SOGRAPE

INTRAVARIETAL CONSERVATION AND POLYCLONAL SELECTION

The Portuguese work to protect the genetic legacy of the grapevine

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April 1st 2022

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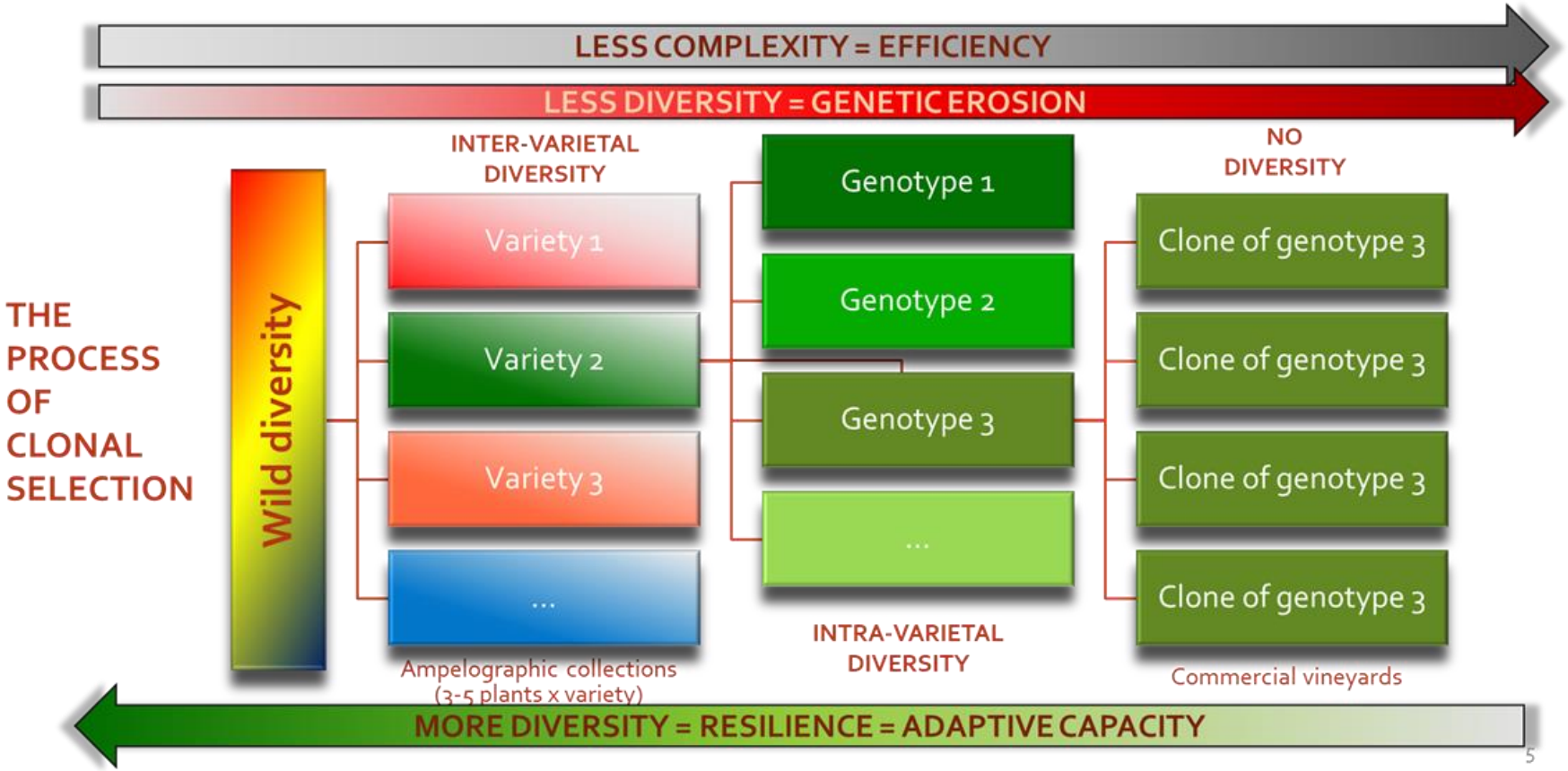
A PROBLEM AND A SOLUTION

