

FGRT oak programme

Quercus petraea and *Q robur*

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FGRT oak programme

Presentation focus

- Species' properties, populations, site and climate adaptation
- Seed demand and seed orchards and plus trees
- Seed stands
- Provenance variation and species performance



Trichomes and stomata on a southern live oak leaf. Trichomes are coloured in white, and are fine outgrowths that protect a plant against extreme weather and insects. Stomata are in purple, small pores that regulate the flow of gases in a plant. Cyan are the vessels that transport water throughout the leaf. All three are essential to plant life, and are under genetic control.

Quercus petraea – sessile oak – dair ghaelach

Long-lived – native to most of Europe

Light-demander, well-drained, fertile, acidic to neutral soils

Upland areas, in mixed forests with other broadleaf species

Adaptable to a variety of environmental conditions

Quite resistant to drought



Quercus petraea distribution

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One of the most economically and ecologically important tree species in Europe.

Strong, high-quality, durable wood, used in construction, furniture making, and barrel production (resistant to liquids and to insect and fungal attacks). Coppiced in eastern Europe as a valuable source of firewood and charcoal. Important ecological role as it supports various insects and its fruits (acorns) provide a valuable food source. Canopy allows a fair amount of light to pass through, permitting understorey growth.

Quercus robur– pedunculate oak – dair ghallda

Large, long-lived, deciduous tree native to Europe and parts of western Asia.

Tolerates colder conditions than sessile oak

Prefers fertile, moist soils

Pioneer species in plains and hills and a late successional

Species in valleys and floodplains

Commonly found in lowland forests and mixed woodlands, often forming dominant stands, or coexisting with other

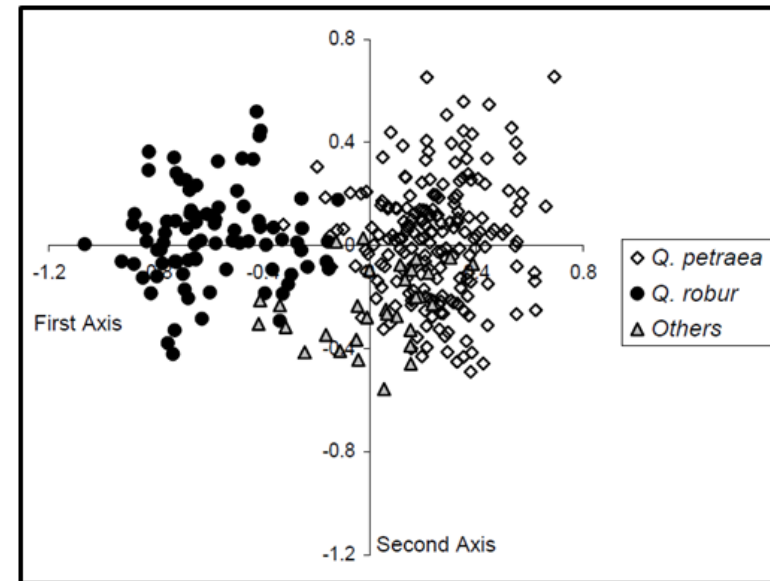
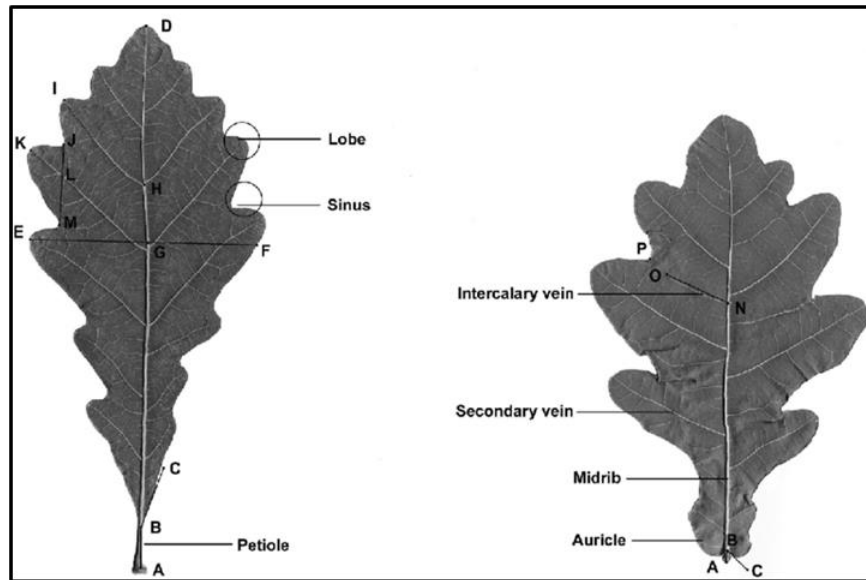
broadleaf species



Quercus robur - distribution
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Wood properties very similar to sessile oak. Widely planted in Europe for forestry and ornamental purposes, contributing to landscape conservation and restoration projects. Similar autecology as sessile oak.

