Degradation of historical vineyards: soil erosion vs. abandonment

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Aim of the study:

1. **Analyse the changes in soil erosion intensity in historical vineyards**

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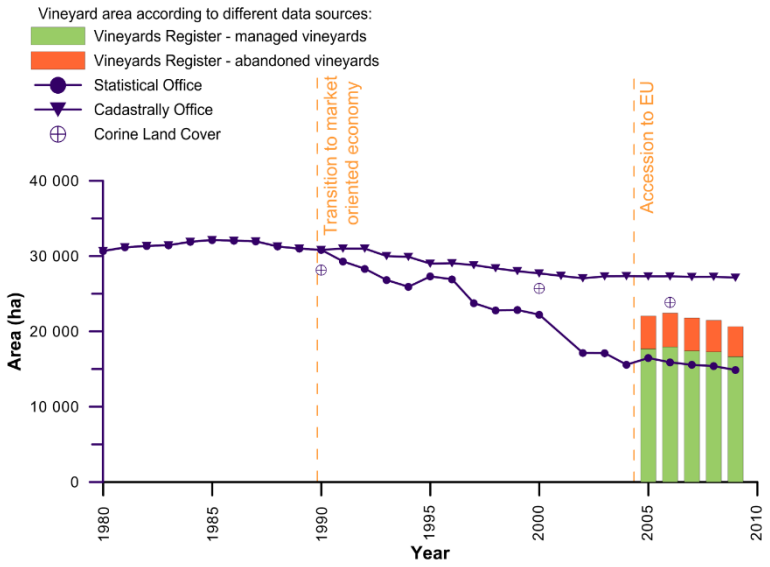
1. **Analyse the changes in soil erosion intensity in historical vineyards**

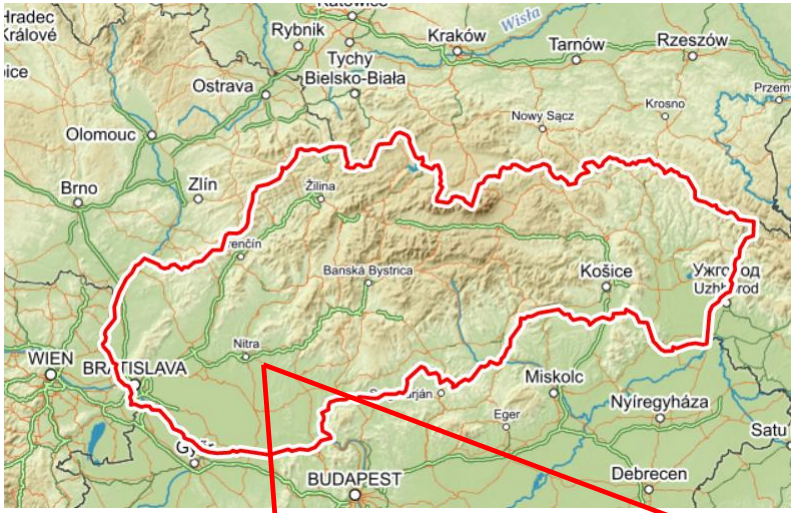
2. **Analyse the changes in management of historical vineyards**

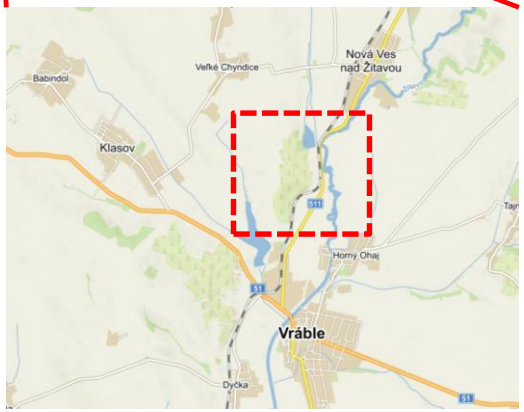


- Area of registered vineyards in 2022: 14 364 ha
- 303 mosaics of traditional vineyards covering 7 601 ha recorded in 2010
- 120 mosaics regularly managed, 128 partly abandoned, 55 abandoned

Methodology:

Study area





- Altitude 150-200 m.a.s.l
- Maximum slope 12°
- Average annual precipitation 572 mm
- Silty loam or silty clay loam soils

