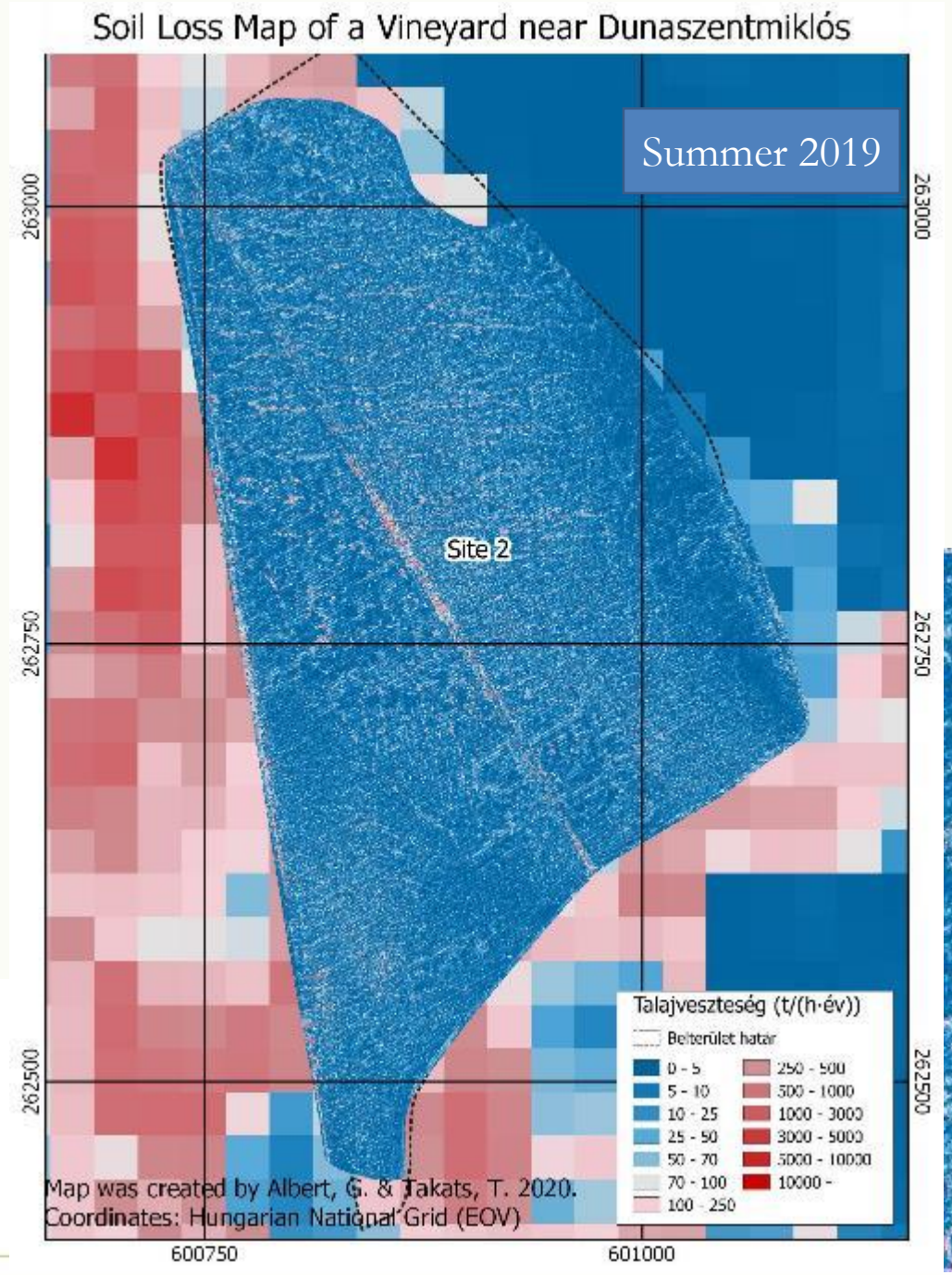