Industrial clonal selection = tragic genetic erosion



Polyclonal selection: faster gains and conservation

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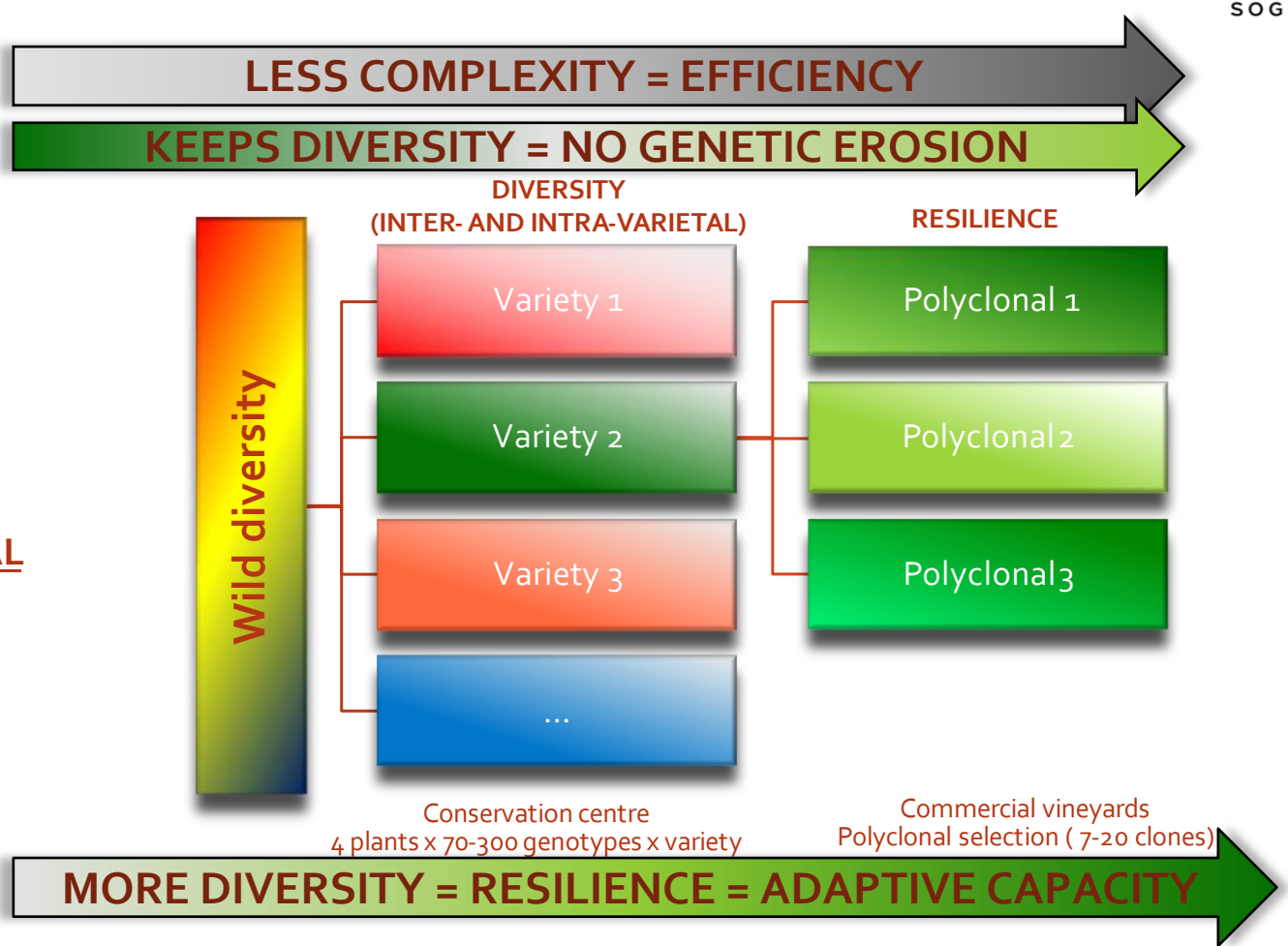

THE PROCESS OF POLYCLONAL SELECTION

A long-term vision

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Grassroots conservation work

- 40 years, 120 researchers (partial time)
- 30 000 genotypes, >200 varieties

Selection for gains

- >70 varieties
- 178 selection field trials
- Polyclonal selections available since 1984
- Homologated 150 clones of 24 varieties

Clear, transparent communication

- Selection catalogue with full disclosure
  - Selection details
  - Predicted genetic gain
  - Environmental stability

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ASSOCIAÇÃO PORTUGUESA PARA A DIVERSIDADE DA VIDEIRA

PORVID – The conservation centre

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THE SCIENTIFIC BACKGROUND

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First theorized in France

Max Rives - ENTAV, 1971

- Methodological bases
  - Theory of linear models (Searle et al., 1992; McCulloch et al., 2008)
  - Genetic gain: R = S x h^2 (Falconer & Mackay, 1996)
  - Empirical best linear unbiased predictor (EBLUP) (Henderson, 1975)
  - Study of GxE interaction (Lynch & Walsh, 1998)

First stage sampling of intravarietal variability in old vineyards in different regions

