



WP2.1
Barley Genetics :
Science excellence to Economic impact

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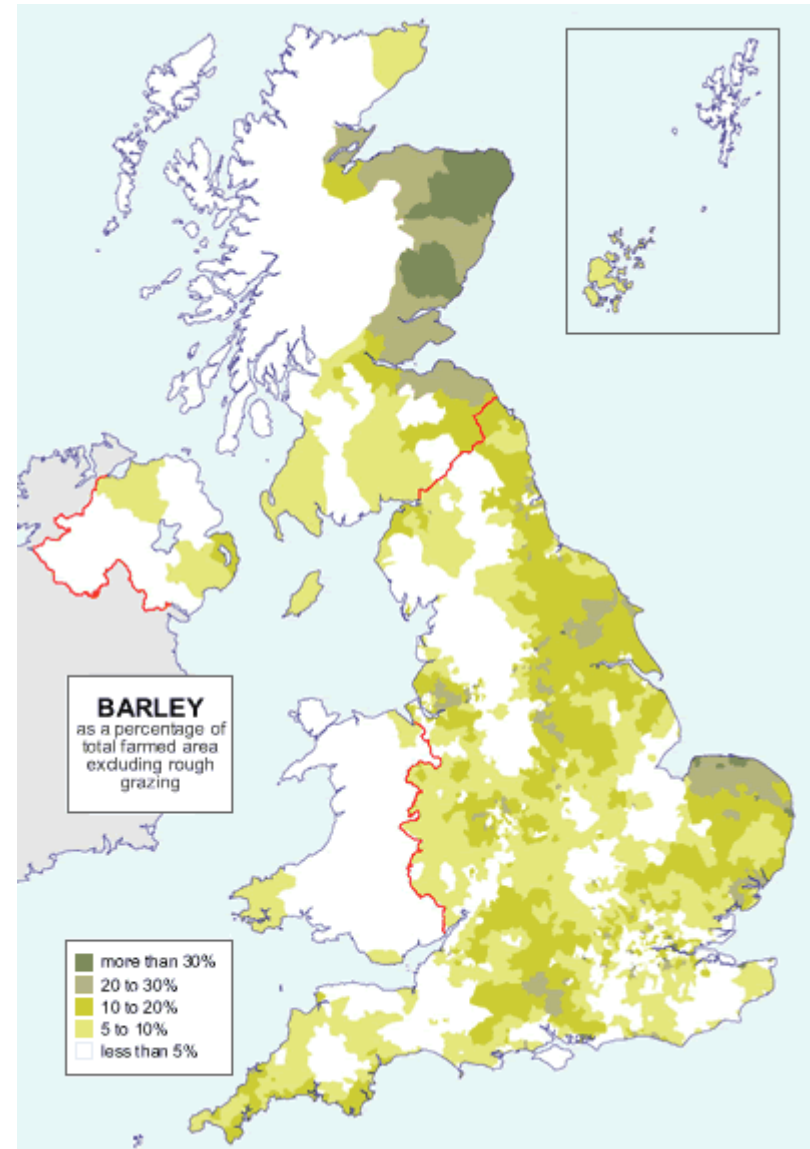


Scottish Government
Riaghaltas na h-Alba
gov.scot

SEFARI 

Barley in Scotland

- Largest arable crop ~300,000 ha
- 75-80% spring sown
- Production approx. 1.8M tonnes per annum
- Approx. 50% used in malting for brewing and distilling
- Industries valued £4.4Bn to Scotland
- >7000 jobs in rural Scotland