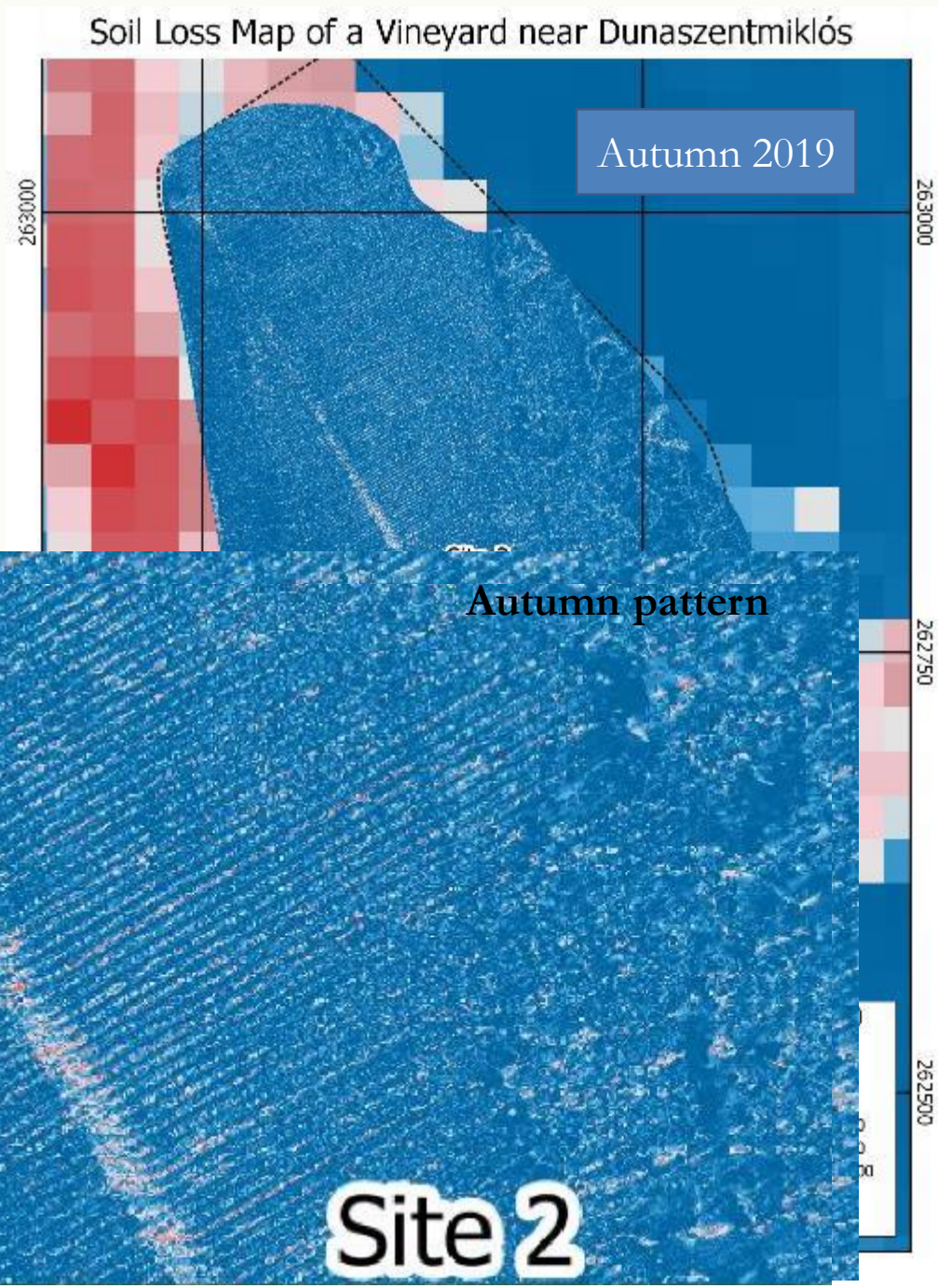
