



# Root2Res

## Root to Resilience: Root phenotyping and genetic improvement for rotational crops resilient to environmental change

**Root2Res**, a Horizon Europe project running from 2022 – 2027 will investigate how to increase the resilience of cropping systems to climate change impacts through the characterization of below ground ideotypes and identification of tools for rapidly assessing genotypes. The project will focus on tolerance against abiotic stresses and carbon sequestration.

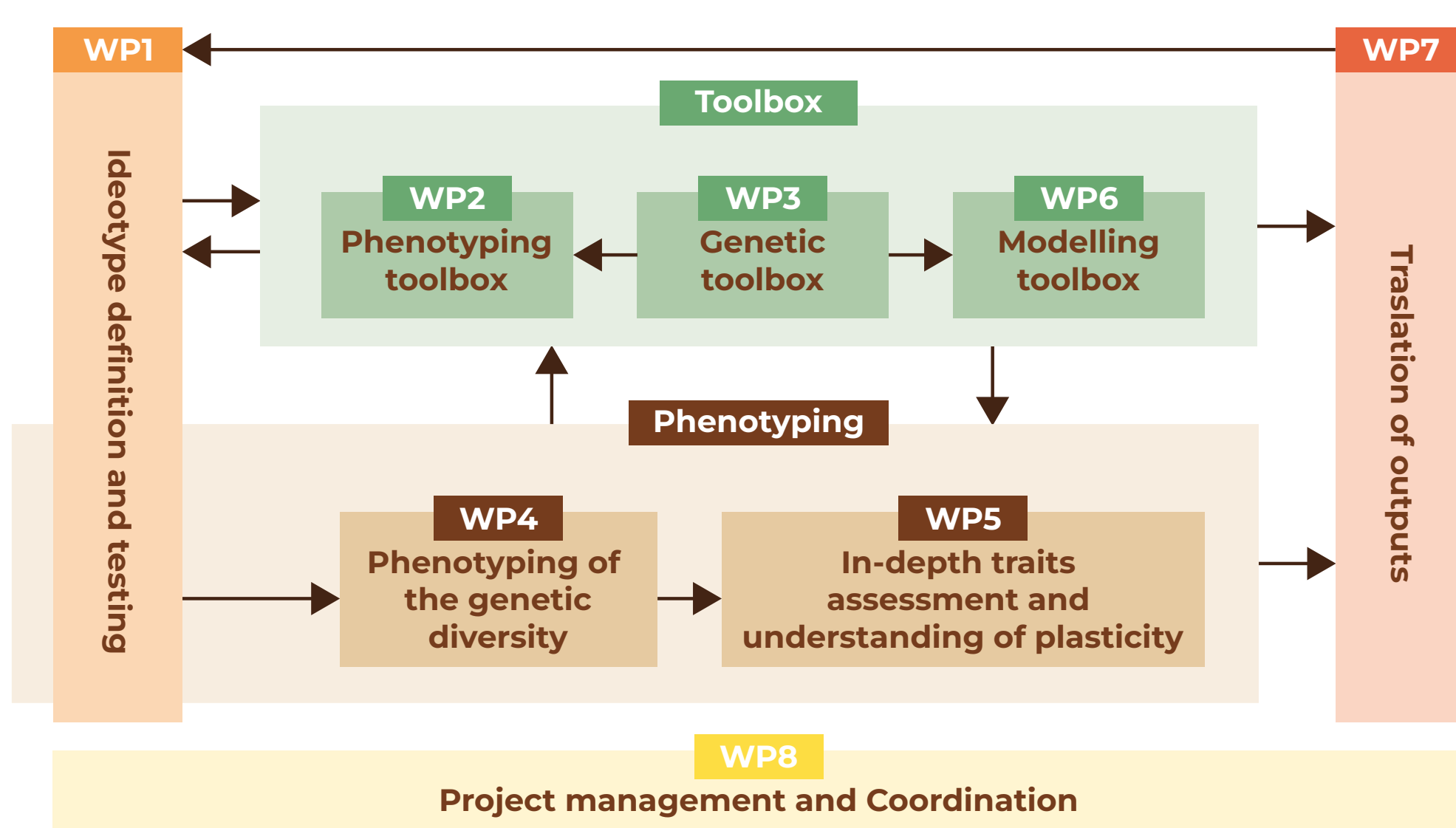
**Aim:** To deliver simple to use high-throughput screening tools to facilitate breeders to consider root traits for resilience.

### General Objectives

- 1 Define, identify and test root/rhizosphere ideotypes for a changing environment in crops common to rotational systems in Europe.
- 2 Define and provide a complete set of tools to consider root traits.
- 3 Identify, develop and multiply germplasm and populations for phenotyping activities at different scales and use materials to identify new candidate genes and markers connected to root traits and their plasticity and enable novel pre-breeding germplasm, for all crops.
- 4 Quantify plasticity of extended root phenotype for germplasm under a range of environmental conditions, including the identification of the relevant root traits, trade-offs with other characteristics and impact on carbon sequestration.
- 5 Actively engage with relevant stakeholders, disseminate and exploit new knowledge/tools to improve the sustainability of agriculture with environmental change.

### 8 Work packages

- WP1 The definition and the field test of root-based ideotypes.
- WP2, WP3 and WP6 Toolboxes for phenotyping, genetic and modelling of root systems respectively.
- WP4 Phenotyping of genetic diversity.
- WP5 In-depth assessment of root/rhizosphere plasticity.
- WP7 Output translation to plant breeders & farmers and WP8 global management.