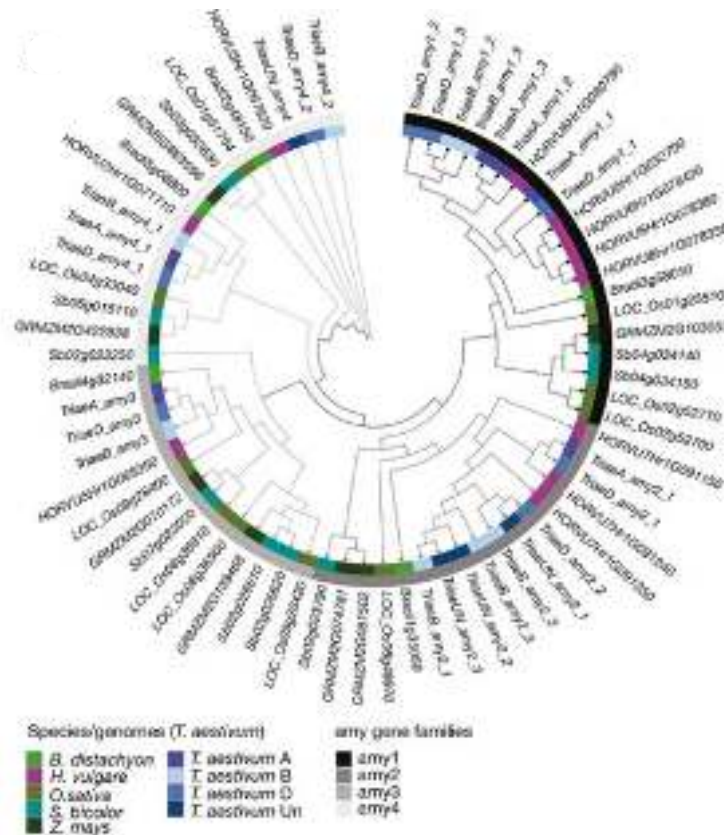


Scientific Excellence



- Publication of Barley genome sequence in 2017
- Culmination of 10+ years work – multinational
- Past RESAS work-packages
- Profound impact

Barley Genome



CAVALINA
CELEBRITY
OPTAR
CHOCOL
CHARICE
ONT/ANP
CHIME
CINNAMON
OT/ARTP
CLARITY
CLASO
ROFAT7
CULALA
COGION
COOPER
COINCHO
CIELWIL
OR/MDN
CHUSSES
DAGAS
RANTY

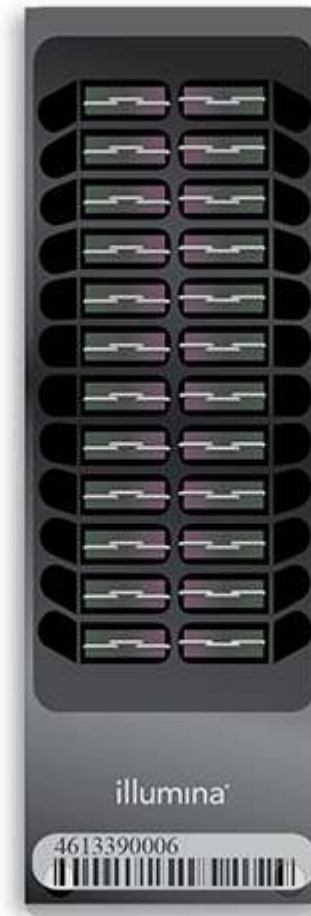


- Delineation of gene complement
- Comparison with other species
- Patterns of diversity across genome
- Discovery of gene variants

50K Illumina Genotyping

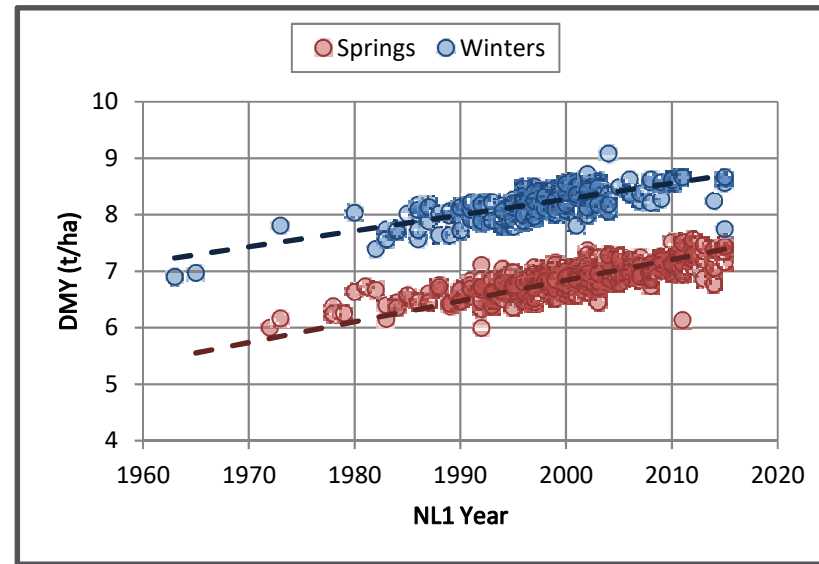
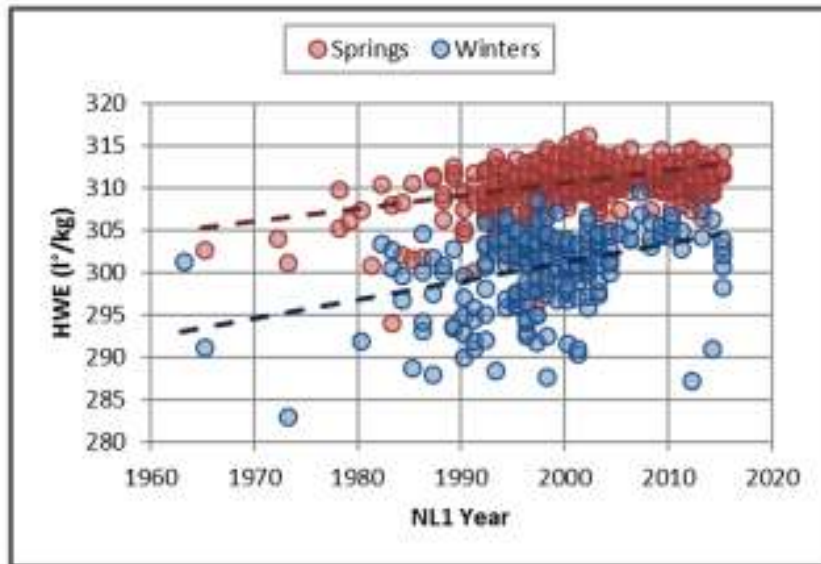


