PRR Plano de Recuperação e Resiliência
REPÚBLICA PORTUGUESA
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SYMINGTON
Family Estates

Slope of the terrace's embankment matters?

A case study reviewing geometry terraces in Douro Region

8th International Congress on Mountain and Steep Slopes Viticulture ▪ Montreux ▪ Switzerland 6-8 May 2026

GRAHAM'S ♦ COCKBURN'S ♦ DOW'S ♦ WARRE'S ♦ QUINTA DO VESUVIO ♦ QUINTA DO ATAÍDE ♦ ALTANO ♦ QUINTA DA FONTE SOUTO

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A case study reviewing geometry terraces in Douro Region.

Fernando Alves[1]; Joana Valente[1]; Mário Natário[1]; Pedro Capella[2]; Susana Pereira[2,3]; Carlos Bateira[2,4]

[1]Symington Family Estates, Vinhos S.A; [2] FLUP, UPorto; [3] CEGOT, UPorto; [4]RisKam, CEG, ULisboa / FLUP, UPorto

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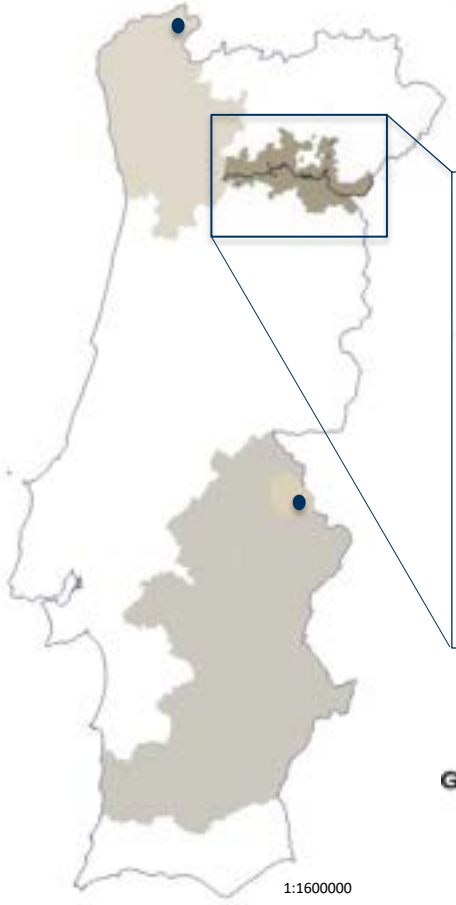
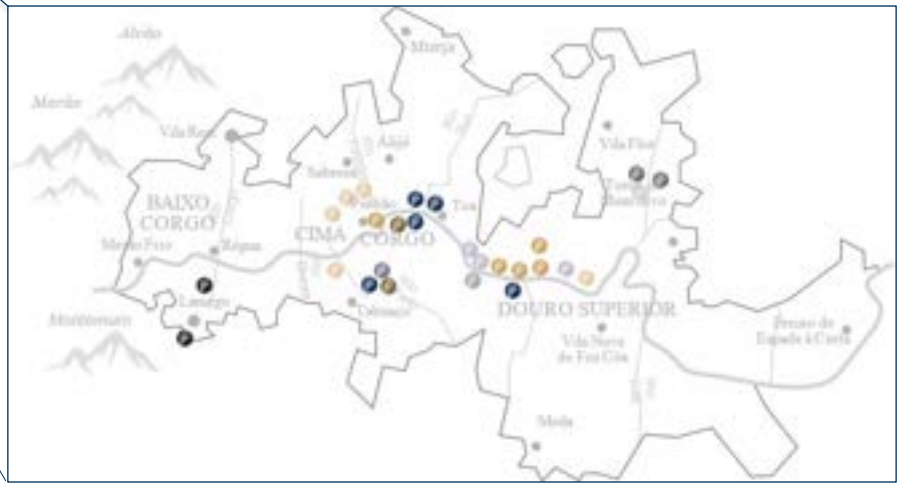
Symington Family Estates