> *Acquiring sufficient variability*

Second stage: first large field trial (Experimental population of clones, 100 – 400 genotypes)

> *Acquiring robust knowledge*

Third stage: multi-environmental trials for clonal comparison

> *Evaluating GxE interaction*

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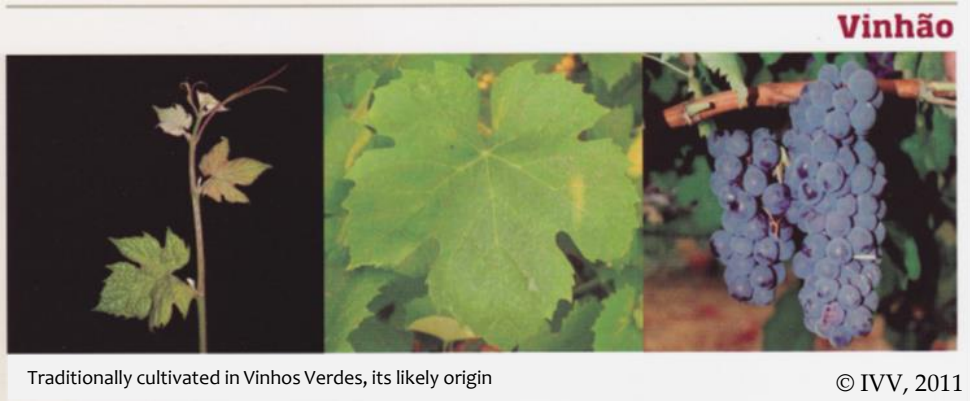
METHODOLOGY AND PRACTICAL APPLICATION

Selection of grapevine variety VINHÃO



Traditionally cultivated in Vinhos Verdes, its likely origin

aka SOUSÃO

Selection of VINHÃO: methodology

1st. STAGE: sampling of intravarietal variability in old vineyards across different regions
Diagnosis of highly frequent viruses

2nd STAGE: first large field trial (Experimental population of clones)

Arcos de Valdevez, 211 clones. All clones were grafted on 196/17 rootstock, the experimental design was a randomized complete block design (with 5 resolvable replicates), with a row-column arrangement, and two plants per plot. Yield was evaluated in years 1988 - 1991, 1993 and 1997. Potential alcohol, total acidity, pH, anthocyanins and total phenol index were assessed in 1993 and 1997, and berry weight, malic and tartaric acids in 1997.

3rd STAGE: clonal comparison field trials

(34 clones carried on a predicted genetic gain for yield of +17%)

- Barcelos (S. Miguel da Carreira). Plants were grafted on 196/17 rootstock, the experimental design was a randomized complete block design (6 resolvable replicates), with a row-column arrangement, and 4 plants per plot. Yield was evaluated in 1993, 1994, 1995, 1996 and 1998. Potential alcohol, total acidity and pH were assessed in 1994, 1995 and 1996.
- Braga (S. Paio de Pousada). Plants were grafted on 1103P rootstock, the experimental design was a randomized complete block design (5 resolvable replicates), with a row-column arrangement, and 4 plants per plot. Yield was evaluated from 1994 to 1999. Potential alcohol, total acidity and pH were evaluated from 1995 to 1999.
- Vila Nova de Famalicão (Seide). Plants were grafted on 161/49 rootstock and the experimental design was a randomized complete block design (9 resolvable replicates), with a row-column arrangement, nd 3 plants per plot. Yield was evaluated in 1997, 1999, 2000, 2001, 2003 and 2004. Potential alcohol, total acidity and pH, were assessed in 1999, 2000, 2001, 2002, 2003 and 2005, berry weight in 2000, 2001, 2003 and 2005, anthocyanins and total phenol index in 2003 and 2005.
- Additionally, vigour and rootstock affinity with 2 rootstocks (SO4, 99R) were evaluated. Microvinifications and diagnosis of virus (GFLV, ArMV, GLRaV1, 2 and 3) by enzyme linked immunosorbent assay (ELISA) were also performed.