- Ploughed with garden tractor
- Established in 1983
- 261 meters long
- 2 rows of 33 poles, 1 row of 30 poles

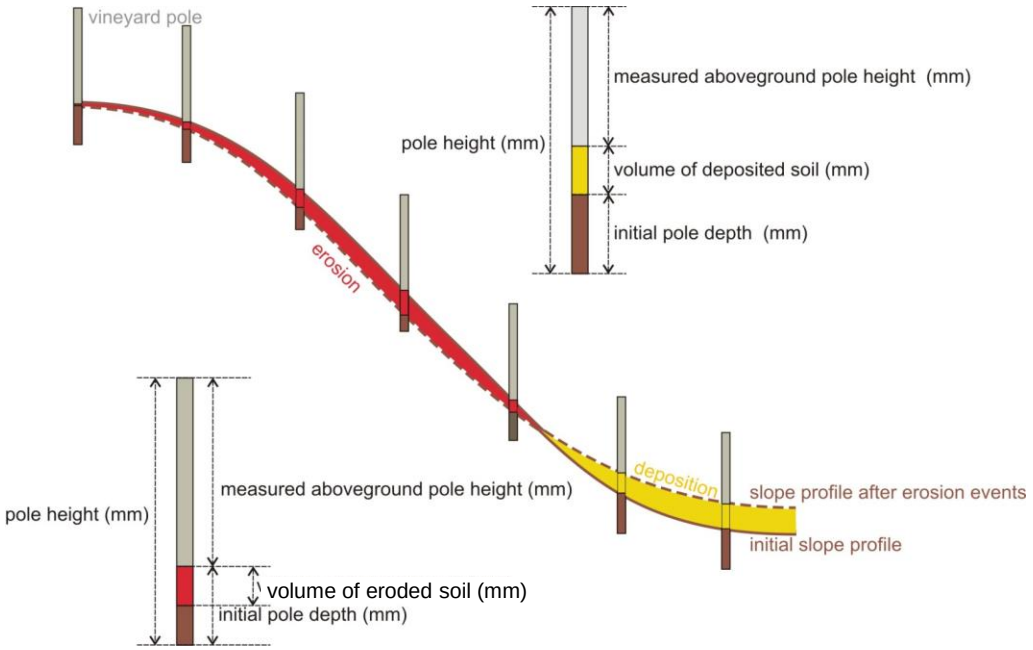
- Hoed in 1975-2016, grassed in 2016
- Established in 1975
- 250 meters long
- 2 rows of 33 poles, 1 row of 30 poles

- Rotavatored in 1970-2009, abandonned in 2010
- Established in 1983
- 250 meters long
- 4 rows of 41 poles

Control plot

- Relative flat terrain, average slope 2°
- Ploughed
- Measured in 2011 and 2022
- 9 rows of 10 poles