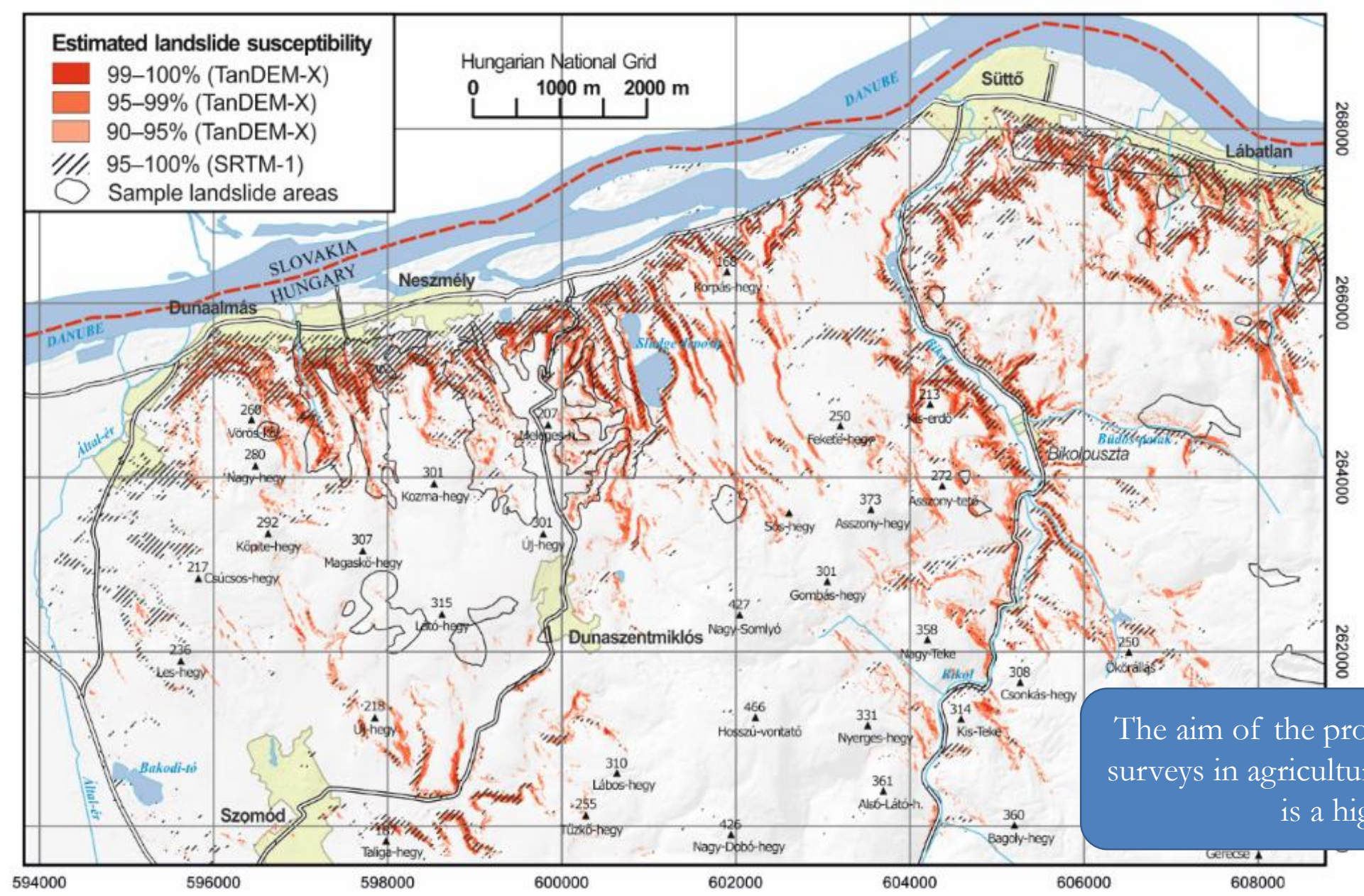