Quintas Symington na Região do Douro



1,120

hectares

31 *quintas*

***Terroirs* distintos**

+Alentejo (Fonte Souto) 2017

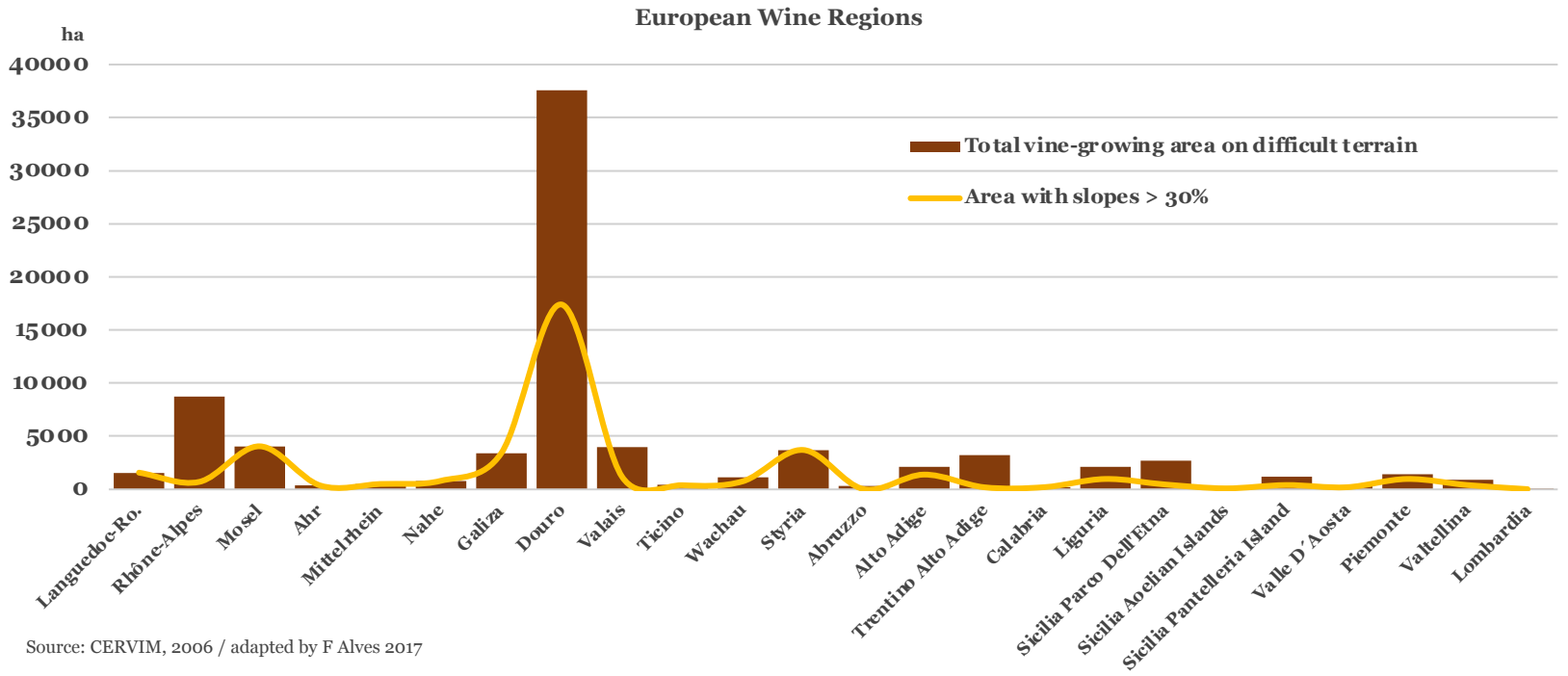
+ Vinhos Verdes (Rodas) 2022

+ UK (Hambledom) 2023

GRAHAM'S PORT · DOW'S PORT · WARRE'S · COCKBURN'S PORT · QUINTA DO VESUVIO · P+S PRATS & SYMINGTON · QUINTA DO ATAÍDE · ALTANO DOURO · QUINTA DE FONTE SOUTO

Steep slope wine Regions

- **Douro Region represent 53% of the steep slope vineyard surface**



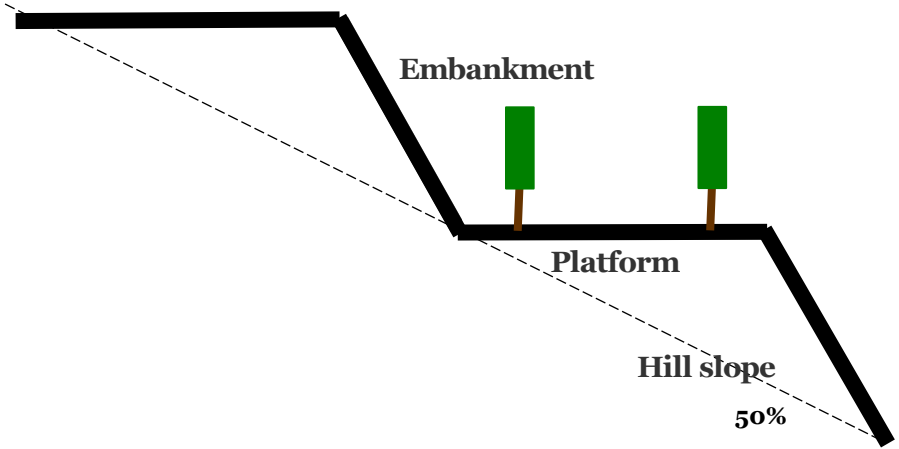
Source: CERVIM, 2006 / adapted by F Alves 2017

Terraced vineyards

Terraces guidelines

- **Guidelines**

- Several works and authors, on Portuguese bibliography addressed to Douro, gives orientation to the construction of terraces defining:
- The width of platform;
- The height of the embankment (riser);
- Lateral and longitudinal platform slopes;
- Suitable original landscape slope;
- Vine's plantation geometry;
- Slope of the embankment (riser) assumed 175 to 200%;
- *Joint number "Despacho Conjunto" no. 473/2004*, only defines a maximum hillslope of 50%, and one row terrace.



Terraces geometry at Douro Region (50 years ago!)

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On a ainsi constaté que la largeur minima des plates-formes où l'on obtenait les rendements les plus élevés de ces machines ou de machines analogues de la Komatsu, était de 3,8 à 4 m.

Des terrasses de cette largeur peuvent être établies sur sol rocheux, avec des pentes allant jusqu'à 65 p. 100.

Dans ce cas, en effet, il n'est pas nécessaire de recourir au talus naturel; on peut utiliser un talus de 1 : 0,5 ou même de valeurs plus basses, à condition que les précipitations pluviométriques annuelles ne soient pas supérieures à 800 millimètres. La roche nue se revêt très tôt, naturellement, et le talus assure la stabilité. Nous n'avons enregistré, au cours de notre expérience, aucun cas d'éboulement des terrasses, depuis la première qui a été exécutée à titre expérimental, en 1967.

