

ADAPTATION STRATEGIES FOR SOIL AND WATER CONSERVATION IN A CHANGING WORLD

Proceedings

Bořivoj Šarapatka, Marek Bednář and Patrik Netopil
(Eds.)



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and Societas pedologica slovac

in cooperation with
International Union of Soil Sciences,
European Society for Soil Conservation,
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The Minister of Agriculture Zdeněk Nekula
and the Ministry of the Environment of the Czech Republic,
the Rector of Palacký University in Olomouc,
and the Dean of the Faculty of Science of Palacký University in Olomouc

present

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ADAPTATION STRATEGIES FOR SOIL AND WATER CONSERVATION IN A CHANGING WORLD

Bořivoj Šarapatka, Marek Bednář and Patrik Netopil
(Eds.)

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Ministry of the Environment
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MINISTRY OF AGRICULTURE
OF THE CZECH REPUBLIC

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Dear colleagues,

Before the Covid pandemic came along, we had already decided, together with Czech and international organizations, that we would organize a conference in the university city of Olomouc on the topic of adaptation strategies for soil and water conservation. We discussed the definitive focus for a long time, including whether to prioritize the changing climate in the title. In the end, we took the title more broadly to emphasize the changing world and the many changes taking place within it. In Olomouc, we are thus following on from the international conference on “Degradation and revitalization of soil and landscape”, which we organized at the same venue in 2017 in cooperation with soil science associations of the V4 countries. We are meeting in Olomouc, where you will feel the genius loci of the historical and academic city. As early as prehistoric times, the area above the floodplain of the Morava River provided an attractive place for settlement. Over time, the city gradually developed, and in the Middle Ages it became the center of power of the whole of Moravia, one of the three historical lands of today’s Czech Republic. In the mid 16th century, a university was founded here, the second oldest in the Czech Republic. So we meet at a time when the university is celebrating 450 years of existence.

Agricultural and partly also forested land has always been the wealth of the region known as Haná, and has ensured the livelihood of the local population. It is no different today. Unfortunately, as in other countries, we are witnessing many degradation influences that disrupt the land’s productive and non-productive functions. This applies not only to the area in which we will meet for a few days, but globally. I am glad that experts in soil and water protection, from a number of countries with different natural conditions, will gather at the conference. It will be an opportunity for meaningful discussion and exchange of experience from all around the world. I am pleased that people who work in the landscape, or who influence the face of the landscape with their decisions, are participating in the conference or are interested in its conclusions. This is evident in the organizations which have helped in the preparation of the event.

When planning annual professional events, in which the soil science societies of the Czech and Slovak Republics cooperate, we always try to propose a variety of excursions so that the participants can get to know the issues discussed during the lectures and discussions. It is no different for this international conference, where excursions will provide an opportunity to visit two areas with different conditions for management and landscape protection. One is in the agricultural production area of South Moravia, and the other is in the higher altitudes of the Beskydy Mountains.

I am convinced that the organizing team will succeed in creating a pleasant atmosphere for you in Olomouc, where we will not only gain new insight into important issues, but will also enjoy four pleasant days of interesting discussion and accompanying events.

On behalf of the organizing and scientific committee of the conference.

*Bořivoj Šarapatka
Chairman
of the Czech Society of Soil Science*

PROGRAM

MONDAY 19th JUNE 2023

17:00–18:00 Registration

18:30 Welcome drink

TUESDAY 20th JUNE 2023

10:00–10:45 Opening ceremony

10:45–12:00 Keynote speakers

10:45 **Possible policies and actions to protect the soil cultural and natural heritage of Europe (*Costantini*)**

11:15 **Soil Erosion Monitoring of Agricultural Land of Czech Republic (*Pavlík, Hřebíčková, Kapička, Šarapatka, Dumbrovský, Bednář*)**

11:45–12:00 Discussion

Lunch

Session: **ANALYSIS OF SOIL AND WATER PROTECTION ON A GLOBAL AND LOCAL SCALE**

13:15 **Understanding and mitigating extreme diffuse pollution from Norwegian agricultural watersheds (*Confesor, Øygdalen, Bechmann*)**

(Lectures marked in bold are introductory lectures in individual thematic blocks)

13:35 Topography-based detection of Ephemeral Gullies suitable for protection by Grassed Waterways in Eastern Austria (*Brunner, Schmaltz, Steger, Strauss*)

13:50 Ephemeral gullies and its characteristic in conditions of the Czech Republic (*Dumbrovský, Sobotková*)

14:05 Comparison of the Physical Properties of Soils on Transverse Profiles along the Gullies (*Živanovič, Rončević, Čorluka, Čebašek, Rupar*)

14:20 Natural and bio-technical water retention measures in the Švihov reservoir catchment – watershed management, researchers, designers and farmers work together (*Zajíček, Fučík, Hejduk, Kvítek*)