- Use of variant sequence information
- International consortium
- 50,000 individual markers across barley genome
- Uptake by industry 20,000 assays sold



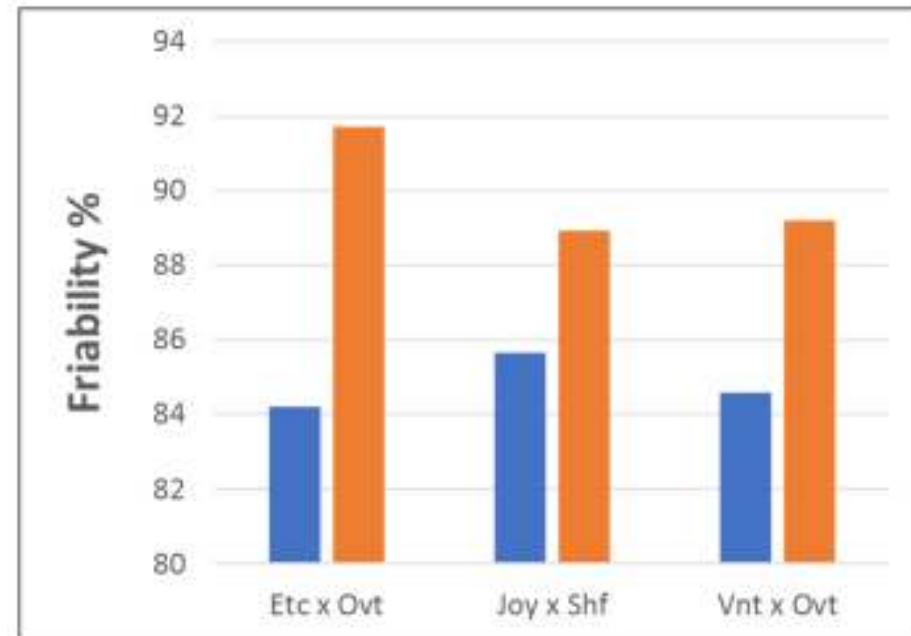
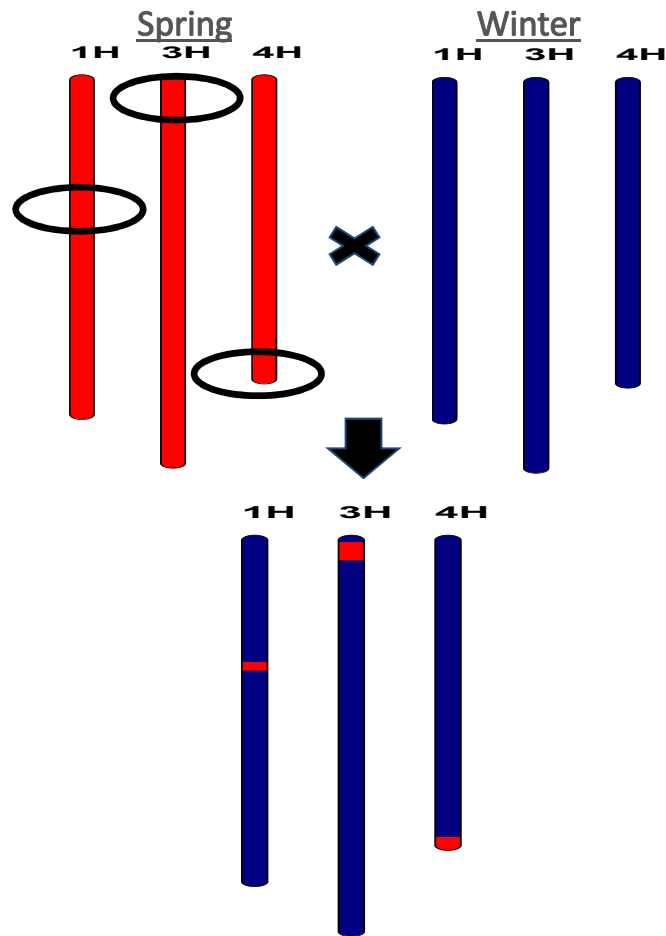
Industrial impact