- **7 clones were selected for improved productivity: 61, 62, 63, 64, 65, 66, 67**

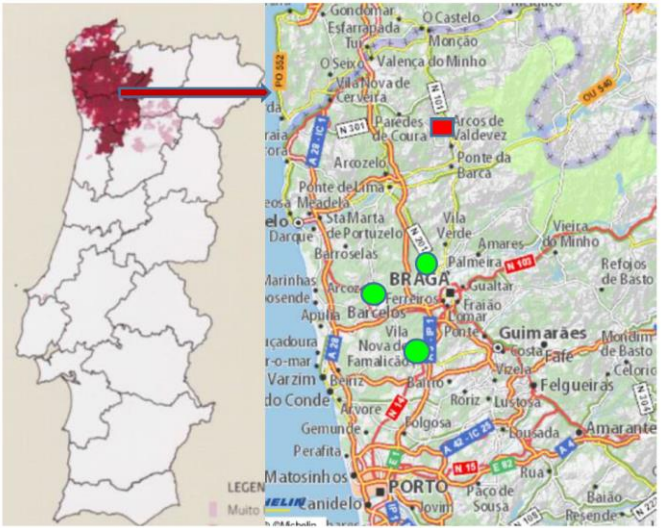
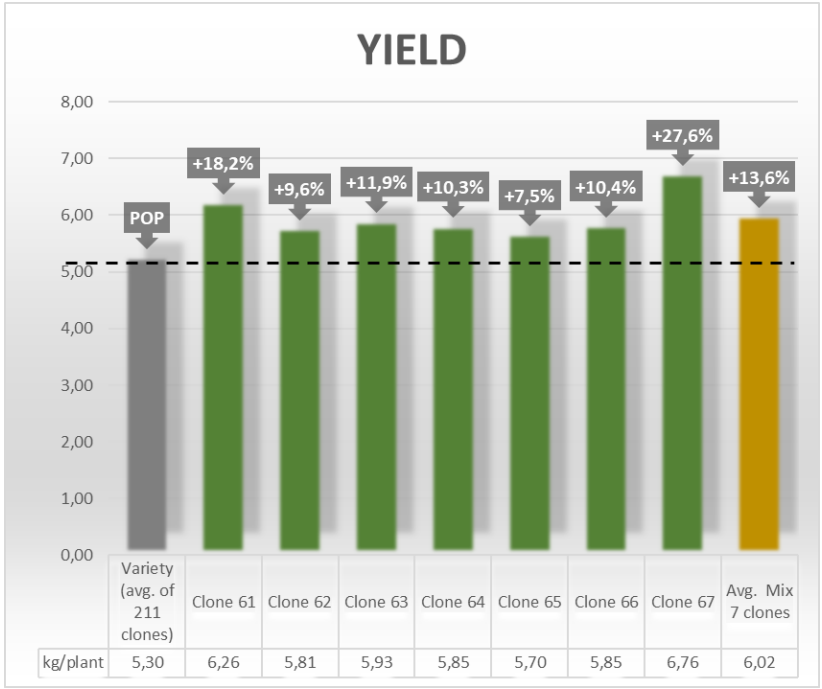
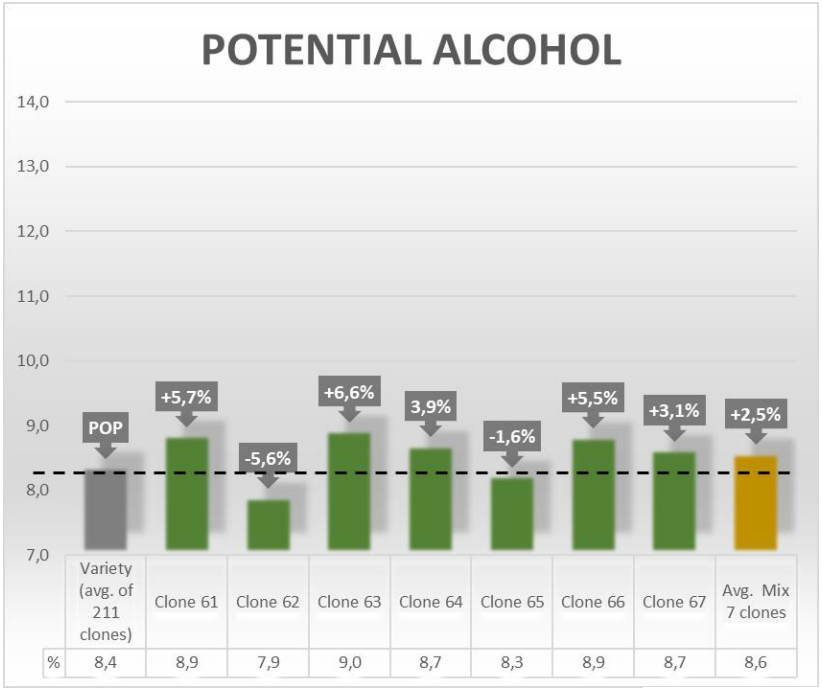


Figure 2. Vinhão is mostly grown in NW Portugal (rouge region highlighted on the map, [16]). The selection procedure comprised the installation of 4 field trials in this region (■, the first large field trial; ●, the field trials for clonal comparison).