14:35–15:00 Discussion

15:00–15:30 Coffee break

15:30 **The effect of concentrated flow on sediment and nutrient retention in vegetated filter strips** (*Schmaltz, Ramler, Strauss*)

15:50 Impacts of climate change on erosion processes (*Podhrázká, Kučera, Karásek, Pochop*)

16:05 Erosion modelling in Norway: changing needs and opportunities (*Barneveld*)

16:20–16:30 Discussion

16:30–17:30 Poster session

19:00 Social evening

WEDNESDAY 21st JUNE 2023

Session: ANALYSIS OF SOIL AND WATER PROTECTION ON A GLOBAL AND LOCAL SCALE

9:00 **Changes in soil fauna (Acari: Oribatida, Mesostigmata; Nematoda) communities in Scots Pine (*Pinus sylvestris* L.) forests across S-N European gradient** (*Kamczyc, Pers-Kamczyc, Wierzbicka, Dobies, K. Urbanowski, Malica, Skorupski, Oleksyn*)

9:20 Tolerance of ectomycorrhizal mycelium of *Paxillus involutus* exposed to Pb (*Szuba*)

9:35 Vegetation growth dynamics in the water level fluctuation zone of the Three Gorges Reservoir and its responses to habitat stressing (*Rao, Tang*)

or

An experimental study on snowmelt – wind – rainfall compound erosion on sloping farmlands of Chinese typical Mollisol region (*Zheng, Zhao*)

9:50 Precious Soil and Water Resources – Sustainable Land Management (*Zlatic*)

10:05–10:20 Discussion

10:20–10:50 Coffee break

Session: RESEARCH INTO THE IMPACT OF ANTHROPOGENIC AND NATURAL INFLUENCES ON SOIL AND WATER FROM THE POINT OF VIEW OF PRODUCTION AND NON-PRODUCTION

10:50 **Possible hazards associated with the use of wastewater and sludge from wastewater treatment plants in agriculture** (*Ko-dešová, Švecová, Klement, Féř, Fedorova, Nikodem, Grabič*)

11:10 Economic Effects of Applying the Future Agricultural Production Structure Model (FAPSMS): The Case of Barička River Basin (*Tričković, Rončević, Živanović, Grujić, Stefanović, Jovanović, Zlatic*)

11:25 Methodology to quantify the global agricultural crop footprint including soil impacts (*Ascaso, Palacino, Valero, Valero*)

11:40 The Effects of Water Erosion on Soil Properties and Crop Yield in a Highly Exploited Agricultural Area of South Moravia, Czech Republic (*Šarapatka, Bednář, Černožský*)

11:55–12:15 Discussion

Lunch

- 13:30 How effective are undersown crops and strips-tillage at mitigating soil erosion and pesticide transfer in maize crops? Results and insights from field trials (*Clement, Bielders, Degré, Manssens, Foucart, Pigeon, Blondel, Huyghebaert*)
- 13:45 Impact of plastic pollution on the quality of arable soils in the Sava and Danube river valleys (*Saljnikov, Grujić, Jovković, Stanković, Krnjajić, Marjanović*)
- 14:00 Soil organic carbon stock in a Colluvisol profile: application of hyperspectral imaging to study soil organic carbon variability in a deep soil profile (*Reyes Rojas, Žižala, Matoušková, Zádorová*)
- 14:15 Forest logging residues as an important source of nutrients and carbon sink on the clear-cuts area (not only) after the bark beetle calamity (*Šrámek, Fadrhonsová, Neudertová Hellebrandová, Novotný*)
- 14:30 Application of biochar in a Chernozem in northern Kazakhstan: effects on soil properties and spring wheat yield (*Lo Papa, Toktar, Conte, Shayakhmetova, Bakirova, Ahmetov, Mukanova, Balakhmetova, Dazzi*)
- 14:45 Development of soil organic carbon stock on agricultural soils of Slovakia (*Barančíkova, Koco, Makovníková, Halas, Skalský, Kobza*)

15:00–15:20 Discussion

15:20–15:40 Coffee break

NATIONAL AND INTERNATIONAL GOALS, STRATEGIES AND DIRECTIONS FOR SOIL AND WATER CONSERVATION FROM THE POINT OF VIEW OF PRESENT AND FUTURE GENERATIONS

- 15:40 **UNCCD – the Rio Convention for binding the issues with soil and water conservation** (*Houšková*)
- 16:00 Watershed health monitoring-based strategy: A tool for watershed adaptive management (*Sadeghi, Meisina, Maeker*)

16:15 Living labs and lighthouses lead towards healthy soils in Europe
(*Sobocká*)

16:30 Strategy and priorities of soil cover development research and
monitoring in Slovakia (*Kobza*)