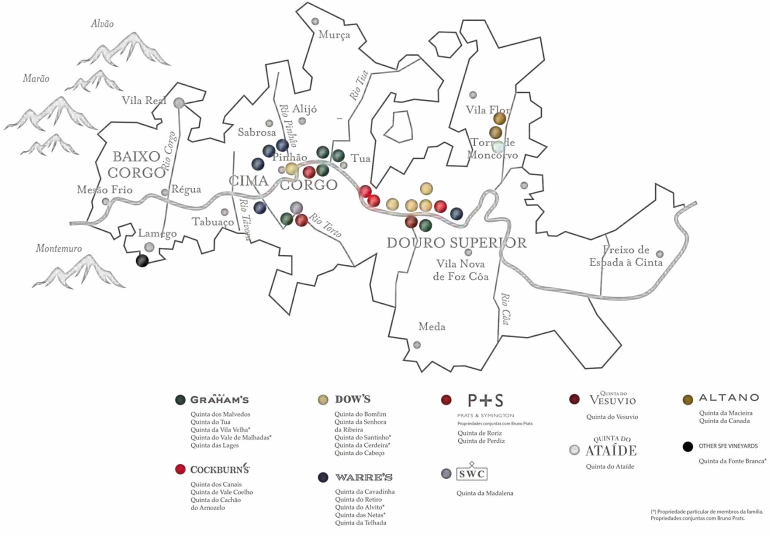
24éme Congrès OIV, 1974

Bolzano-Riva del Garda (Italie)

Grácio, M. 1975. Aménagement des vignobles en forte pente. Bull OIV 48-530

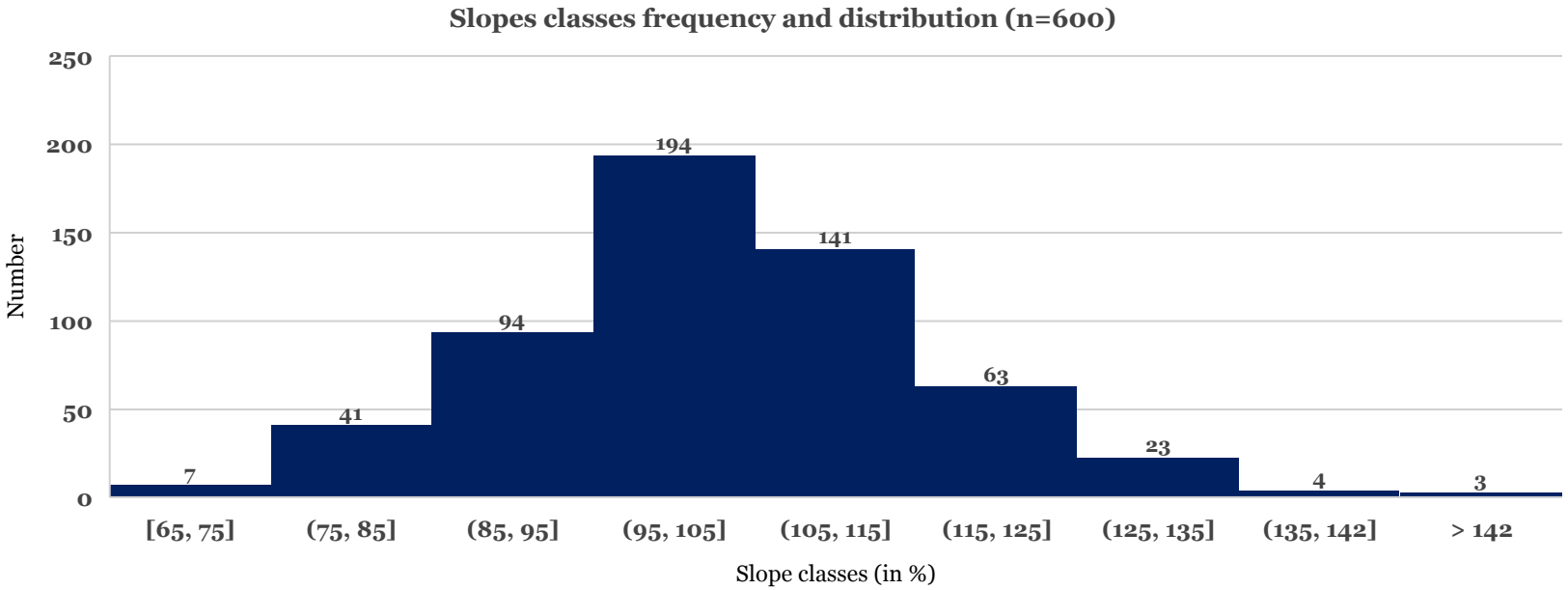
Terraces geometry

- A study was carried out to assess the values of the riser gradient with a digital clinometer (with ≈600 measurements);
- The field observations cover diverse locals and vineyards, built and managed by different Viticulturists and machinery operators;
- A GIS-supported data, high-precision digital elevation models (10 x 10 cm) and continuous gradient measurements were used over large experimental areas;