- Collaboration with commercial breeding companies
- Use of genotyping platform across breeding lines
- Together for pre-competitive research
- e.g. Leveraged BBSRC/AHDB IMPROMALT project



- Malting quality gap between winter and spring barley
- Winter varieties higher yielding and more resilient
- Can spring quality be used to improve winter barley?

Better winter malting quality



■ Without ■ With Spring Regions

- Key spring malting quality regions
- Marker assisted backcrossing into winter varieties

- Consistent increase in HWE
- Most significant effect on modification traits

Grain Skinning

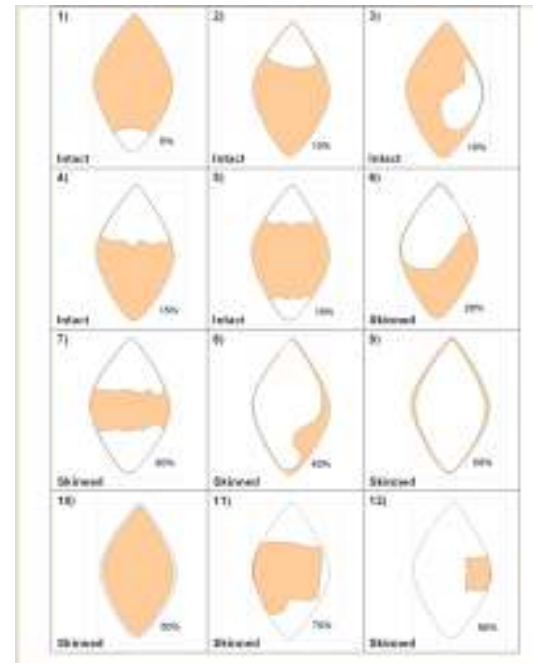


- Skinning - defect when the husk becomes partially/completely detached from the grain at harvest.
- Causes variability in germination - affects malting quality
- Increasing concern to the industry