Q petraea x Q robur hybrids



Kelleher *et al.*, (2004), *Annals of Botany*, 96 (7).

Adaptation in *Q. petraea*

Adaptive introgression as a driver of local adaptation to climate in European white oaks

New Phytologist (2020) 226: 1171–1182 doi: 10.1111/nph.16095

The hypothesis

“*Quercus robur* extends farther north (up to Finland) and east (up to the Ural Mountains) – see Leroy et al.(2020) – and has a higher frequency in wetter climates (Eaton et al., 2016) [in comparison to *Q. petraea*]. We suspect that the introgression of *Q. robur* alleles for genes involved in these differential responses may have contributed to the expansion of *Q. petraea* populations to higher elevations in the Pyrenees and wetter climates in Ireland”.

Seed orchards and plus trees

- Desirability to secure supplies of superior oak material on the island of Ireland for commercial broadleaf planting according to FGRT objectives and good forestry practice and aligns with Forest Strategy 2023-2030
- Erratic annual acorn supply from registered seed stands and other sources – mast year dependent – insufficient number of seed stands being collected from
- Say annual demand will rise to 50 t/year by end of decade, evenly split between species and aim is 50% from seed orchards established from plus trees

50% of say 50 t/yr ~ 25 t/yr

Acorn production rate, say 0.5 t/ha/yr

**Area of seed orchards needed = 25 t/yr / 0.5 t/ha/yr
is ca 50 ha or 20-30 orchards**

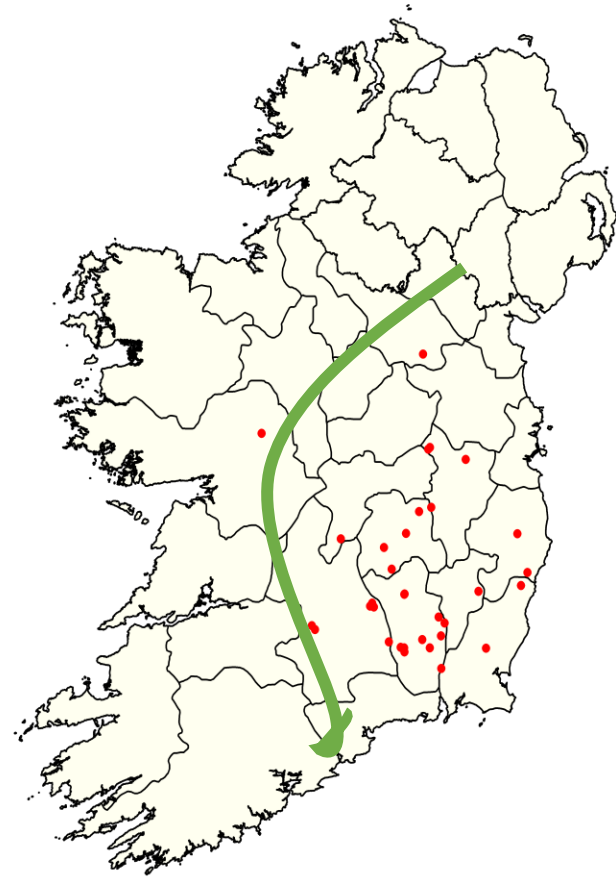
Oak plus trees – the breeding population

Also includes GB and some NL material

Most in gene bank at JFK Park Co Wexford

Aim is to extend geographic spread and number of genotypes

Target to end of 2025, 12 additional plus trees in each of Q
petraea and Q robur



Plus trees ctd

- Source material to date - Forest Service/Coillte 100+ oak plus trees selected and propagated 1990-1994 at Coillte Newtown and Kilmacurragh, FGRT oak clone bank at JFK with GB material, material from GB, small amounts from NL and FR - supplemented by climbing in 2022
- 2025 new collections, 14 Q robur, 10 Q petraea, selected over September-November
- Scion collections underway for grafting in NL, and growing-on for new orchards and archiving at JFK

Seed orchard plans

- Overall, FGRT is aiming to facilitate the establishment 12-16 oak seed orchards (six-eight in each species), based on each carrying 50-60 genotypes, using clonal material, replicated a minimum of three times
- Timeframe to end of decade.
- Three orchards to date (Coillte and Fingal Co Council), one in preparation for planting 2026/2027 – with a good level of interest for further orchards
- At production stage – c 8-10 years combined production has the potential to reach about 5-8 tonnes of acorns per year.