Soil erosion intensity measurement and calculation



$$\Delta h = (h_i - d_i - h_m) / \Delta t$$

$$\Delta A = \rho_d . 10 . \Delta h$$

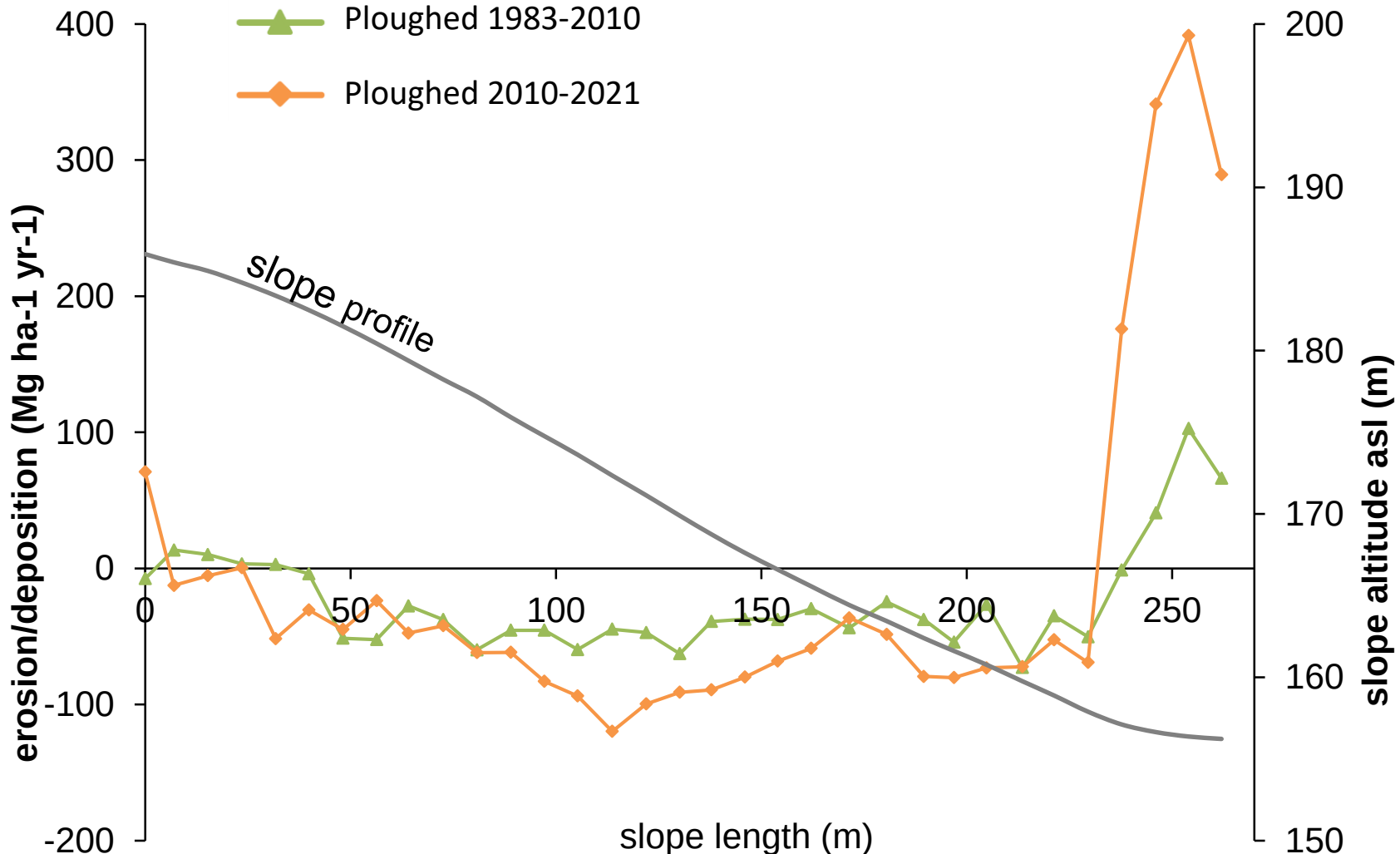
Δh - soil erosion or deposition (mm.year^{-1})
h_i - whole pole height (mm)
d_i - initial underground pole deepness (mm)
h_m - measured aboveground pole height (mm)

ΔA - soil erosion or deposition (t.ha^{-1}.year^{-1})
ρ_d - soil bulk density (g.cm^{-3})

Lieskovský J, Kenderessy P. 2014. Modelling the effect of vegetation cover and different tillage practices on soil erosion in vineyards: A case study in vráble (Slovakia) using WATEM/SEDEM. *Land Degradation and Development* **25**: 288–296. DOI: 10.1002/ldr.2162