Grain Skinning



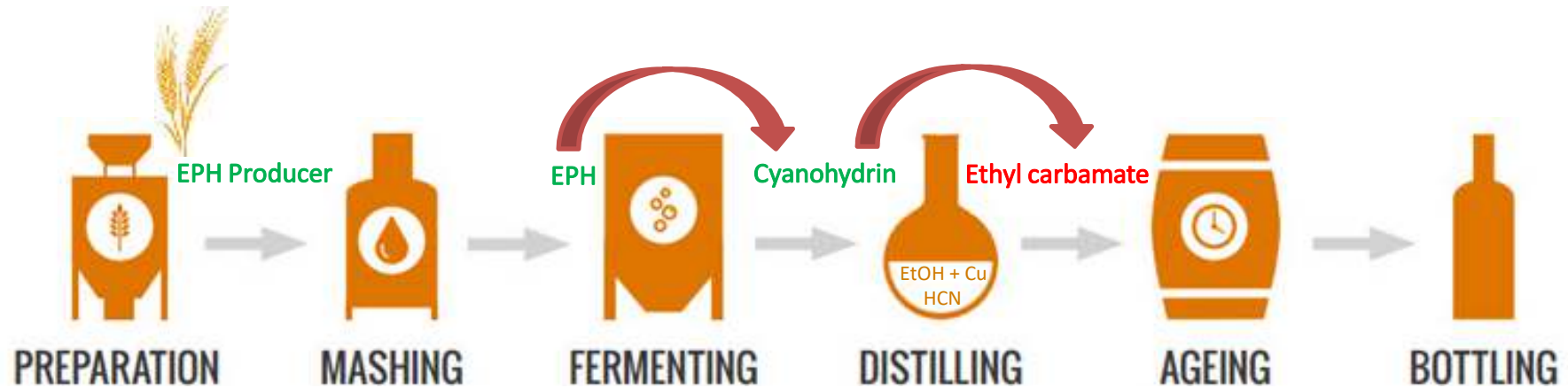
Grain scoring protocols



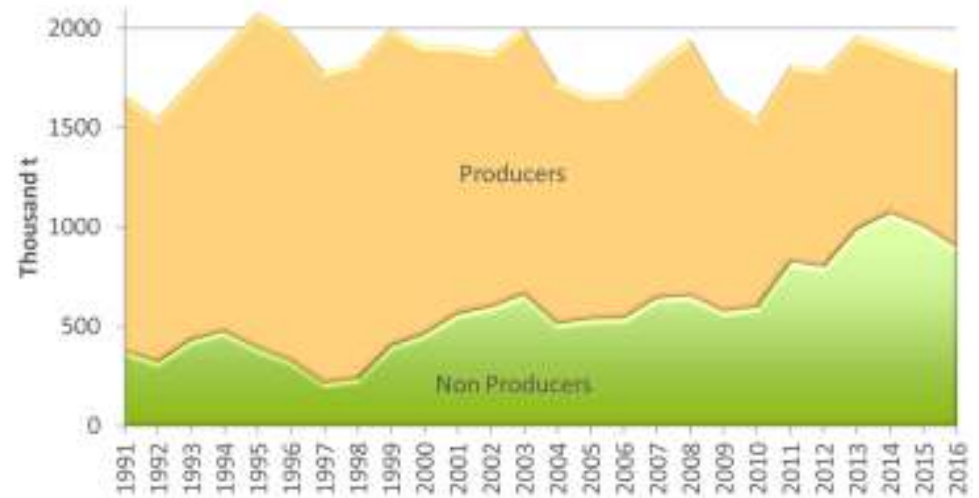
- Leveraged funding from BBSRC & AHDB
- Developing a standardised grain scoring protocol by working with industry ($\geq 20\%$ husk area)
- Malting Barley Committee
Scottish Varieties Consultative Committee



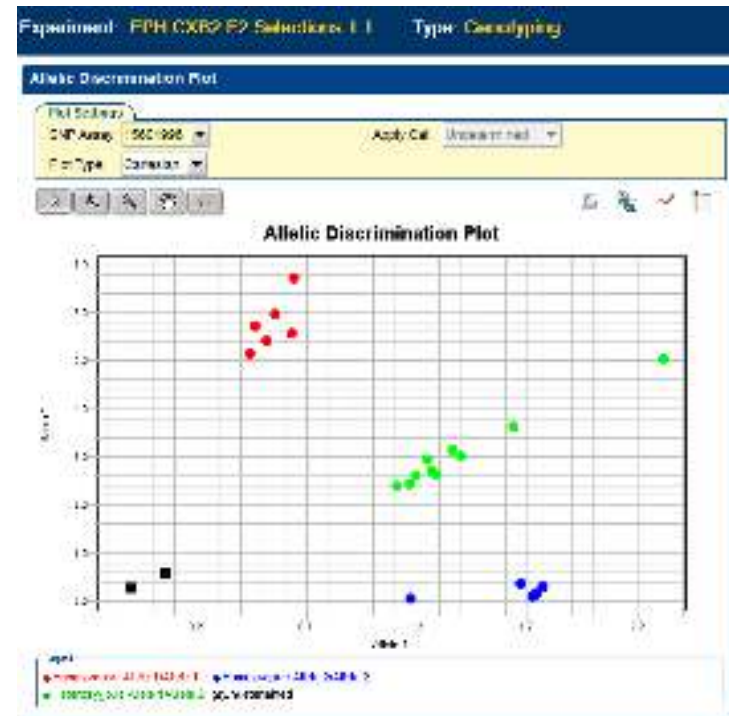
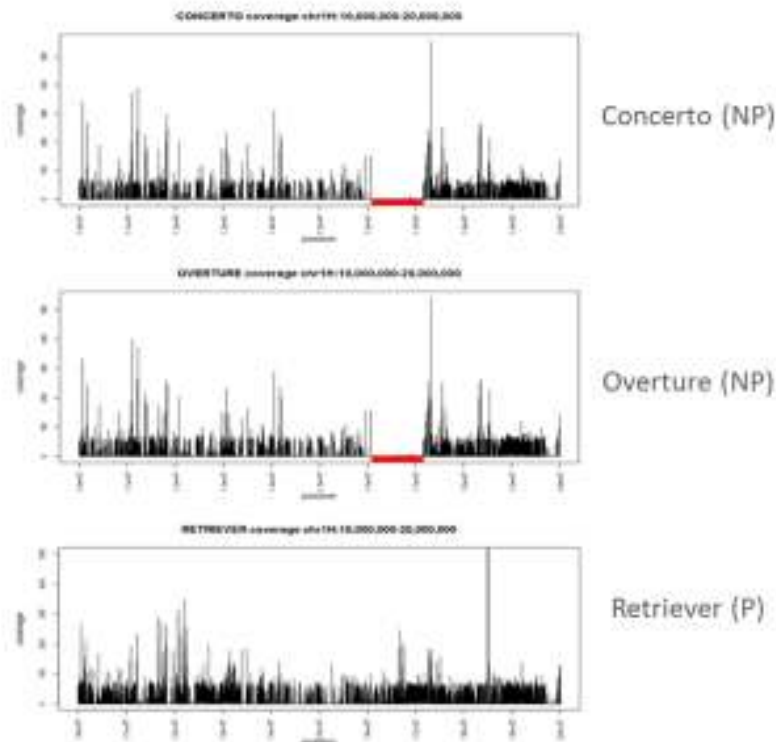
Epiheterodendrin (EPH)