Typical seed orchard layout

Coillte - Q robur orchard, Garryricken, Co Kilkenny

60 genotypes x 3 reps = 180 plants

Random genotype allocation at first, then max distance – as far as practicable

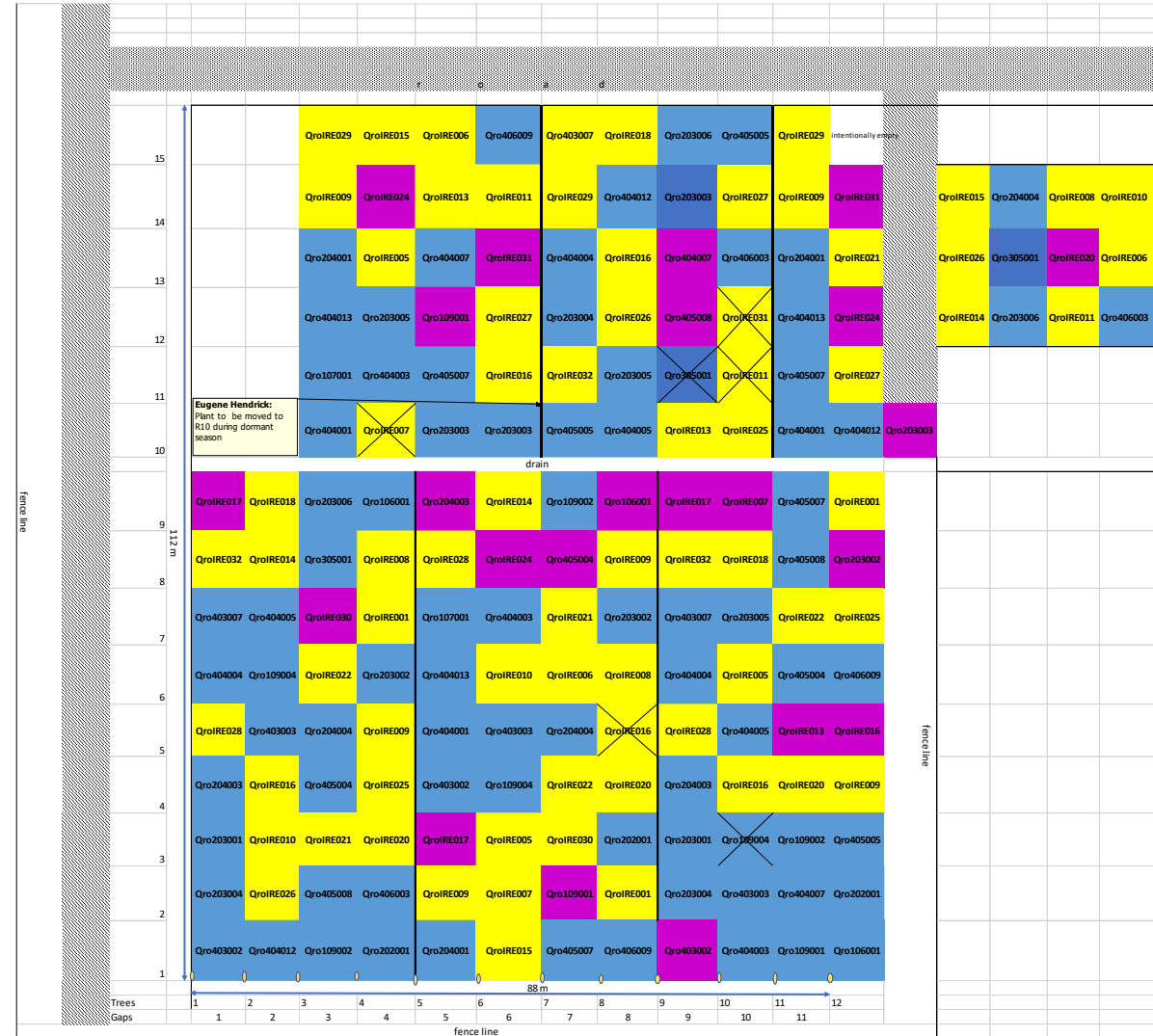
96% survival end 2023

29 plants to be added 2024

10 plants 2026

Free to grow 2027-2028 first acorns 2030-2034, depending on growth and climate

Need good maintenance and annual stump sprout removal



Registered seed stand activation

c 100 seed stands registered, 50:50 Q robur

<10 under active collection every year

potential to expand in line with overall objectives of using indigenous genetic resources

expansion of number of sites in collection is most immediate way increase indigenous production

a mast year, such as 2025 brings more stands into economic collection

aim is to extend number of seed stands with annual acorn collection

FGRT and Coillte collaborating on ways to enable a number for annual collections



Thanks to our collaborators and sponsors in this exciting oak journey

Coillte and Coillte Nurseries

Irish Distillers

Department of Agriculture Food and the Marine

Fingal County Council