16:45–17:00 Discussion

17:00–18:00 Poster session

**18:00 Meetings of ESSC, Czech Society of Science,
Societas Pedologica Slovaca, etc.**

THURSDAY 22nd JUNE 2023

PROFESSIONAL EXCURSIONS

FRIDAY 23rd JUNE 2023

9:00–11:00 Keynote speakers

9:00 **Mapping of soil-based ecosystem services and soil threats of
European arable lands – A systematic review and new approaches**
(*Reyes Royas, Coblinski, Cornu, Piccini, Saby, Vašát, Borůvka*)

9:30 **Changing paradigms in combating desertification. A perspective
from Mediterranean Europe** (*Rubio*)

10:00 **Forest soils of the Czech Republic – current state and change
expected after the bark beetle outbreak** (*Šrámek, Borůvka,
Neudertová Hellebrandová, Vašát, Sáňka O., Fadrhonsová, No-
votný, Sáňka M.*)

10:30 **A win-win strategy for consolidating soil awareness in politics
and reaching an effective soil governance in society** (*Dazzi, Lo
Papa*)

11:00–11:30 Discussion

11:30–12.30 Conclusion and Closing Ceremony

Lunch

POSTER PRESENTATIONS

Session: ANALYSIS OF SOIL AND WATER PROTECTION ON A GLOBAL AND LOCAL SCALE

The Potential of Hyperspectral Aerial Surveys for Identifying Waterlogged Areas in Agricultural Landscapes (*Bednář, Netopil, Šarapatka*)

Enhancing direct runoff estimates through modification of the NRCS-CN method (*Caletka, Drbal, Fučík*)

Evaluation of the agroecosystem service potential – regulation of the soil erosion (*Pálka, Makovníková*)

Drop Size Generated by Dripping Rainfall Simulators for Soil Research–Review (*Rončević, Živanović, H. van Boxel, Iserloh, Štrbac, Kašanin-Grubin, Antić*)

Measures for water retention in landscape in the Czech Republic (*Štěpánková, Dzuráková, Osičková*)

Interactive effects of wind velocity and slope gradient on splash erosion (*Kallehouei, Sadeghi, Khaledi Darvishan*)

Long-term agrochemical testing of agricultural soils related to natural and socio-economic conditions of Czech Republic (*Houška, Šipoš, Kaláb, Vašát, Pavlů, Penížek, Bednář, Václavík, Šarapatka, Borůvka*)

Monitoring of soil properties and groundwater level in alluvial floodplain forest (*Sedlák, Pospíšilová, Prudil, Basu*)

Multi-level nitrogen balance at temperate forests in the territory of the Czech Republic (*Samec, Rychtecká, Sirota*)

Migration of organic carbon and Ca in soddy-podzolic soil limed by chalk: laboratory trial (*Litvinovich, Lavrishchev, Bure, Zhapparova, Aisakulova, Gömöryová*)

Potentially toxic elements in agricultural soils in the Czech Republic – state and development (*Poláková, Reiningger, Kubík*)

A study of salinization of agricultural soils in the Maisky district of the Pavlodar region of Kazakhstan, using remote sensing data (*Rakhmanov, Šarapatka, Alibekova, Hekera, Černohorský, Bednář, Smanov*)

Response of soil chemical and biochemical properties to biochar and (biochar + compost) application under *Zea mays* in a degraded environment (*Notario Del Pino, González Correa, Raya Ramallo, Arco Lázaro, Haroun Tabraue*)

Impact of black cherry (*Prunus serotina Ehrh.*) on soil mites (*Acari: Mesostigmata*) in Scots pine (*Pinus sylvestris L.*) stands growing on post-agricultural lands (*Malica, Urbanowski, Raczka, Skorupski, Kamczyc*)

Determination of soil losses by wind erosion to support proposals for optimal measures to protect soil from wind erosion (*Kučera, Podhrázská, Blecha*)

Session: **RESEARCH INTO THE IMPACT OF ANTHROPOGENIC AND NATURAL INFLUENCES ON SOIL AND WATER FROM THE POINT OF VIEW OF PRODUCTION AND NON-PRODUCTION**

Byzantine agricultural terraces and their impact on soil conservation water distribution and fruit trees growth in the central Negev Highlands desert south Israel (*Ashkenazi, Chen*)

Degradation of traditional vineyards in Slovakia by abandonment and soil erosion: A case-study of Vráble viticulture district, Slovakia (*Lieskovský, Kenderessy*)

Soil cover change since Systematic Agricultural Soil Survey in the 1960s – Czech Republic (*Pavlů, Penížek, Zádorová, Žižala, Houška, Borůvka, Biney*)

Soil cover around the world's deepest flooded abyss near Hranice (*Vlček, Šimečková, Oppeltová, Sedláček, Geršl*)