- Barley varieties: 'producers' and 'non-producers'
- Past development of diagnostic marker
- More non-producer varieties



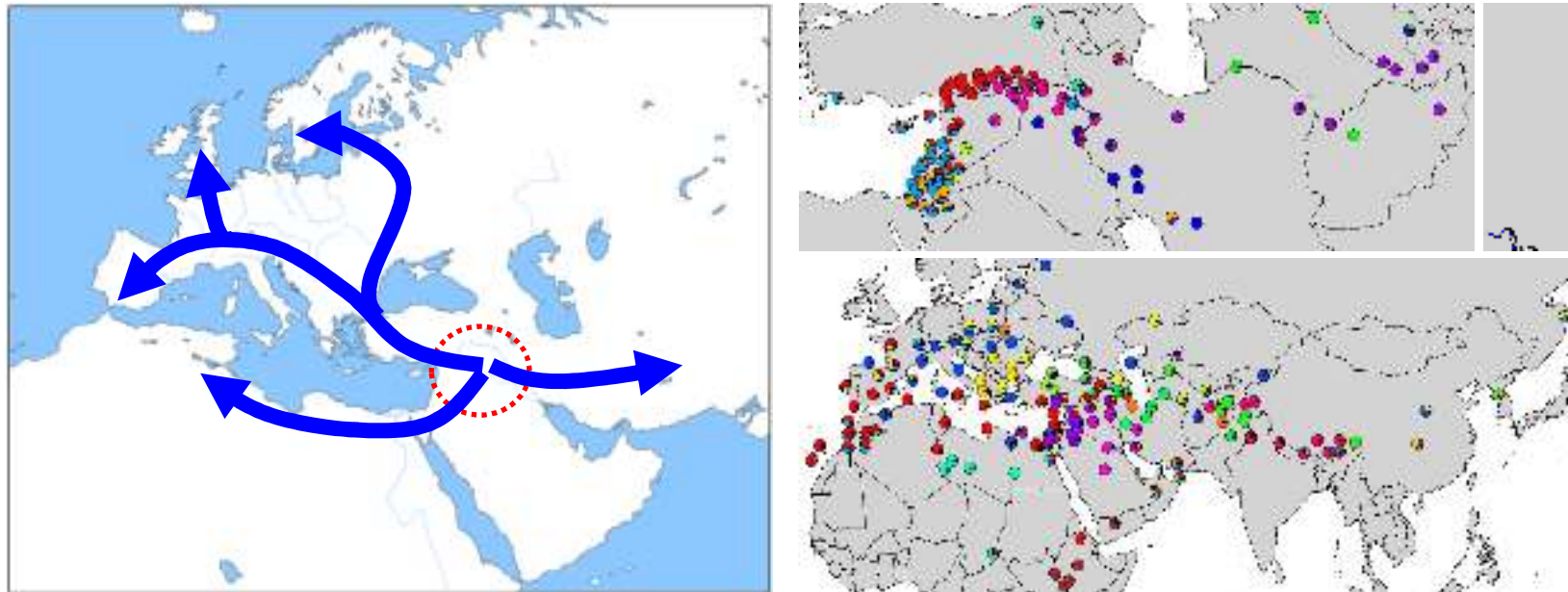
EPH Innovate project



- Leveraged Innovate Project with SWRI
- Improved diagnostics using genome sequence