Selection of VINHÃO: genetic gains





Selection of VINHÃO: sensitivity to GxE interaction – the base for polyclonal selections

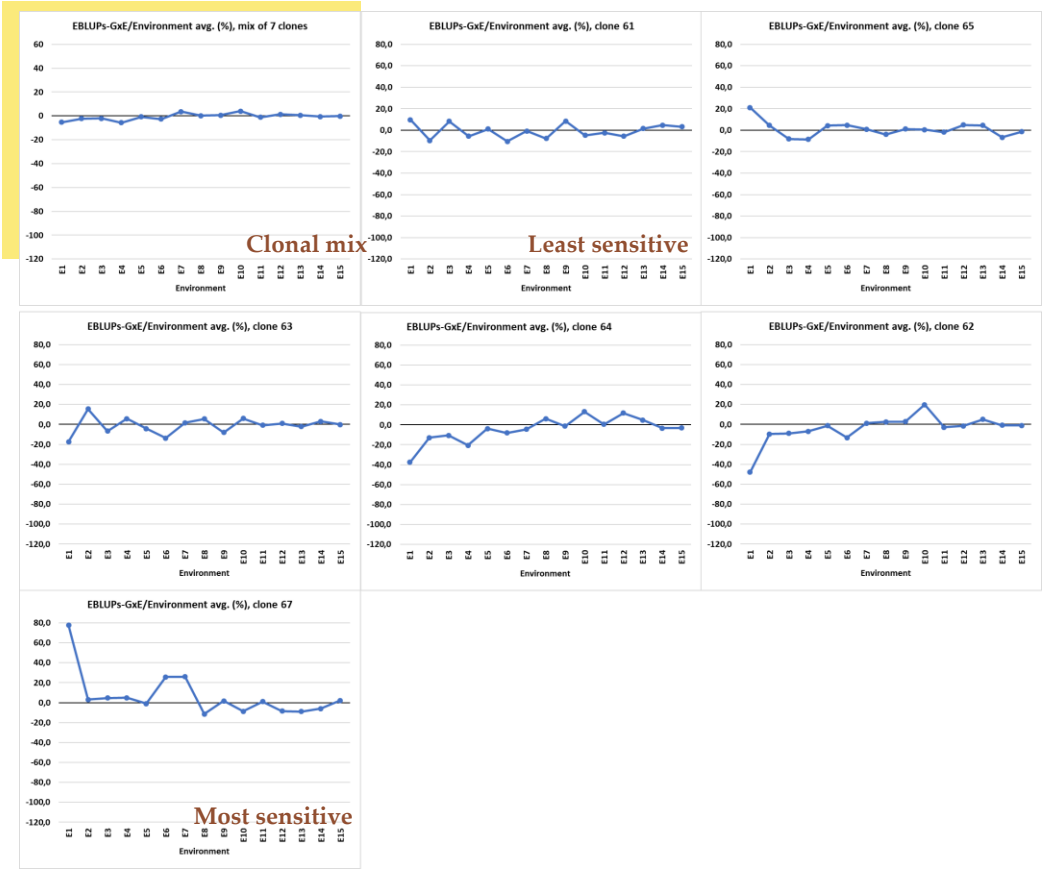


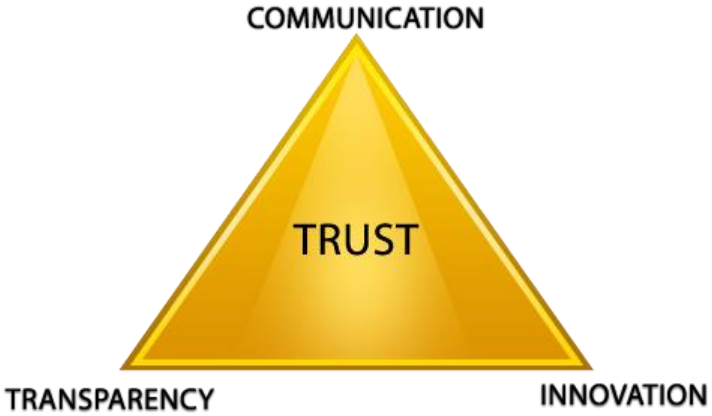
Table 3. Environments (E) used for the study of G×E interaction