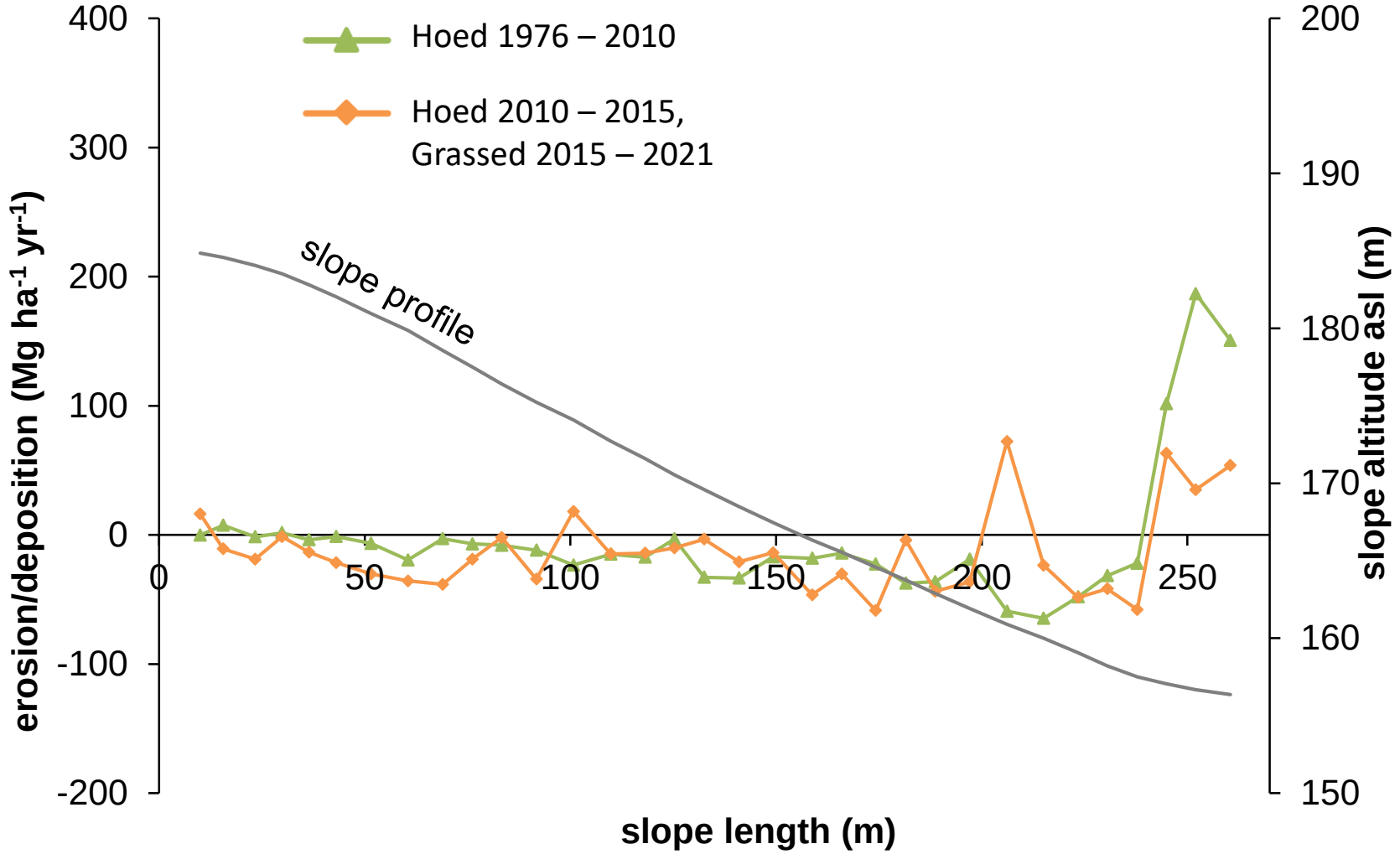
1983-2010
Erosion: -2.26 mm/year (-33.47 Mg/ha/yr)
Deposition: +4.72 mm/year (+69.88 Mg/ha/yr)

2010-2021
Erosion: -3.73 mm/year (-55.34 Mg/ha/yr)
Deposition: +20.23 mm/year (+299.42 Mg/ha/y