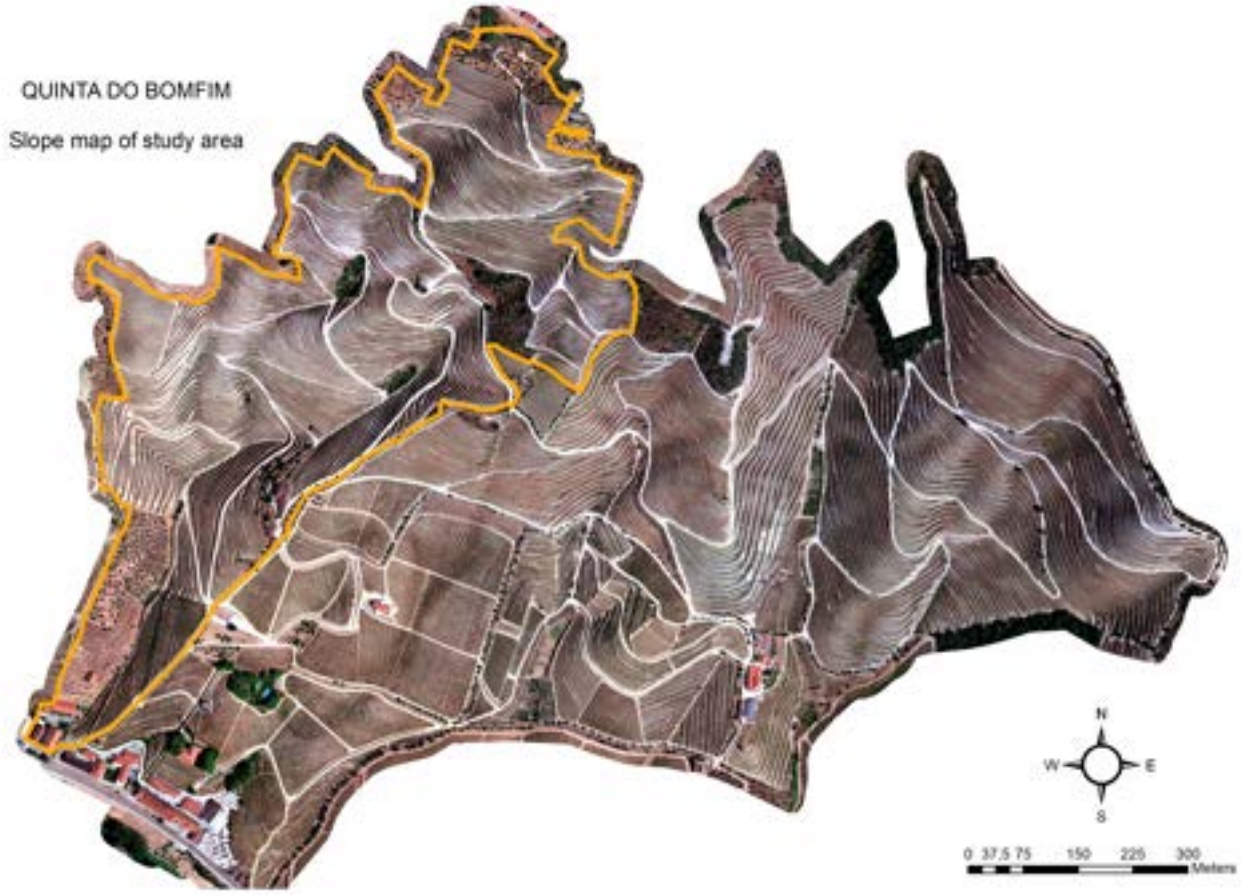


Results: embankement slope - discreet data

- The riser (embankment) gradients range from 90% to 110%, with higher frequency.
- These values are in accordance with established parameters in foreign regions and several studies with steep-slope vineyards, including issues such as terrace stability and erosion control, with several authors pointing to a slope gradient of 1:1 or even less as more sustainable to control embankment erosion.



Results: embankment slope: continuous data GIS



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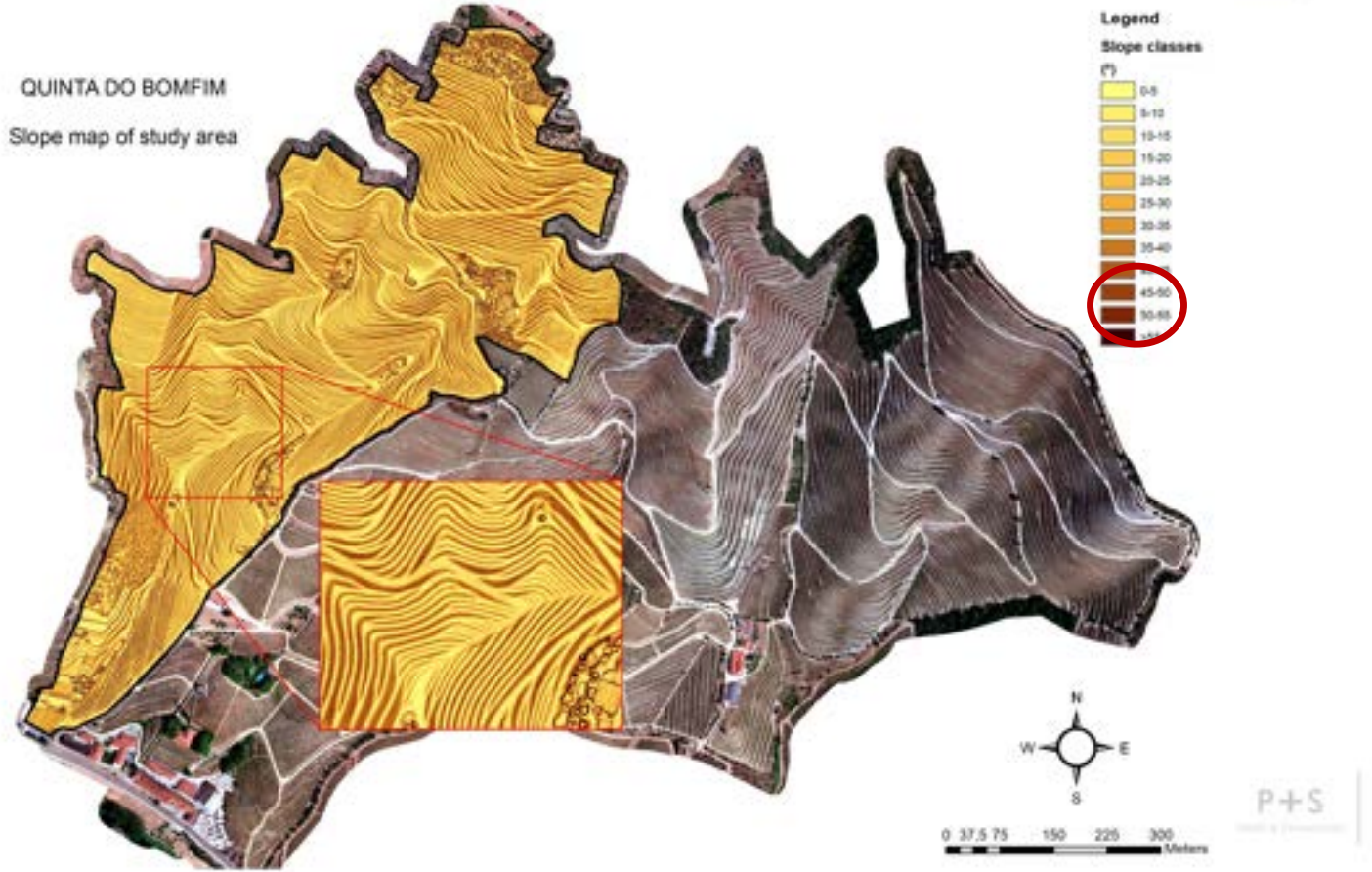
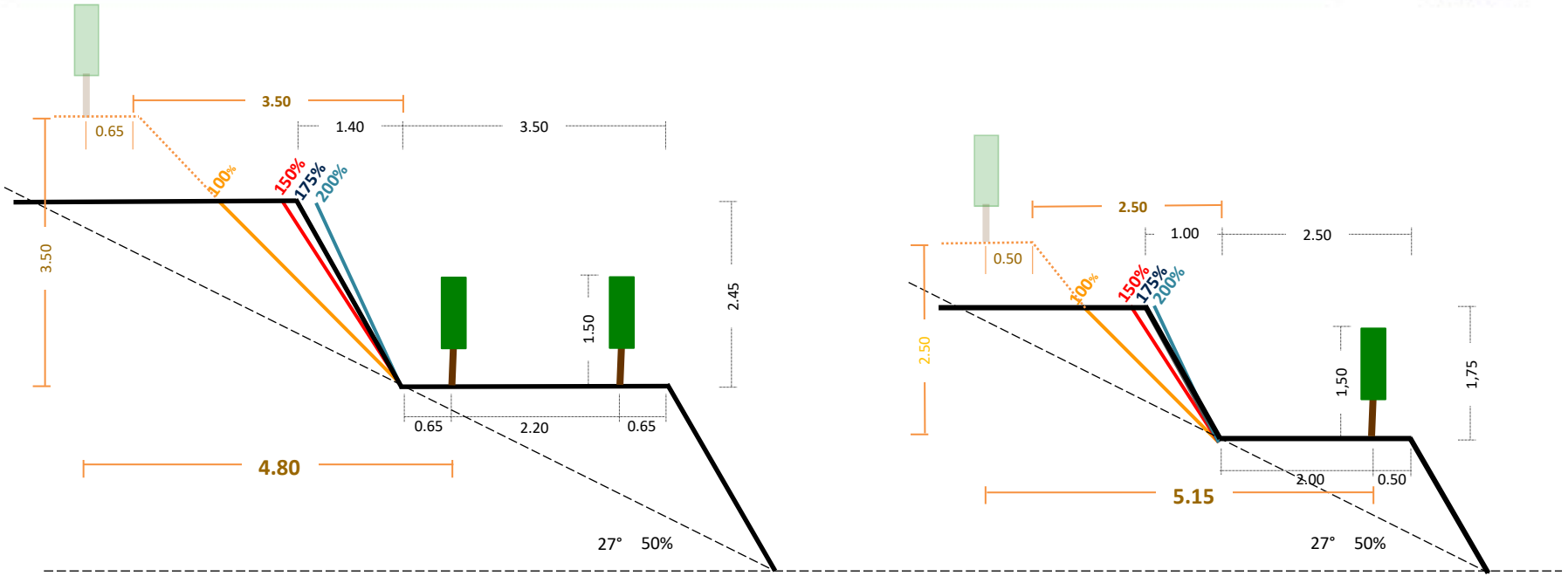