E1	Famalicao1997 (0.760 kg/plant; H^2=*31.2*)
E2	Braga1998 (1.831 kg/plant, H^2=*49.7*)
E3	Barcelos1993 (1.960 kg/plant, H^2=*40.9*)
E4	Famalicao1999 (2.170 kg/plant, H^2=*32.4*)
E5	Arcos1997 (2.938 kg/plant, H^2=*49.7*)
E6	Barcelos1998 (3.265 kg/plant, H^2=*42.1*)
E7	Braga1997 (3.821 kg/plant, H^2=*0.447*)
E8	Famalicao2000 (5.198 kg/plant, H^2=*0.638*)
E9	Braga1996 (5.905 kg/plant, H^2=*0.347*)
E10	Famalicao2001 (7.736 kg/plant, H^2=*0.622*)
E11	Arcos1993 (9.621 kg/plant, H^2=*0.608*)
E12	Barcelos1996 (10.323 kg/plant, H^2=*0.365*)
E13	Famalicao2003 (10.738 kg/plant, H^2=*0.825*)
E14	Famalicao2004 (12.271 kg/plant, H^2=*0.704*)
E15	Arcos1991 (12.861 kg/plant, H^2=*0.598*)

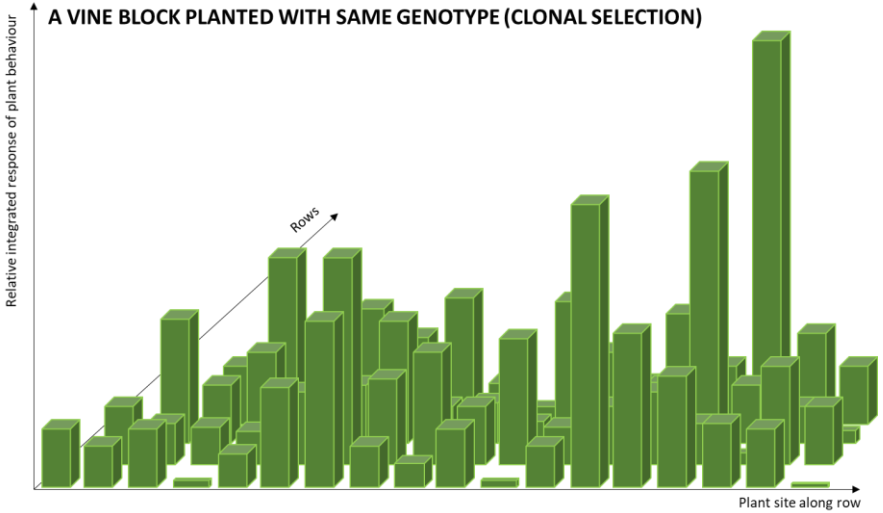
RESULTS, ADOPTION AND RECOGNITION

Transparency is critical for innovation adoption

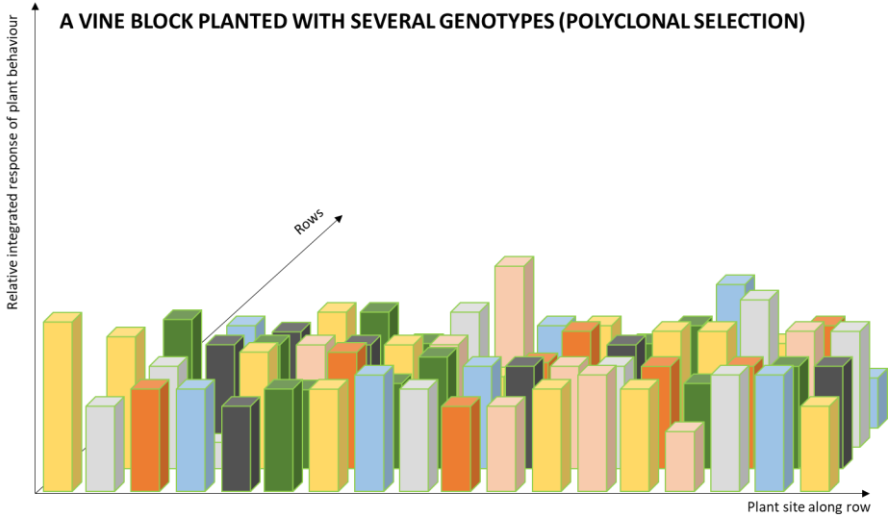
- **Trust is required to move people away from their comfort zone**
- Trust builds on a solid **accountability** base
- Accountability is supported by clear and **transparent communication**
- **Communication** is key for **understanding**



How polyclonal works to increase stability of behavior



Plants express a summed response of the genome to the environment of the specific place where they are and to the interaction between both (G x E interaction).



The random genotype mix compensates the variation due to the specific environment of each and to interaction between both (GxE inbteration).

