FOREST GENETIC RESOURCES TRUST

An outline of the Forest Genetic Resources Trust seed orchard programme

Version 4.1 – March 2026

Background

Both oak species, pedunculate (*Quercus robur*) and sessile (*Quercus petraea*) are important for wood production, biodiversity and for landscape and cultural reasons. Oak currently occupies ca 20,200 ha, or about 2.5% of the stocked area of the forest estate (DAFM Forest Statistics 2025 https://assets.gov.ie/297338/a280944a-dace-4812-9d6d-48822a5ab87e.pdf).

Policy is to expand forest cover to reach 18% of land cover, which would bring the oak area on pro rata basis to 30-40,00 ha, a substantial resource. Most if not all the additional area is likely to be established by planting. This will entail a significant demand for acorns for the production of planting stock. In addition, during reforestation, or as part of continuous cover forestry, additional material will be needed. The recent COFORD publication, *All Ireland Forest Reproductive Material Demand Forecast for the period 2025-2035* (www.coford.ie/media/coford/content/publications/2025/01038FRMDemandForecast20252035vf181225.pdf), projects a large and sustained increase in acorn demand under all policy scenarios examined:

> *Demand for oak is projected to rise significantly in all* [policy] *scenarios, almost doubling from 3.1 million plants annually* [at present] *to 5.8 million by 2035 under the Baseline. Under Scenario 3, annual demand for oak plants could reach 10.1 million by 2035, equivalent to over 128 tonnes of acorns. This increase is driven by forest policy emphasising broadleaves, a decrease in the reliance on ash, the critical role of oak in native woodland establishment and the anticipated Nature Restoration Law targets for oak woodland.*

Seed orchards

Seed orchards are recognised as an effective way to bulk up and deploy selected and improved forest reproductive material, including oak. Furthermore, having recourse to indigenous supplies of oak seed reduces reliance on imports of acorns and plants, thereby reducing risks of disease and the use of less well-adapted genetic material.

Over the period 1990-1994 some 102 oak plus trees (roughly half and half *Q robur* and *petraea*) were selected in Ireland, based on the level of stem straightness, vigour, and absence of epicormic shoots, spiral grain, and stem fluting. Scion wood was obtained from most of the plus trees and placed in clone banks at two Coillte properties in Co Wicklow. This material, supplemented by material from plus tree selections in GB and a small number of French and Dutch locations, forms the basis for the current FGRT oak seed orchard programme. FGRT is in the process of supplementing the oak plus collection, and in 2026 extended the oak plus tree selection by a further 14 pedunculate and 10 sessile. FGRT collected scions from the plus trees in late 2025, which were grafted in early 2026 and are now being grown on.

In establishing seed orchards in any tree species it is important to base the orchard on phenotypically superior trees, and to provide for genetic diversity by using a minimum number of genotypes (individual trees), say 50 in the case of oak. In order to ensure good outcrossing the orchard is designed to place genotypes at maximum distance from each other. These considerations, and the replacement of failures and the detection and removal of graft stump sprouts guide FGRT's approach to designing and maintaining oak seed orchards, which accords with good international practice.

All in all, seed orchard establishment is a long-term business, but in partnership with landowners such as Coillte and Fingal County Council, and with the Agri-Food and Biosciences Institute (AFBI) and Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland the process of seed orchard establishment has begun. Over the past two years this work has been enabled by grant aid funding from the Department of Agriculture, Food and the Marine (DAFM) and other sponsorship funding. The key enabler from a forest owner's perspective is the Seed Orchards, Forest Type 9 (FT9) measure under the current DAFM Afforestation Scheme. The overall aim of the measure is to increase the quantity and quality of forest tree seed (see Teagasc outline of the scheme at https://teagasc.ie/crops/forestry/grants/seed-orchards/).

Apart from the primary aim of acorn production, the orchards and plus trees also enable studies on the genetic diversity of oak in Ireland and on oak phenology and growth.

FGRT's approach to oak selection and seed orchards is based on recurrent selection, with oak orchard progeny testing, while supplementing the breeding population with new genotypes from new plus trees. We also see a need to wood quality in the widest sense to include wood chemistry and suitability across a range of uses, including cooperage.

Seed production in oak stands in Ireland is intermittent, with mast years occurring infrequently, about every 6-7 years, with 2025 being a notable mast year. Acorns are borne every year however and are collected annually in aa small number of registered seed stands. Reliance on imported seed is high, with the preferred source being Dutch material, which comes from a long-established system of seed orchards based on selected material (see COFORD Connects Note www.coford.ie/media/coford/content/publications/2018/RM21OakBreeding160418.pdf). Given the periodicity of indigenous seed production and the small number of oak seed stands used for seed collection, FGRT's view is that a move to more assured and better adapted oak material is necessary. To that end, FGRT's interventions are mainly to facilitate establishment of oak seed orchards, as well as the activation of acorn collection in more of the registered oak seed stands.