Terraces geometry: study cases



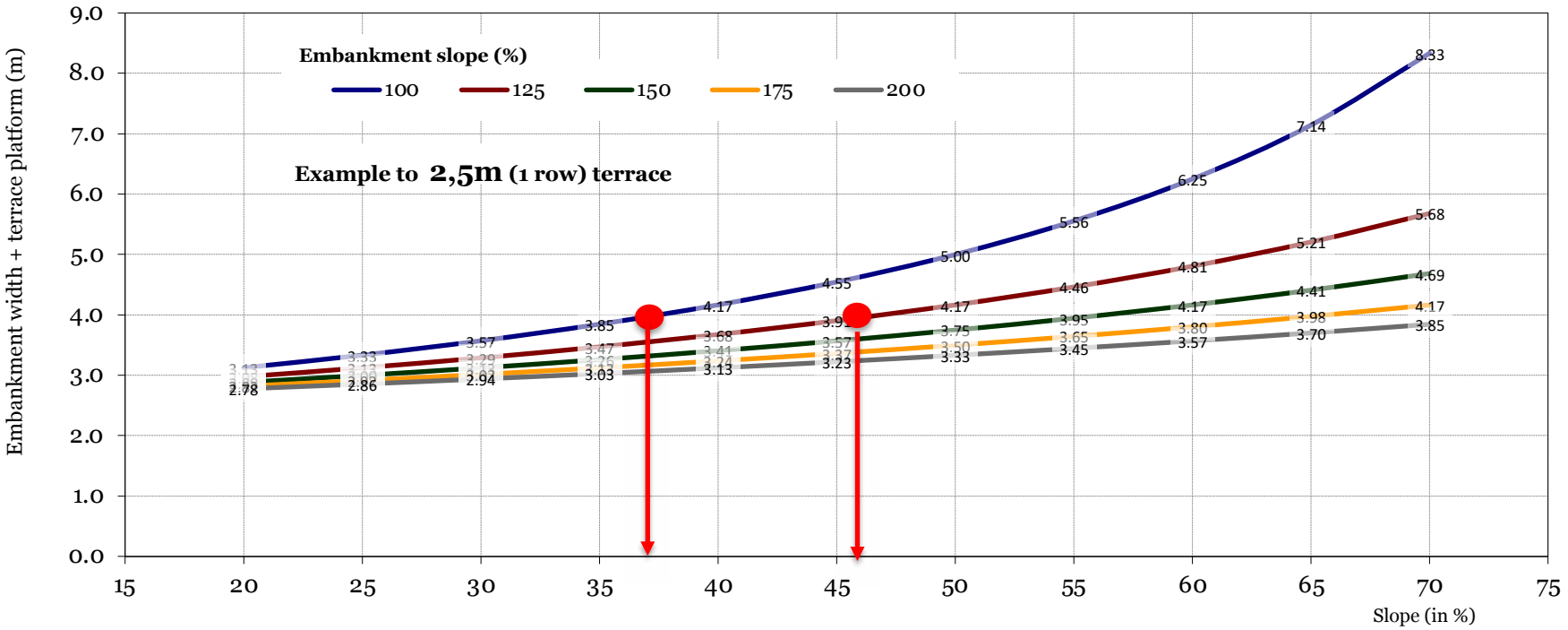
- Representation of different embankment slopes (% of inclination). Original hillside 50%. Simulation to 1 or 2 rows/terrace.