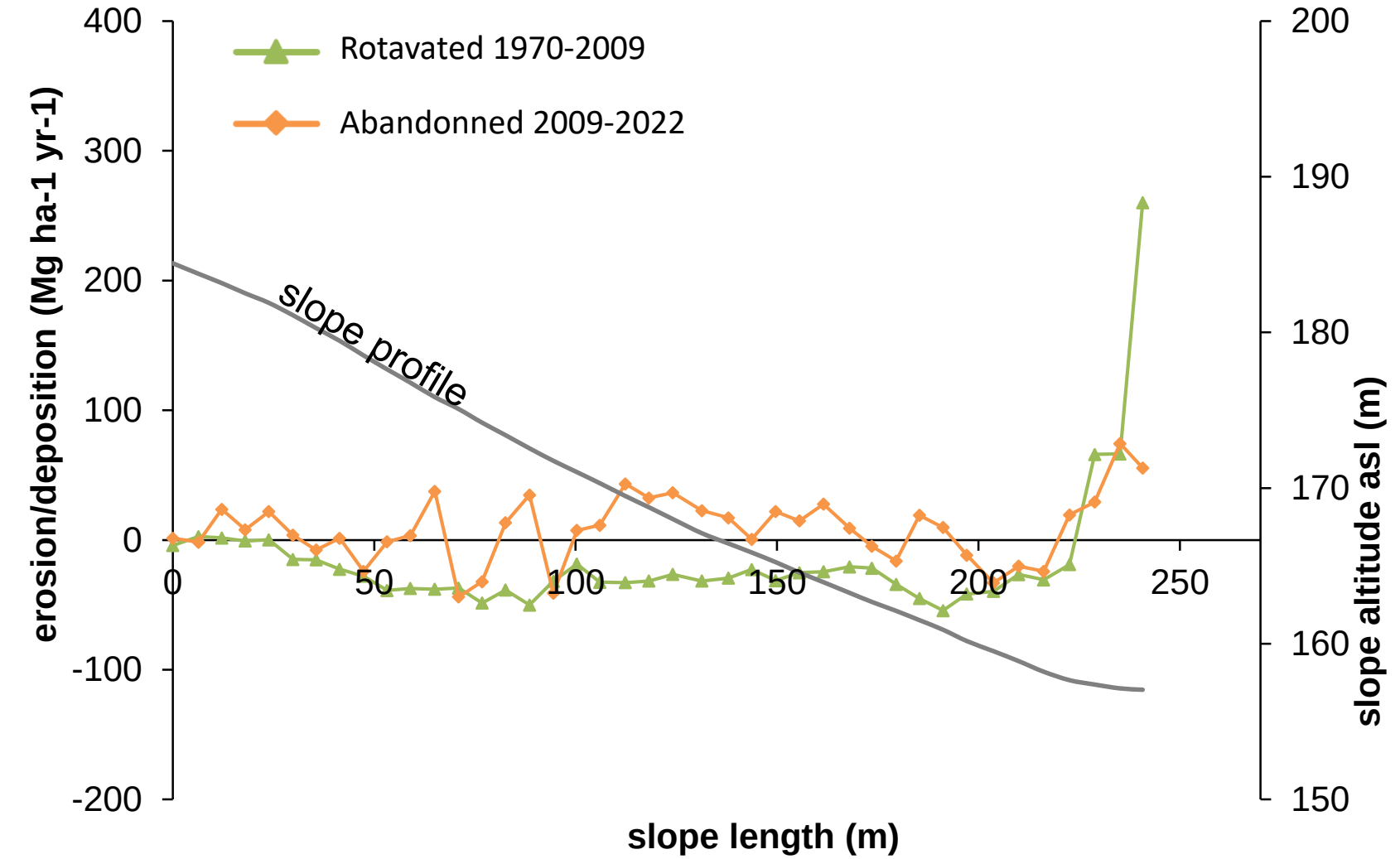
1976-2010
Erosion: -1.27 mm/year (-18.92 Mg/ha/yr)
Deposition: +9.88 mm/year (+146.35 Mg/ha/yr)

2010-2021
Erosion: -1.32 mm/year (-19.55 Mg/ha/yr)
Deposition: +3.42 mm/year (+50.68 Mg/ha/yr)

