Elaboration of digital soil map products for the support of terroir mapping

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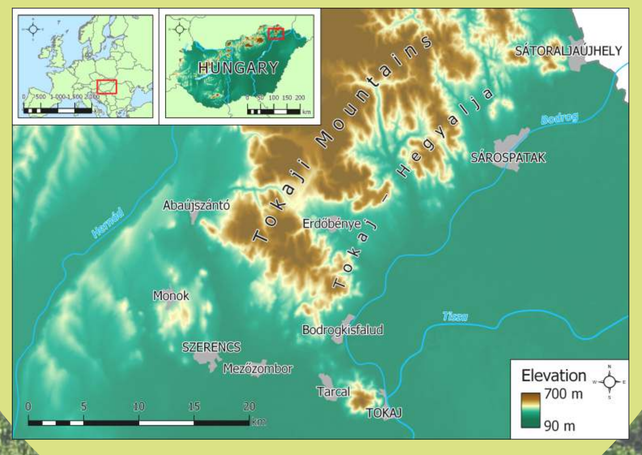
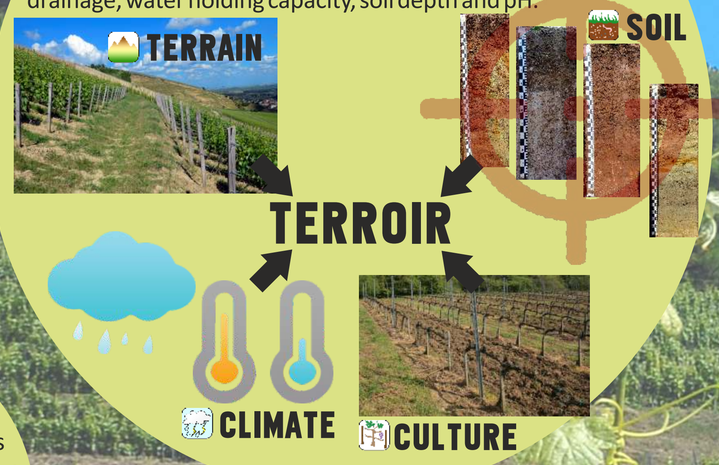
A "terroir-based approach" is needed for the characterization of viticultural land and the survey of the state of the vineyards. Soil plays dominant role determining the viticultural potential and terroir delineation. Relevant soil property map products can be created by the application of digital soil mapping (DSM) methods. DSM methods use spatially exhaustive, environmental auxiliary variables related to soil forming processes for spatial inference, which should be in direct or indirect relation with the target soil property and should provide full coverage for the target area. The soil-landscape relation can be modelled by geostatistical and data-mining methods. In this study regression kriging and classification trees methods were used to predict the target soil properties.

1. Our study area is located in Hungary, in the Tokaj Wine Region, which is a historical region for botrityzed dessert wine making. Tokaj Mountains was formed mostly by Miocene volcanic activity, where andesite, rhyolite lavas and tuffs are characteristic and loess cover also occurs in some regions.

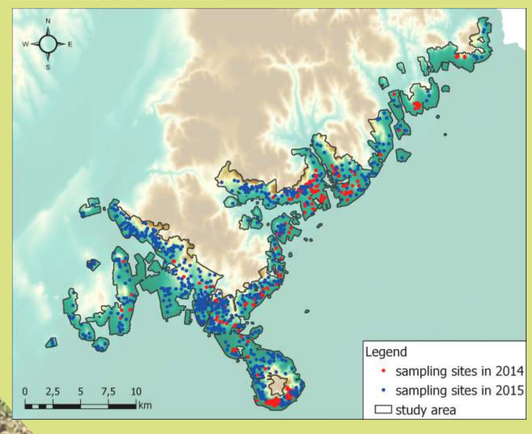


2. Terroir is a homogeneous area that relates to both environmental and cultural factors, that influence the grape and wine quality. Soil plays dominant role determining the viticultural potential and terroir delineation; the most relevant soil properties are drainage, water holding capacity, soil depth and pH.



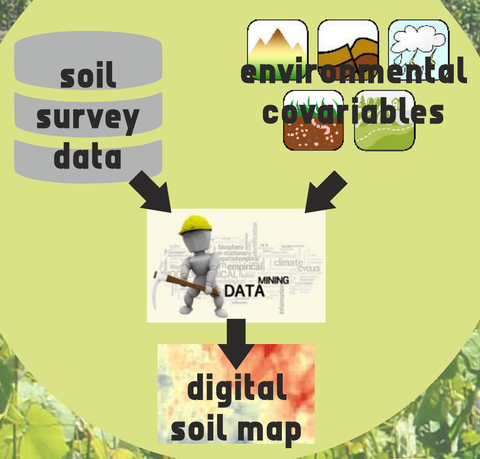
3. The soil sampling strategy was designed to be representative to the combinations of basic environmental factors (slope, aspect and geology) which determine the main soil properties of the study area. Field survey was carried on 2 levels:

1. 200 sites: to obtain a general pedological view of the area
2. further 650 sites: designed by simulated annealing technique to take into consideration the results of the preliminary survey and the local characteristics of the area