The projected increase in current annual acorn demand from ca 30-45 tonnes[1] (about 70% robur and the balance sessile oak) to the projected annual levels that could reach over to over one hundred tonnes provides an opportunity to significantly increase indigenous production. FGRT's view is that 50-60% of annual acorn production should be through the seed orchard route, supplemented necessary by registered seed stand collections with imports being relied on to a deceasing extent.

What area of seed orchards is potentially needed? Box 1 provides an approximation, based on Scenario 2 of the COFORD All Ireland FRM forecast, assuming half the area envisaged in the forecast will be managed for wood production[2].

Box 1. *An approximation of the area of oak seed orchards needed to supply half of the forecasted annual acorn requirement for managed oak woodland on the island of Ireland.*

50% projected total acorn demand for managed oak woodland (forecasted Scenario 2) = <u>20 t/yr</u>

Estimated average seed orchard acorn production rate = <u>0.5 t/ha/yr</u>

Potential area of oak seed orchards needed = 20 t/yr/ /0.5 t/ha/yr = 4<u>0 ha</u>

The FGRT model is to facilitate the selection, and propagation of selected phenotypically superior oak, and offer this material to the nursery sector and landowners at low to zero cost, for the establishment of seed orchards for acorn production. The aim is for the seed orchard owner to provide this material to the market, and/or use it for their own needs, for forest establishment and regeneration. Coillte, FGRT and/or the Future Trees Trust UK, and other originators retain ownership of the underlying genetic resources. The orchard owner owns the trees and the acorns. FGRT also aims to undertake progeny trials, with the owners' permission, based on acorns collected in the orchards.

Progress to date

FGRT working with Coillte and Fingal County Council has established three orchards, two in Q petraea and one Q robur. In Northern Ireland DAERA, working with our colleagues in AFBI, the Future Trees Trust, and FGRT is in the process of completing a sessile oak seed orchard at Castlewellan. The combined area of the current orchards is 5 ha, so about 12-13% of the area we project as being needed. We are also engaging with a number of other landowners who have either received grant aid approval for a seed orchard or have expressed an interest to FGRT in the DAFM seed orchard scheme.

Over the course of November 2025 to January 2026, we have collected scions from over 50 genotypes in each species (additional to those collected from new plus trees). Scions were taken from a plant repository at the Coillte Nursery at Clone, from existing seed orchards and from the FGRT oak genebank at John F Kennedy Park. These have been grafted and are being grown

[1] https://assets.gov.ie/297338/a280944a-dace-4812-9d6d-48822a5ab87e.pdf

[2] Assuming all of the afforestation areas and half of the reforestation areas will be managed for wood production and will use 50:50 seed orchard and seed stand material. The other assumption is that FRM for the non-grant-aided, nature restoration and agri-environmental schemes will in the main be Source Identified (according to the EU FRM Directive).

on. It is anticipated that these plants will meet projected demands for new orchards in 2026/2027 and 2027/2028. We work closely with our colleagues at AFBI and with the Future Trees Trust in GB in scion collection and other matters.

An essential aspect of any forest tree selection and improvement programme is to conserve the original genetic material so it will be available for any future use, and for ex-situ conservation of oak genetic diversity. To that end, FGRT, in collaboration with the National Botanic Gardens, has established an oak plus tree genebank at John F Kennedy Park in Co Wexford. The clone bank is supplemented with any new genotypes FGRT brings into use in the seed orchards. In May 2025 FGRT relabelled the gene bank, as well as removing trees where there was any doubt that the scion was forming the plant. We also undertook genetic fingerprinting of a number of the oak in order to be sure as to species designation, and genotype. This work was carried out with the collaboration of the School of Natural Sciences, Trinty College Dublin.

FGRT, through our sponsors, is part-funding the work of Eamonn Cooper at TCD on oak genomics, which now allows the two species to be distinguished at the genetic level. This is a new tool that will greatly aid our seed orchard work. The work at TCD will also guide us the level of genetic diversity that is represented in the seed orchards, compared with the overall oak population in Ireland and UK. For a species such as oak it is important that the orchards capture wide genetic diversity, given that trees planted today will be growing in a warmer and more variable climate in the 22nd century. Genetic diversity is recognised as one of the ways that trees are able to adapt to changing climates.

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