Maps show the „Keresztrét" vineyard of the HILLTOP winery.

The water-channels are more pronounced on the summer image (left).

The overall soil loss was slightly more during the summer.





Gerzsenyi & Albert (2019)

The aim of the project is to carry out regular surveys in agricultural areas where the erosion is a high-risk factor.

Students involved and scientific dissemination

The project currently involves

- 3 PhD, 1 MS and 1 BS students (2 of them are involved in the ÚNKP National Excellence Program).
- 2 PhD projects were advertised (starting from 2020 September).

Scientific materials (accepted/published):

- 1 journal paper (Q2); 7 international conference abstracts; 1 book chapter.

Non-scientific partner: Hilltop vinery

The long-term goal is to create the scientific and technological conditions for the early detection of erosion hazards, and to give precise estimations on the soil loss!

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Tamás Horváth – Márta Alexy

- Agriculture+Data science = Agroinformatics
- Multiple pilot projects (applied research):
  - *Analysing beehive sounds* for prediction models.
  - *Identifying grape species* (based on photographic images of vine leaves): their growth makes leaf collection challenging and polymorphic leaves make identification of species difficult.
  - *Mangalica monitoring*: this domestic pig is usually fed with a mix of wild pasture, supplemented with potatoes and pumpkins produced on the farm. Mangalica pigs are raised purely or semi-intensively.
  - *Lawn monitoring*: cadastre (Remote sensing and GIS-based).

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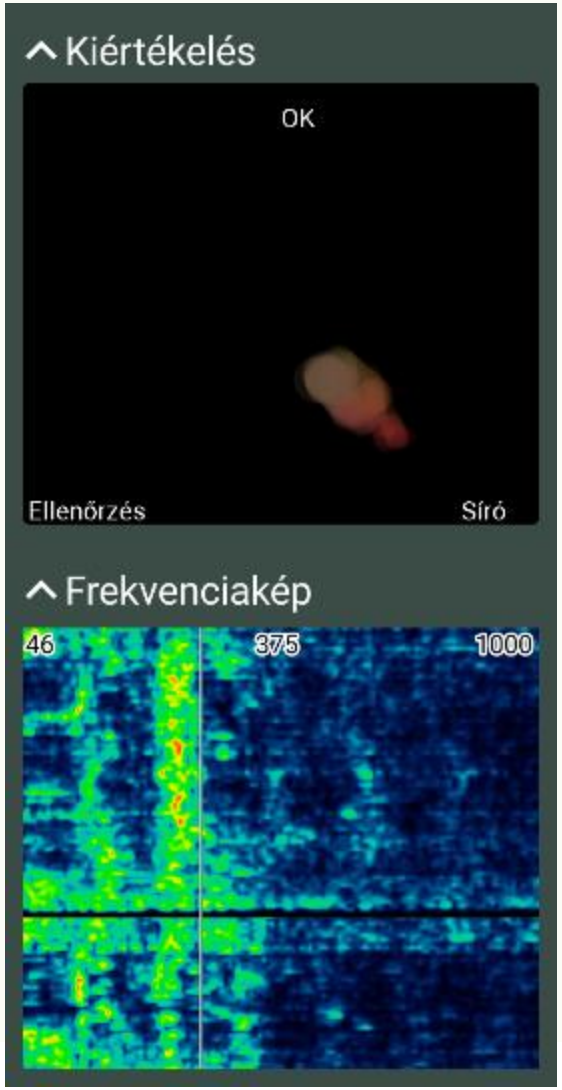
A kép nem jeleníthető meg.



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Future plans in the project

- Elek: Giwer –inventing the Raster Calculator module, handling 3D relief models, segmentation functions.
- Albert: automated recognition of risk areas using drone photographs and monitor small areas of terrain and vegetation cover for predictions soil loss. Explore Machine Learning methods to classify terrains in different type of regions (not only in present study area).
- Horváth–Alexy: pilot-projects in outdoor pig farming, in grass-based animal husbandry, in pomiculture (Szent István University, Debrecen University, Research Institute of Agricultural Economics, Campden BRI Magyarország Nonprofit Kft.)

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Application domain specific highly reliable IT solutions
https://tinyurl.hu/fDuY/

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