Updates in the land evaluation of the agricultural land fund of the Czech Republic (*Blecha, Pavlík, Hřebíčková*)

Climate regulation ecosystem services in selected regions of Slovakia
(*Makovníková, Pálka, Kološta*)

Changes in watershed sustainability due to air pollution (*Mirchooli, Zabihi Seilabi, Sadeghi*)

Vertical distribution of radionuclides in soil and its effect on groundwater vulnerability (*Kratina, Juranová, Marešová, Sedlářová, Kadlecová, Novák, Pohlová, Datel*)

The influence of different tillage methods in the interrow of vineyards on soil erosion (*Čížková, Zemánek, Burg*)

Effects of inoculation of soil microorganisms on organic matter, stability of aggregates and soil available phosphorus under freeze-thaw cycle (*Gharemahmudi, Hamidreza Sadeghi, Najafinejad*)

Do soil properties reflect the changes in a forest stand structure? A case study from the primeval beech forest in Havešová, Slovakia (*Židó, Šumichrast, Kucbel, Gömöryová*)

Changes of chemical properties and carbon stock in forest soils after clearcutting (*Fadrhonsová, Šrámek, Novotný, Tejnecký, Valtera*)

The effect of forest management on physico-chemical properties of sandy soils (*Gömöryová, Židó*)

Relationship between forest management and soil water content dynamics as a forest ecosystem services factor (*Homolák, Kašiar*)

Soil development on metamorphic rocks in the conditions of protected and anthropogenically affected areas of forest ecosystems (*Žigová, Šťastný, Mikysek*)

The effect of whey-based hydrogel addition on soil water holding capacity and availability of nutrients (*Čechmánková, Skála, Horvátová, Vácha*)

Chemical changes in Chernozems as affected by water erosion (*Pospíšilová, Boturová, Plisková, Menšík*)

Pesticides in soil and water in chosen agricultural catchments in the Czech Republic (*Konečná, Karásek, Zajíček, Nováková, Sáňka, Halešová*)

Preliminary results of the geochemical, hydrogeological and pedological study of the Javoříčko–Mladeč karst area (*Novotný, Novotná, Kryštofová, Hadacz, Baldík, Buriánek, Rez, Sedláček, Janderková, Müller, Drahoš*)

Comparison of the physical properties of soils on transverse profiles along the gullies

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Keywords: soil erosion, physical soil parameters, gully, geotechnics, forest

Natural processes and anthropogenic activity threaten soil as a resource. Soil degradation is a global problem intensified by climate change, population growth and economic development. Soil erosion is one of the most prevalent forms of degradation in Serbia. Soil resistance to erosive processes largely depends on the soil's physical properties. Erosion processes affect changes in the physical characteristics of the soil. Therefore, the hypothesis is established: There is a difference between the physical parameters of soil affected by erosion processes and soil on which there are no visible indicators of the action of these processes. The investigated area is located in the southern, hilly part of Belgrade, in a degraded forest area vegetated by Hungarian and Turkey oak (*Quercetum frainetto – cerris*). Intensive landslide and gully erosion processes affect this area. The mechanism of occurrence of the erosion process is piping-erosion. Thirteen transverse profiles were selected on gullies where soil sampling was performed. Sampling was performed on each profile in the gully bed, in the left and right banks at two fixed depths, zone 1, depth 5–10 cm and zone 2, depth of 10–25 cm. Laboratory analyses included tests of volume weight, specific weight, soil particle size distribution, consistent states and humidity. Parameters porosity and clay activity were also analysed. Soil sampling and laboratory testing were done in accordance with SRPS.U.B1 geotechnical testing standards. The comparison of the

obtained results was made between the banks and the gully bed, as well as between the zones using tests: t-test of mean values; W (Mann-Whitney; Wilcoxon) – median test. Hypothesis testing was performed with a significance threshold p of 95.0 %. Testing was conducted in the statistical analysis program Statgraphics centurion XVIII (StatPoint Technologies, Inc. 2019). Comparison of soil parameters in zone 1 had shown a statistically significant difference for percentage of clay and sand, liquid limit, humidity and clay activity. Results of conducted comparison showed that in the zone 2, a statistically significant difference found for the parameter percentage of clay and sand, between banks and gully bed soil samples. While no significant statistical difference found for the other parameters. Analysing the results between zones, a significant statistical difference was found for the gully bed, left and right banks soil samples for the parameters volume weight (dry and humid) and porosity while for gully samples there was significant statistical difference for liquid limit, plastic limit, humidity and clay activity. Comparing all samples of the zones 1 and 2, a significant statistical difference was found for the parameters volume weight (dry and humid), porosity, percentage of sand particles, plastic limit and current humidity.

Based on the obtained results, the hypothesis was confirmed. Physical soil parameters can be used as indicators of the possibility of occurrence of erosion processes.

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