When there are average clearances **greater than 4 meters**, but do not occur continuously along the intervals between rows allowing the vineyard area to continue, for the closest parts, the exclusions resulting from these clearances should be discounted.

Guidelines for measuring the area of vineyard parcels in the context of Regulations (EC) No 479/2008 and 555/2008
Portaria n.º 357/2013, de 10 de dezembro Normas Complementares de Aplicação da Medida de Apoio à Reestruturação e Reconversão de Vinhas (VITIS) (e revisão de 2023

Embankment width + terrace platform / hillside/embankment slopes

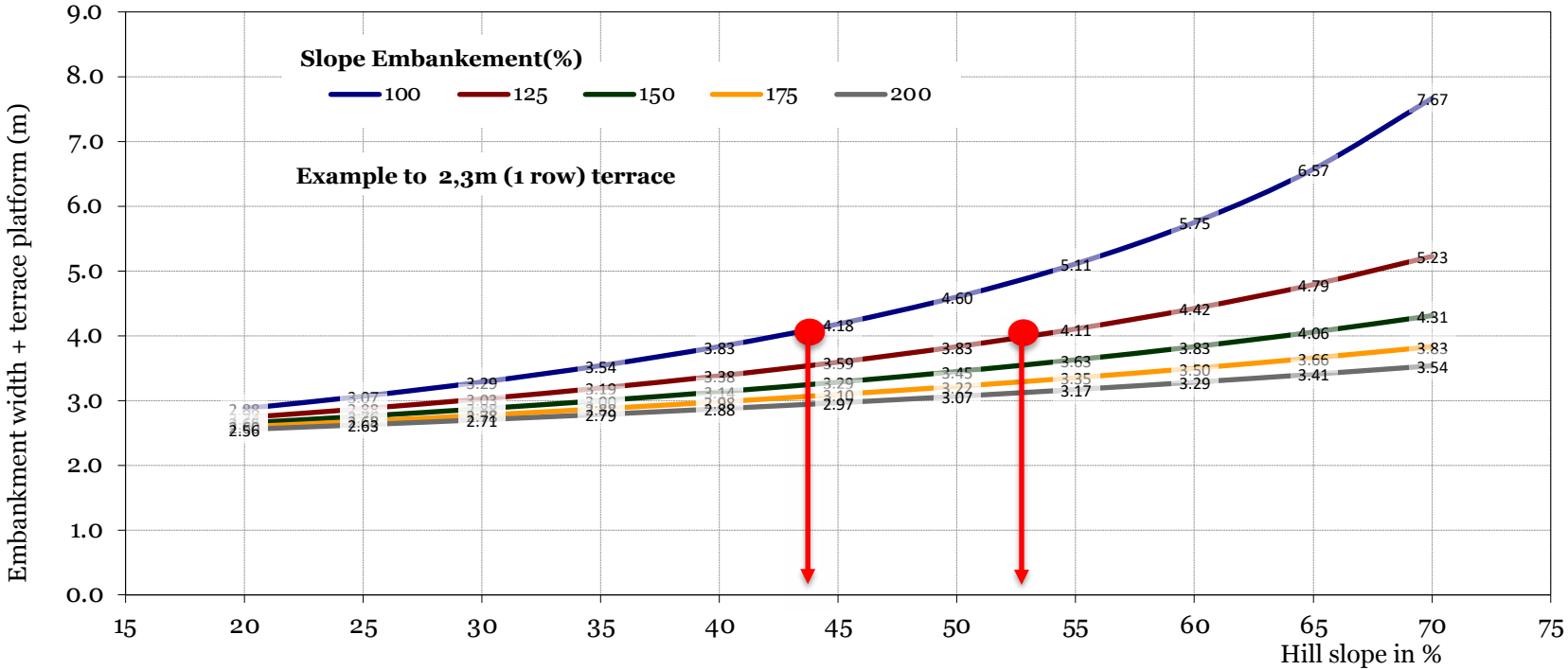
Embankment width + terrace platform as function of hillside slope and embankment slope (simulation 2D)



Cumputing equations from Bianchi de Aguiar, F. et al;. 2002

Embankment width + terrace platform / hillside/embankment slopes

Embankment width + terrace platform as function of hillside slope and embankment slope (simulation 2D