Current status of grapevine selection works

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CONSERVATION STATUS OF VARIETIES LISTED IN PORTUGAL'S OFFICIAL WINEGRAPE VARIETIES LIST (343 varieties)

As of January 2018

Legend:	Native	Foreign	Preserved	Conserved
Total	261	82	167	61

Acolon	Arnsburger	Cabernet-Cubin	Cercial	Dolcetto	Galego-Rosado	Lusitano	Melra	Pé-Comprido	Ratinho	Tália	Tintinha	Vinhão
Aglianico	Assaraky	Cabernet-Dorsa	Chambourcin	Dona-Joaquina	Gamay	Luzidio	Merlot	Pedral	Ricoca	Tamarez	Tinto-Cão	Viognier
Agronómica	Avesso	Cabernet-Franc	Chardonnay	Donzelinho-Branco	Generosa	Malandra	Mindelo	Perigó	Riesling	Tannat	Tinto-Pegões	Viosinho
Água-Santa	Azal	Cabernet-Mitos	Chasselas	Donzelinho-Roxo	Gewürztraminer	Malvarisco	Mondet	Pero-Pinhão	Rio-Grande	Teinturier	Tinto-Sem-Nome	Vital
Alfrocheiro	Bacchus	Cabernet-Sauvignon	Chasselas-Cioutat	Donzelinho-Tinto	Gonçalo-Pires	Malvasia	Monvedro	Perrum	Roal	Terrantez	Touriga-Fêmea	Xara
Alicante-Bouschet	Baga	Cabinda	Chasselas-Roxo	Dorinto	Gouveio	Malvasia-Babosa	Moreto	Petit-Bouschet	Rodo	Terrantez-do-Pico	Touriga-Franca	Zé-do-Telheiro
Alicante-Branco	Barcelo	Cainho	Chasselas-Sabor	Dornfelder	Gouveio-Estimado	Malvasia-Bianca	Moscadet	Petit-Manseng	Roseira	Tinta	Touriga-Nacional	Zinfandel
Almafra	Barreto	Caladoc	Chenin	Douradinha	Gouveio-Preto	Malvasia-Branca	Moscargo	Petit-Verdot	Rotgipfler	Tinta-Aguiar	Trajadura	
Almenhaca	Bastardo	Calrão	Cidadelhe	Durif	Gouveio-Real	Malvasia-Cabral	Moscatel-Galego-Branco	Pexem	Roupeiro-Branco	Tinta-Aurélio	Transâncora	
Alvadurão	Bastardo-Branco	Camarate	Cidreiro	Encruzado	Gouveio-Roxo	Malvasia-Cândida	Moscatel-Galego-Roxo	Pical	Roussanne	Tinta-Barroca	Trigueira	
Alvar	Bastardo-Roxo	Campanário	Cinsaut	Engomada	Grand-Noir	Malvasia-Cândida-Roxa	Moscatel-Galego-Tinto	Pilongo	Roxo-Flor	Tinta-Caiada	Trincadeira	
Alvarelhão	Batoca	Caracol	Códega-do-Larinho	Esgana-Cão-Tinto	Grangeal	Malvasia-de-São-Jorge	Moscatel-Graúdo	Pinot-Blanc	Roxo-Rei	Tinta-Carvalha	Trincadeira-Branca	
Alvarelhão-Ceitão	Beba	Caramela	Colombard	Esganinho	Granho	Malvasia-Fina	Moscatel-Nunes	Pinot-Gris	Rufete	Tinta-da-Barca	Trincadeira-das-Pratas	
Alvarinho	Bical	Carignan	Complexa	Esganoso	Greco	Malvasia-Fina-Roxa	Mourisco	Pinot-Noir	Samarrinho	Tinta-de-Alcobaça	Triunfo	
Alvarinho-Lilás	Boal-Barreiro	Carmenère	Concieira	Espadeiro	Grenache	Malvasia-Parda	Mourisco-Branco	Pintosa	Sangiovese	Tinta-de-Lisboa	Uva-Cão	
Alvar-Roxo	Boal-Branco	Carrasquenho	Coração-de-Galo	Espadeiro-Mole	Grüner-Veltliner	Malvasia-Preta	Mourisco-de-Semente	Português-Azul	Santareno	Tinta-Fontes	Uva-Cavaco	
Amaral	Boal-Espinho	Carrega-Branco	Cornichon	Estreito-Macio	Jacquère	Malvasia-Preta-Roxa	Mourisco-de-Trevões	Praça	Santoal	Tinta-Francisca	Valbom	
Amor-Não-Me-Deixes	Bonvedro	Carrega-Burros	Cornifesto	Fepiro	Jaen	Malvasia-Rei	Mulata	Preto-Cardana	São-Mamede	Tinta-Gorda	Valdosa	
Amostrinha	Borraçal	Cascal	Corropio	Fernão-Pires	Jampal	Malvasia-Romana	Müller-Thurgau	Preto-Martinho	Sarigo	Tinta-Grossa	Valveirinho	
Antão-Vaz	Branca-de-Anadia	Casculho	Corval	Fernão-Pires-Rosado	Labrusco	Malvia	Naia	Primavera	Sauvignon	Tinta-Martins	Varejoa	
Aragonez	Branco-Desconhecido	Castália	Corvo	Ferral	Lameiro	Malvoeira	Nebbiolo	Promissão	Seara-Nova	Tinta-Mesquita	Vencedor	
Aramon	Branco-Especial	Castelã	Cot	Feteasca-Alba	Larião	Manteúdo	Negra-Mole	Rabigato	Semillon	Tinta-Miúda	Verdejo	
Arinarnoa	Branco-Gouvães	Castelão	Crato-Espanhol	Folgasão	Leira	Manteúdo-Preto	Nero	Rabigato-Franco	Sercial	Tinta-Negra	Verdelho	
Arinto	Branco-Guimarães	Castelão-Branco	Dedo-de-Dama	Folgasão-Roxo	Lemberger	Marquinhas	Nero-d'Avola	Rabigato-Moreno	Sercialinho	Tinta-Penajoia	Verdelho-Roxo	
Arinto-do-Interior	Branco-João	Castelino	Deliciosa	Folha-de-Figueira	Liliorila	Marsanne	Nevoeira	Rabo-de-Anho	Sevilhão	Tinta-Pereira	Verdelho-Tinto	
Arinto-dos-Açores	Branco-Valente	Casteloa	Diagalves	Fonte-Cal	Listrão	Marselan	Padeiro	Rabo-de-Lobo	Sezão	Tinta-Pomar	Verdial-Branco	
Arinto-Roxo	Branda	Castelo-Branco	Doçal	Galego	Loureiro	Marufo	Parreira-Matias	Rabo-de-Ovelha	Síria	Tinta-Tabuaço	Verdial-Tinto	
Arjunção	Branjo	Cerceal-Branco	Doce	Galego-Dourado	Lourela	Melhorio	Patorra	Ramisco	Syrah	Tintem	Vermentino	