Work package structure of Root2Res. The arrows show the general interrelationship between work packages.

### Partners

The project includes **22 partners from Europe** (Ireland, UK, France, Spain, Italy, Netherlands, Denmark, Germany, Austria, Switzerland, Slovenia) and **Africa** (Morocco, South Africa).



### Crops



Focus on three crop types common in rotational systems in Europe, with a core set of three species:

- **Cereal:** Barley (spring and winter), durum wheat (bread wheat).
- **Tubers:** Potatoes and sweet potatoes.
- **Legumes:** Faba bean (lentils, peas).

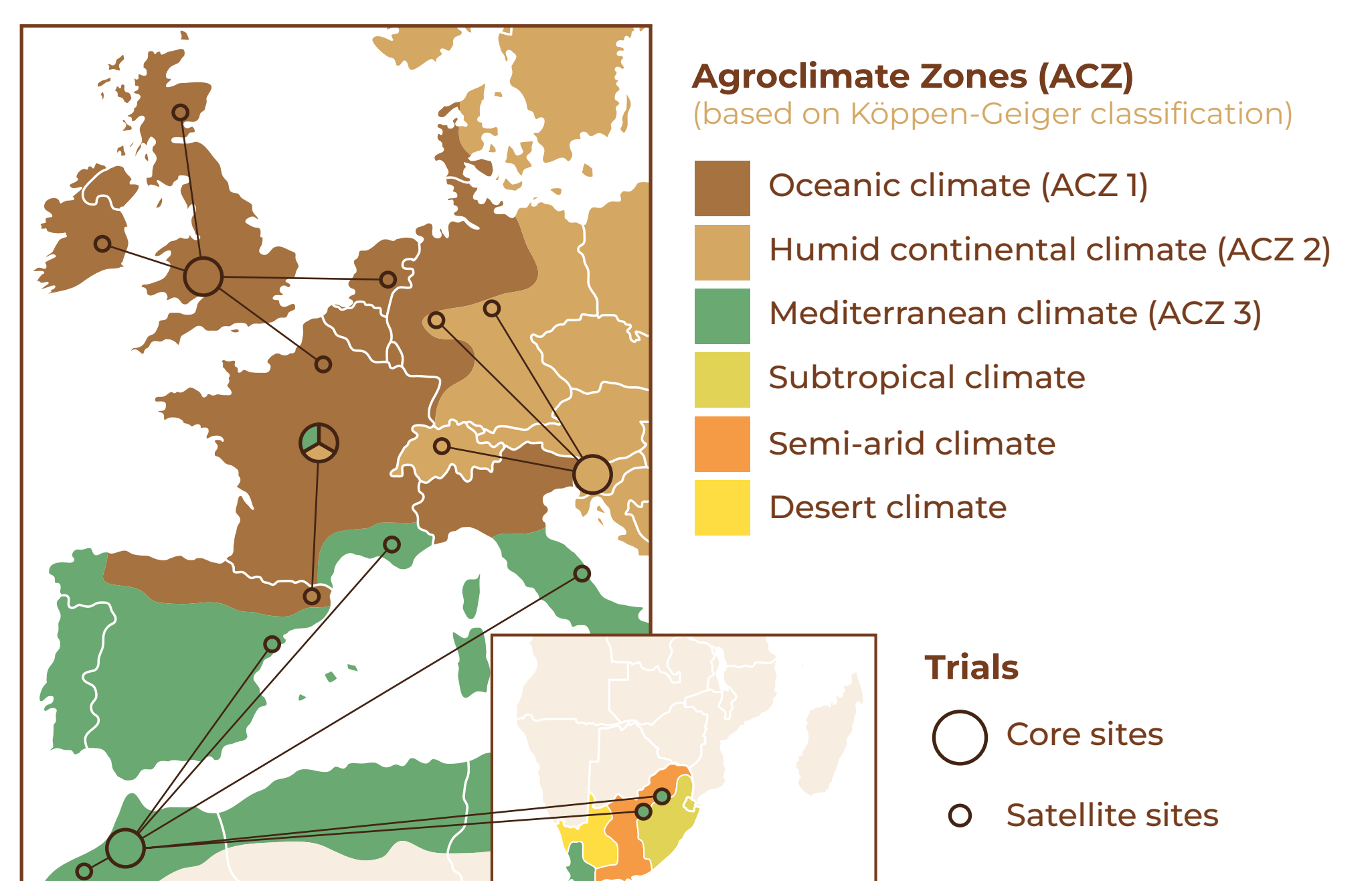
A novelty of Root2Res will be to expand aspects of the research to emerging crops in Europe. To enhance resilience to climate change.

### Environmental stress

The primary stress to be investigated is **water availability, from drought to waterlogging**. Irrigation and rainout shelters will be used to create a range of water stress. Nutrient availability: the impact of N and P availability will also be investigated using nutrient treatments.

### Field Trials Network

**Four core experimental field sites** will be established, **one in each ACZ** (UK, Slovenia and Morocco) and **one at a transition site** between the zones (France). **Satellite fields sites** will host additional trials to reflect variability in **local climate and soils**.



Network of experimental sites, spanning three agroclimatic zones (ACZ).

### Controlled Environment (CE)

**Work will be performed at a range of scales**, from high resolution soil-less experimental systems, to hybrid soil/hydroponic systems for collecting root exudates to mesocosms with sieved and repacked soil and those with natural soil structure maintained.

### Funded by



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