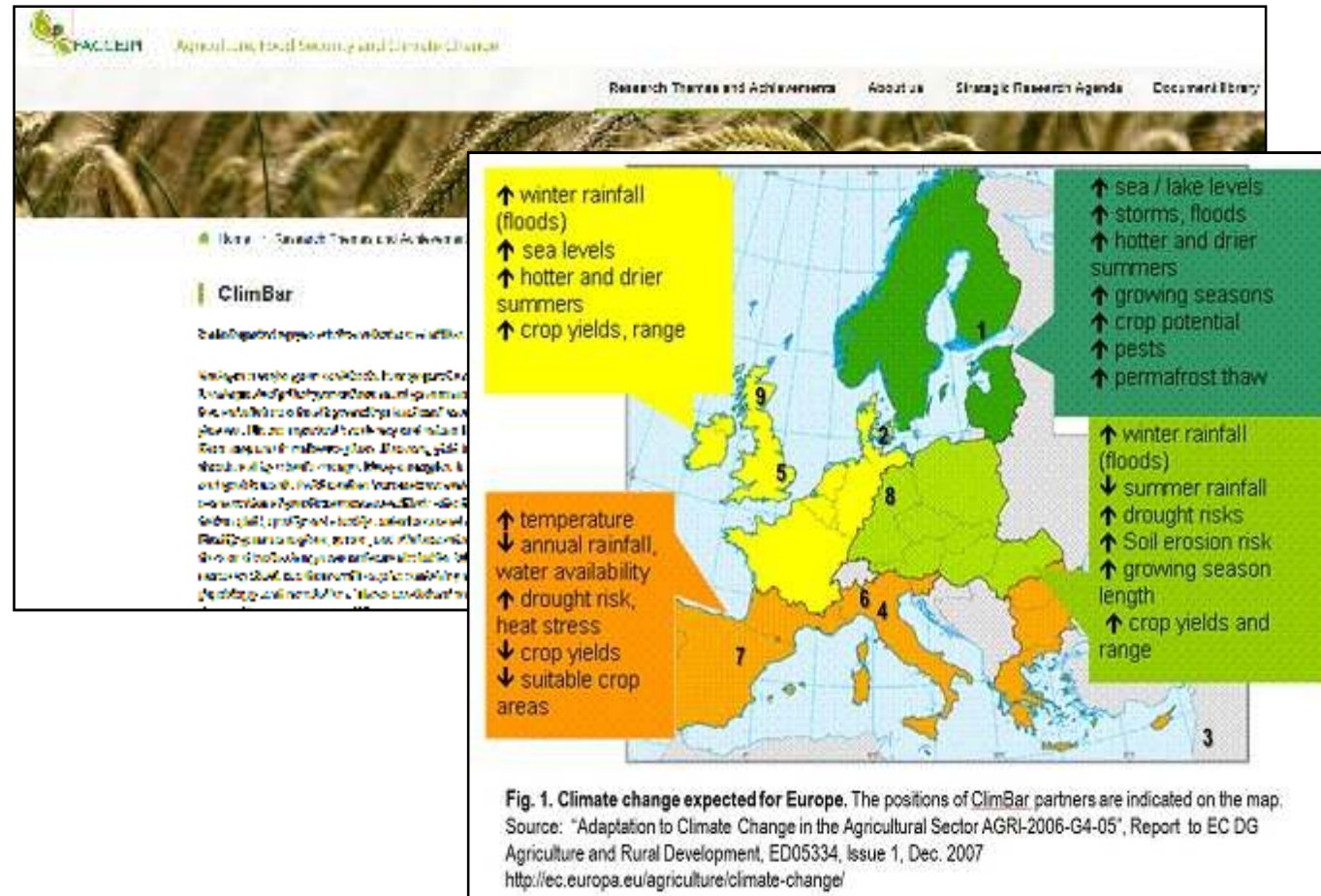


Utilising genetic diversity



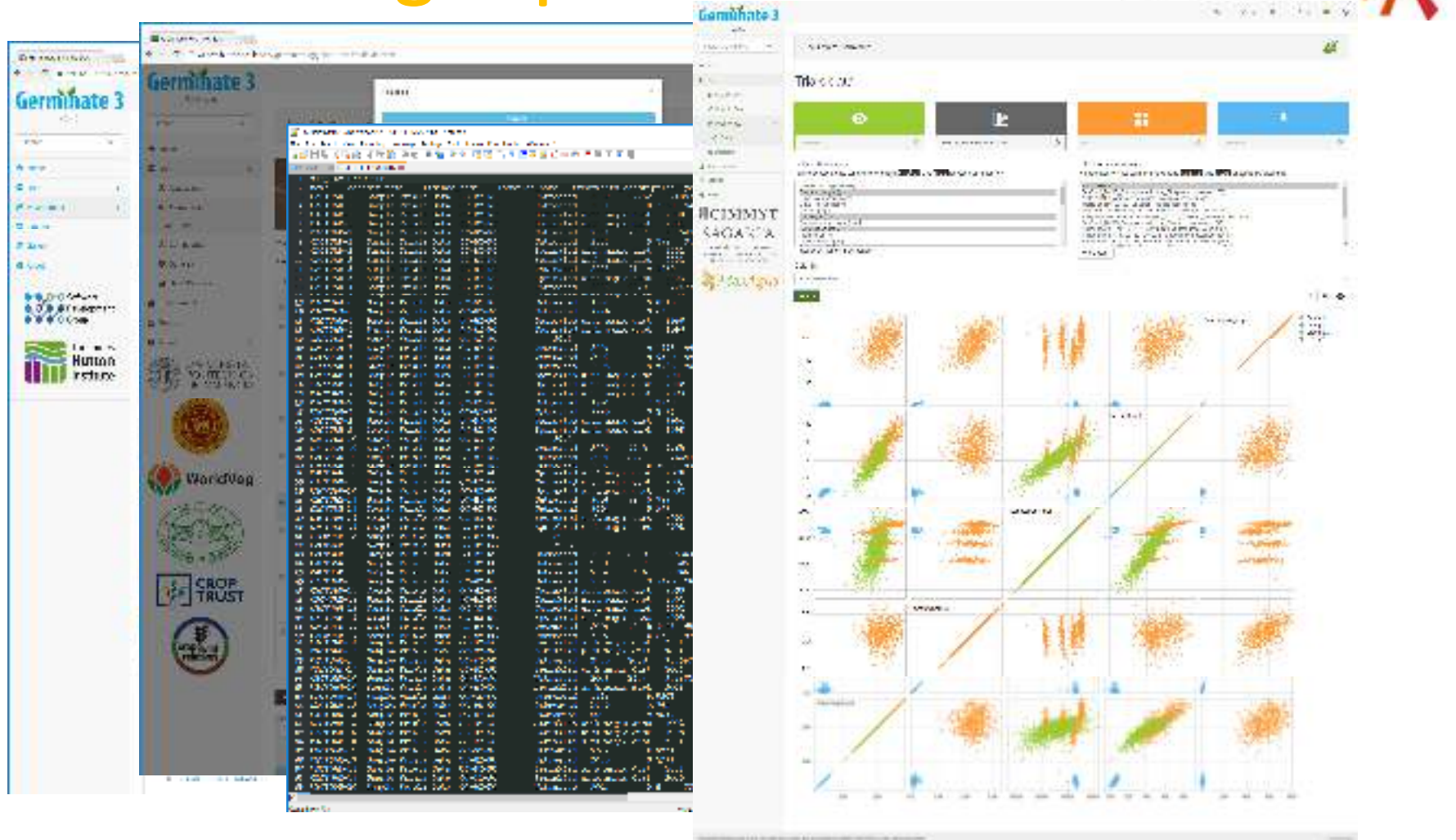
- Characterisation of collections of landrace and wild barley
- Adaption to less intensive production and different environmental stresses
- 'Futureproofing' Scottish production

Climate Change



- Leveraged involvement in ERA-NET ClimBar project
- Nine partners across Europe: co-ordinated trials
- Comparison of performance with meteorological data

Databasing Expertise



- Development of GERMINATE databasing
- Storage, visualisation and analysis of data



Crop Wild Relatives Academic Partners



Future Impact

- Other ongoing work in WP2.1 (links to WP1.3 & WP3.1)
- Spike architecture & recombination - applications
- Impact through proposed International Barley Hub (IBH)