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PORVID – a highly-recognized collective endeavour

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Prof. Antero Martins, President of PORVID is decorated by the President of the Portuguese Republic

48 COUNTRIES UNANIMOUSLY RECOGNIZED THE METHOD AND ITS IMPORTANCE

OIV

OIV-VITI 564B-2019

RÉSOLUTION OIV-VITI 564B-2019

PROTOCOLE DE L'OIV POUR LA SAUVEGARDE ET LA CONSERVATION DE LA DIVERSITÉ INTRA-VARIÉTALE ET LA SÉLECTION POLYCLONALE DE LA VIGNE POUR LES VARIÉTÉS PRÉSENTANT UNE GRANDE VARIABILITÉ GÉNÉTIQUE

L'ASSEMBLÉE GÉNÉRALE,

SUR PROPOSITION de la Commission I « Viticulture »,

DECIDE d'adopter la définition de la « sélection polyclonale » ainsi qu'un protocole de l'OIV pour la sauvegarde et la conservation de la diversité intra-variétale et la sélection polyclonale de la vigne pour les variétés présentant une grande variabilité génétique :

FIRST CERTIFICATION OF POLYCLONAL SELECTIONS IN THE WORLD

SOGRAPE

***República,* 1.ª série**

23 de setembro de 2021

AGRICULTURA

Portaria n.º 201/2021

de 23 de setembro

Sumário: Estabelece os procedimentos para o reconhecimento oficial da certificação voluntária de material de propagação de videira policlonal, sem que tal certificação colida com a certificação obrigatória para a comercialização de materiais vitícolas.

creto-Lei n.º 194/2006, de 27 de setembro, alterado pelos Decretos-Leis n.ºs 78/2
ro, e 9/2021, de 29 de janeiro, que regula a produção, controlo, certificação e cor
teriais de propagação vegetativa de videira, estipula no seu artigo 42.º-A que p
o do Governo responsável pela área da agricultura podem ser fixados proced
para o tratamento por água quente dos materiais vitícolas, para o reconhecime
ções à prova de inseto, para a produção, controlo e certificação de material p
térias que no âmbito daquele decreto-lei careçam de vir a ser regulamentadas
rimeiro lugar, trata-se agora de estabelecer os procedimentos para o reconhecim
ação voluntária de material de propagação de videira policlonal, sem que tal c
a certificação obrigatória para a comercialização de materiais vitícolas, regul

- Defines polyclonal grapevine material
- Establishes rules for registration of polyclonal selections
- Creates a voluntary polyclonal certification system on top of existing sanitary certification
- Establishes rules for labelling grapevine propagation material as polyclonal

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