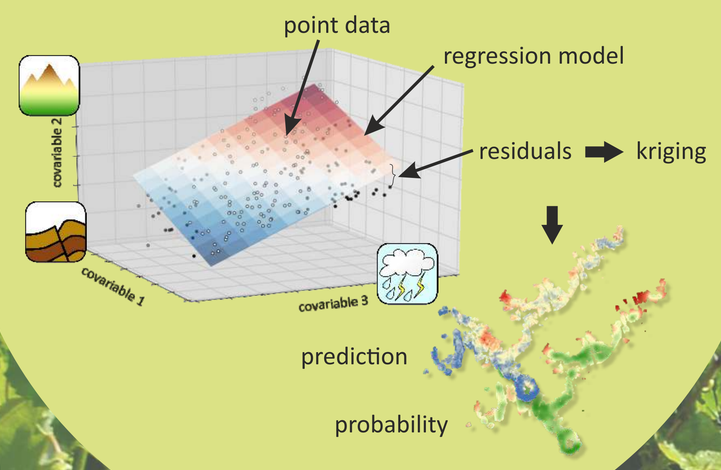
The data collection regarded soil type, soil depth, parent material, rate of erosion, organic matter content and further physical and chemical soil properties.

4. The concept of DSM

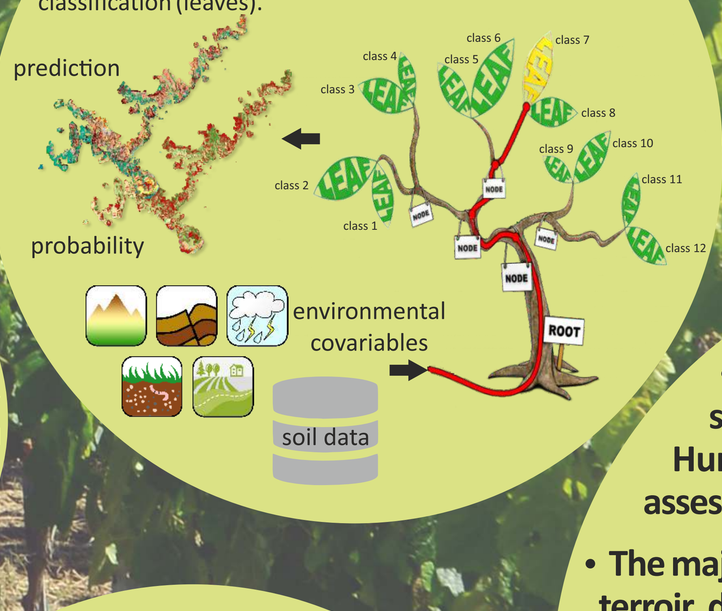


5. The spatial extension of soil survey data was performed by two, different spatial predicting methods – regression kriging (RK) and classification trees (CT), which are widely applied in DSM.

RK combines the multiple linear regression (MLR) of the dependent variable on auxiliary variables with kriging of the regression residuals. The result of the estimation is the sum of the regression model and the interpolated residuals.

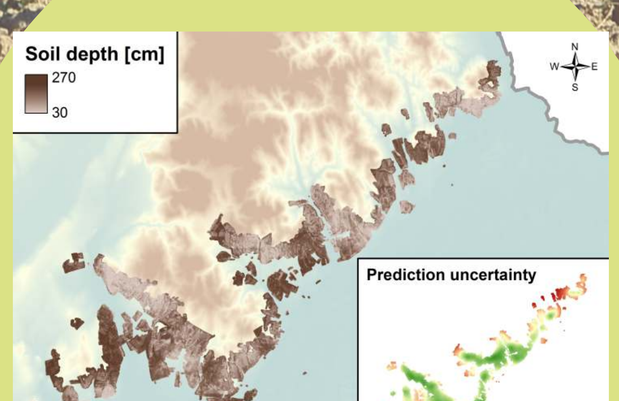


CTs recursively partition the data space to get maximum homogeneity in each classes. The rules for each partition can be combined the conditions from the initial criteria (root) through the nodes to the final classification (leaves).

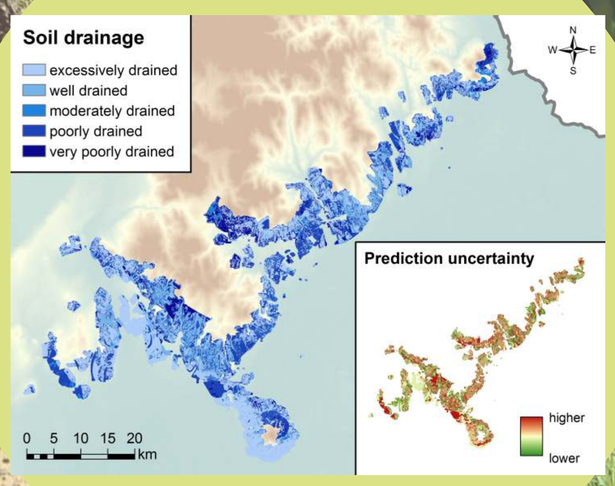


6. In the framework of the recent project a total number of 33 primary and secondary soil property, soil class and soil function maps were compiled. 2 examples of the map products are presented below: soil depth and soil drainage representing a continuous and a class type soil property respectively.

Continuous type soil property map



Class type soil property map



Conclusion

- **A set of the resulting maps supports to meet the demands of the Hungarian standard viticultural potential assessment**
- **The majority of the maps is intended to be applied for terroir delineation. On our poster we present some examples of the resulting soil map products.**
- **The resulted soil map products were also used to predict other climatological parameters (e. g. the frequency of frost damage) and agronomic properties (as potential growth rate, earliness, stock selection).**
- **The soil map products together with the climatological, terrain and agronomic map products enable the terroir delineation in the area.**

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