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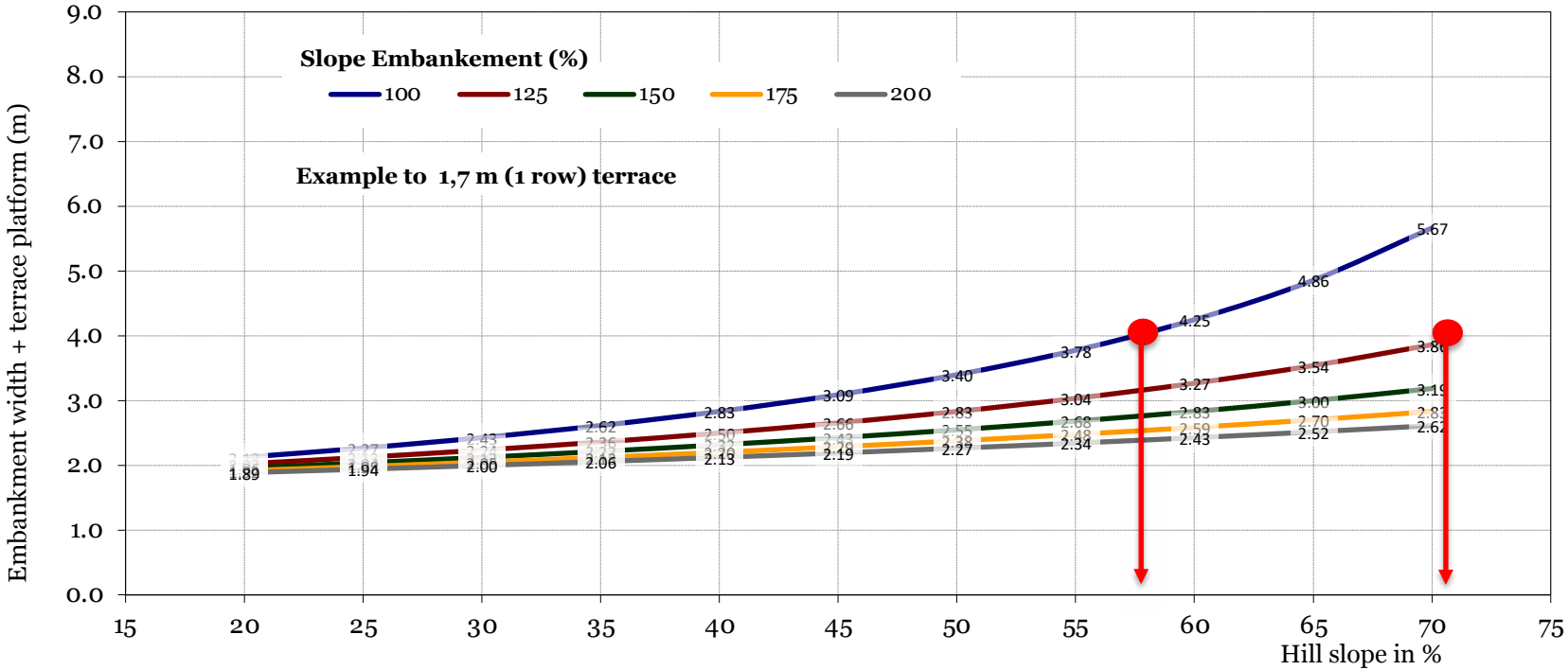

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Practical example of implications to growers

Vineyard geometry allowing innovative solutions to mechanical harvest - under adaptation at Symington.

See also Poster PO-148 OIV 45th Congress

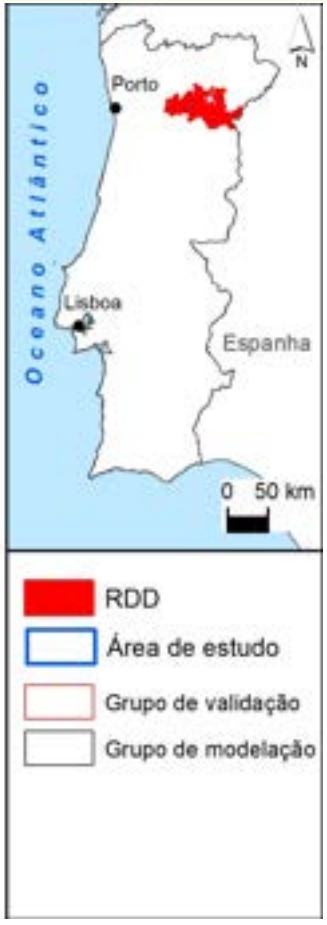
MECHANICAL HARVESTING IN STEEP SLOPE VINEYARDS: CASE STUDY IN NARROW TERRACES AT DOURO REGION.

VITINOV 2014-2018: ProDER Cooperação para a Inovação Medida 5.1

Extreme precipitation (winter 2022 / 2023) - erosion events

- Case study (FLUP / SYMINGTON) - candidate study area to LivingSoiLL Project

Experimental site – Terraces geometry - landslide - winter 2023



- Statistical data on the **2023** inventory:
- Modelling group – 155 landslides – 9,867.5 m² of affected area
- grupo de validação - 74 deslizamentos - 5306 m2 de área deslizada
- **Total - 229 deslizamentos - 15173,5 m2**
- **1,517 ha de área deslizada**
- **≈ 7,5% da área de vinha da zona de amostragem**

New studies on terraces geometry and water erosion models

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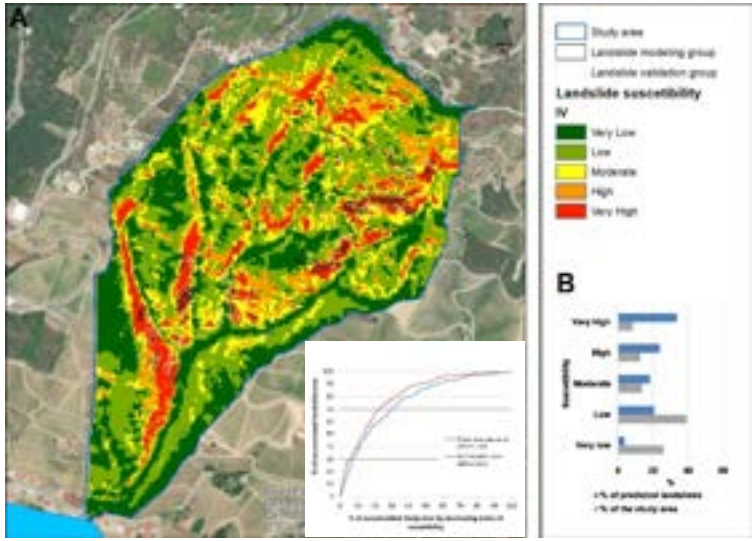
- **Sensitivity analysis of shallow landslide predisposing factors on terraced slopes in the Douro Valley**
- The main purpose of this work is to stablish statistical relations between an event landslide inventory (shallow translational slides – STS) and a set of predisposing and triggering factors that control slope instability in man-made slopes