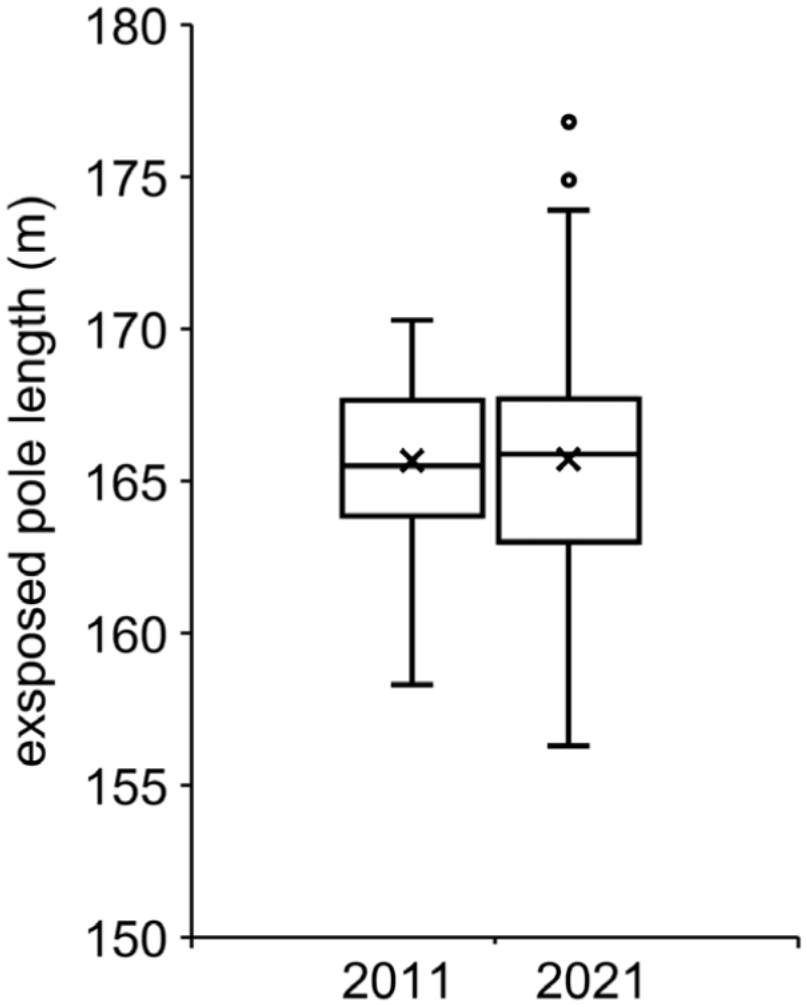


1970-2009
Erosion: -1.85 mm/year (-27.41 Mg/ha/yr)
Deposition: +8.84 mm/year (+130.76 Mg/ha/yr)

2009-2022
Erosion + **regeneration**: +**0.32 mm/year (+4.73 Mg/ha/yr)**
Deposition + **regeneration**: +3.58 mm/year (+53.03 Mg/ha/yr