- **Modelling the superficial formation thickness at slopes organized on agricultural terraces at Douro Demarked Region**
- Spatial modelling of the surface formations (SF) thickness that support the terraces at Douro
- Uses an arithmetic model that integrates curvature, slope and normalized slope height, with: (i) the **field observation** and measure of the terrace riser; (ii) the **construction of electrical resistance profiles** up to 2.5m depth

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Preliminary take home messages

- General results pointed to the advantages of adopting steep risers (≈1:1) in constructing the terrace and served to evaluate soil erosion susceptibility in varying terrace geometries.
- Positive conclusions of the application is the success in the validation of soil erosion occurred in past events (further work due LivingSoiLL project www.livingsoill.eu)
- These results contribute to the proper evaluation of vineyard parcels, following EU guidelines, whilst addressing the reality of Douro vineyards and mountain viticulture in general and help growers to apply the best practices.
- New regulation *Decreto-Lei n.º 48/2023*, relieved the stress to growers, to new vineyards, but no yet match an ideal solution to steep slope vineyards.

New geometry terraces and new machinery

- Narrow terraces (1 row) - 1,7m platform width

- Mars 2025 - plantation

- April 2026 – after **720mm** rain (December - mid February
- Further work to devellope after the extraordinary precipitation from 2026 winter
- Review data from the previous anomaly in winter precipitation (2023)

New layout vineyards (1992-1995) tentative… !!

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Início > Conteúdo > Maquinaria agrícola

Maquinaria agrícola

1995-06-04 00:25:43

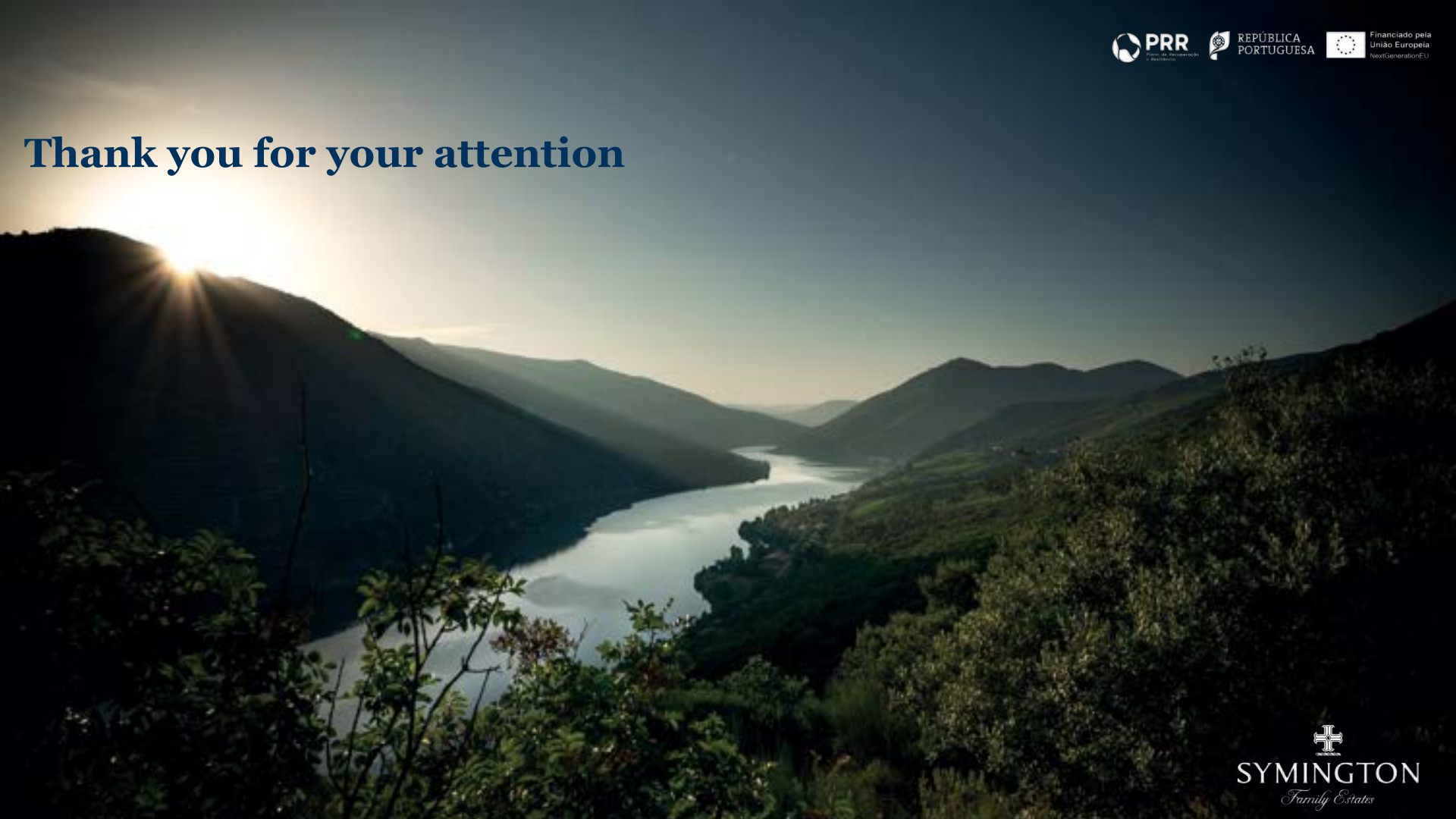
https://arquivos.rtp.pt/conteudos/maquinaria-agricola/

RTP arquivos_

Início > Conteúdo > Maquinaria agrícola

Maquinaria agrícola

1995-06-04 00:25:43 **1995 Multy-JYP CHAPPOT Valais**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