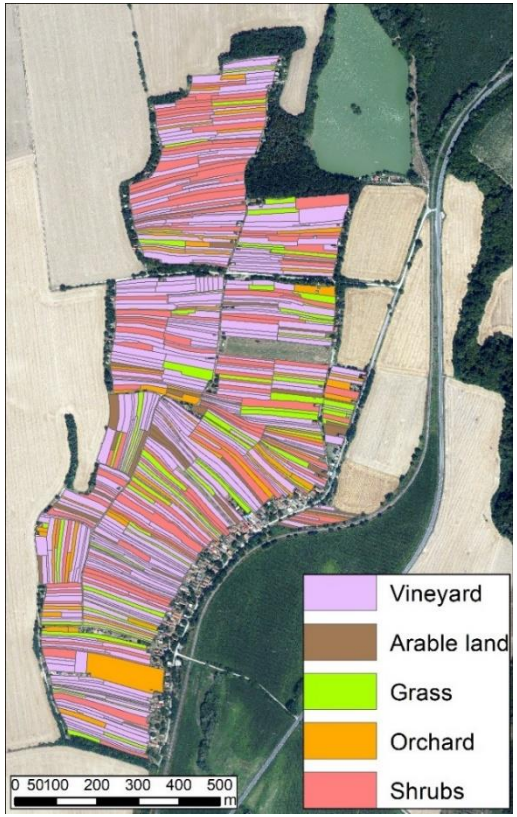


Average exposed poles heights:
2011: 165.68 ±2.43 cm
2021: 165.72 ±3.69 cm

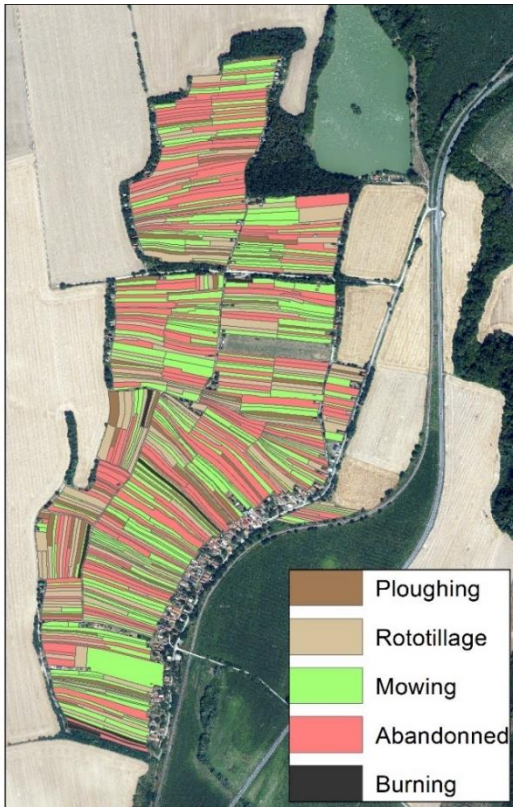


Results:

Landcover and management practices



54.35% - covered by vines
24.30% - overgrown by trees and shrubs
9.46% - covered by grass only
8.05% - used as orchards
3.83% - covered by bare soils and are cultivated by plough or rototiller



35.7% - abandoned
35.96% - regularly mowed
20.76% - cultivated by rototiller
6.40% - ploughed
1.16% - signs of grass burning
***0% - hoed**

Conclusions and further research:

- Despite the fact that soil erosion intensity may increase due to increased rainfall erosivity, this process will be mitigated by continuous abandonement and more frequent grass cover application.
- The soil surface on abanonned vineyard increased 0.32 mm/year in eroded part of the slope and 3.58 mm/year in footslope. Average increase on whole slope was 0.72 mm/year
- The measurements on control plot showed only minimal change on average exposed pole height, but increase in variability over decade. That indicates, that pole height method is applicable for the measuring the long term erosion and deposition rates in vineyards, but sufficient number of observation is needed to minimize the measurement uncertainty.
- The most important factors causing the degradation of traditional vineyards is not soil erosion anymore, but decreasing management that leads to the abandonment.



COMPUTATION OF ANTI-EROSION EFFECTS OF VINEYARDS BASED ON FIELD EROSION MEASUREMENTS – CASE STUDY FROM THE VRÁBLE VITICULTURAL DISTRICT (SLOVAKIA)

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LAND DEGRADATION & DEVELOPMENT

Land Degrad. Develop. **25**: 288–296 (2014)

Published online 7 May 2012 in Wiley Online Library (wileyonlinelibrary.com) **DOI**: 10.1002/ldr.2162

ABSTRACT

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KEYWORDS: erosi

Received: 4 May 2022 | Revised: 1 August 2022 | Accepted: 23 August 2022

DOI: 10.1002/ldr.4446

RESEARCH ARTICLE

WILEY

Degradation of traditional vineyards in Slovakia by abandonme

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Funding information
European Regional Developm
Vedecká Grantová Agentúra
SAV

Catena 235 (2024) 107702

Contents lists available at ScienceDirect

Catena

journal homepage: www.elsevier.com/locate/catena

Effect of grass cover and abandonment on soil surface changes and soil properties in traditional vineyards in Vráble viticultural region in southwestern Slovakia

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ARTICLE INFO

Keywords:
Soil erosion
Abandonment
Vineyards
Soil properties
Soil profile
Soil regeneration
Chernozem

ABSTRACT

Land use transition, related to the extensification of management and agricultural abandonment, is a widespread phenomenon across European landscapes. In this study, we examined the effects of protective grassing and abandonment on soil protection and regeneration in traditional vineyards of the Vráble viticultural region, located in the temperate climate zone of central Europe. We analysed changes in the soil surface level, soil profile, and soil properties at various slope positions: shoulder, backslope, and footslope. Variability in the soil surface level was assessed using the poles height method, which was developed to quantify soil erosion and deposition. The results showed that both measures positively affected soil development. In the abandoned vineyard, the soil surface level increased by 0.72 mm yr^{-1} on the slope shoulder, 0.26 mm yr^{-1} on the backslope, and 3.58 mm yr^{-1} on the footslope. In contrast, the cultivated vineyard exhibited minimal changes in the slope

Thank you for your attention !