

Project number: 6630
Funding source: COFORD

Date: December, 2014
Project dates: Jan 2014 – Dec 2014

Birch and alder tree improvement



Key external stakeholders:

Farm forest growers, tree nurseries, commercial forestry companies, COFORD & Forest Service, Department of Agriculture, Food and Fisheries

Practical implications for stakeholders:

The outcome/technology or information/recommendation is to provide a sustainable supply of improved, adapted and healthy seed of birch (*Betula*) and alder (*Alnus*) within the framework of the EU Forest Reproductive Material (FRM) regulations.

- Help to enhance the diversification of broadleaf growing stock
- Underpin a vibrant rural economy
- Encourage environmental sustainability and biodiversity
- Plant material from the downy birch 'Qualified' seed orchard is available to interested parties for the commercial production of improved birch seed

Main results:

- Grafted downy birch (*Betula pubescens*) representing each of the clones in the indoor 'Qualified' seed orchard is available for the commercial production of improved birch seed.
- Partners were sought for the commercial production of improved seed
- Indoor silver birch (*Betula pendula*) seed orchard established with material originating from South Scotland/North England region.

Opportunity / Benefit:

Parent material will be available to nurseries to produce and market improved planting material. As the supply system is put in place, forestry owners can avail of improved planting material to increase the monetary and ecological value of their forests. The availability of improved birch planting material would enable the Forest Service to list birch as a grant-aided species providing more choice to forest owners.

Teagasc project team: Dr. Nuala NiFhlatharta
Dr. Elaine O'Connor
Mr. Oliver Sheridan

1. Project background:

Two species of birch are native to Ireland i.e. *Betula pubescens* and *Betula pendula*. Currently birch is not on the recommended species list for afforestation grants. This is mainly due to poor stem quality of naturally regenerated birch and the poor survival and growth rates that have followed importation of seed from abroad. The development of birch as a commercial forestry tree species supports government policy to increase forestry area, increase the broadleaf component of forestry, use more native species and to increase the diversity in Irish forestry. The physiology of birch and alder means that they can be planted on land not suitable for other broadleaf species e.g. common oak (*Quercus robur*). The discovery of ash dieback (*Chalara fraxinea*) on our native ash has resulted in a ban on ash planting. This in turn has focused further emphasis on alternative native broadleaf species.

The birch project began with an initial study i.e. 'Pilot project for the genetic improvement of Irish Birch' (1998-2000) and this has been followed by a series of other National Council for Forest Research and Development (COFORD) funding. The improvement of alder (*Alnus glutinosa*), a species that is on the Forest Service schedule, was initiated in 2005. This was tied in with the birch project to take advantage of similarities in the techniques of tree breeding. More recently, (February 2012 - January 2014), the work was carried out within the Forest Genetic Resources Research Programme (ForGen) project.

2. Questions addressed by the project:

- Do better quality provenances of birch and alder exist in Ireland and can they be recommended as suitable seed collection areas?
- Can superior individuals of birch and alder be identified to be used as a base population for an improvement programme?
- Do the characters of growth and stem form display heritability for cyclical and concurrent selection and improvement?
- Can superior families of birch and alder be identified in progeny trials, indicating high value parent trees to retain in the breeding populations?
- How do the selected clones respond to growing in a managed seed orchard and what is the annual seed yield?

3. The experimental studies:

The long term objective of this research programme is the genetic improvement of birch and alder tree germplasm for deployment in farm forestry.

Downy birch – The research is now at a stage where there are downy birch grafted plants representing each of the clones in the indoor 'Qualified' seed orchard for the establishment of commercial seed orchards.

Grafted silver birch – A seed orchard established with scion material collected from thirty six plus trees from Scotland.

Silver birch seedlings – A small amount of open-pollinated seed was obtained in 2013, representing twelve different female parents from this collection also. The seed was sown in 2013 and the seedlings were transferred to root-trainers to grow on before planting in field trials.

Alder – Scion material was collected from each of the plus trees in the seed orchard in February 2014 and grafted.

4. Main results:

- Grafted downy birch – There are sufficient numbers of grafted downy birch plants representing each of the ninety birch clones, to establish commercial indoor 'Qualified' seed orchards. Partners were sought for the production of birch and alder seed and/or plants at the 'Qualified' level and selected, based on a process of meetings, interviews and presentations. The commercial production should lead to self-sufficiency in the supply of improved, adapted and healthy plant material. Grafted plant material will also be available for planting in a genebank in Teagasc Oak Park and will augment the existing clones already represented in the genebank.

- Grafted silver birch seed orchard – The Scottish silver birch plus trees originated from the best trees selected from stands of birch in an area bound by the rivers Clyde, Forth, Mersey and Humber in the South Scotland/North England region. Seed from this orchard will be used to establish field trials to determine if this collection of selected plus trees have potential in Ireland. Scion material from thirty six plus trees was grafted in 2013 resulting in a success rate of thirty five out of thirty six. Two replicates of each clone were used to establish the indoor seed orchard.
- Silver birch seedlings - Three small field trials were established in 2014 with progeny from twelve families and located in Waterford, Mayo and Cavan, to check suitability for growing in Irish conditions. It is believed that this population should be suited to Irish conditions due to its proximity both geographically and climatically to Ireland. These trials will continue to be monitored and assessed annually.
- Common Alder (*Alnus glutinosa*) – Due to the age and quality of the alder in the indoor seed orchard they are in the process of being replaced with younger replicates. Grafted plants representing each of the plus trees in the alder collection are now available to replace and establish a new indoor seed orchard in Teagasc to facilitate further research. Grafted clones of the alder plus trees are available to plant in the genebank in Teagasc Oak Park and also for the establishment of an outdoor seed orchard.
- Birch thinning – A three hectare birch trial planted in 2001 in Castletown, Nenagh, Co. Tipperary was thinned for the first time with the removal of 35% - 38%. Before thinning commenced potential crop trees (PCTs) and competitors were measured for height and diameter at breast height (Dbh). The next step will be to analyse the data collected.

5. Opportunity/Benefit:

- The establishment of commercial seed orchards both outdoor and indoor should lead to the provision and self-sufficiency of improved, adapted and healthy seed, providing a sustainable supply and improved planting material to forestry owners.
- The use of improved material can enhance the monetary and ecological value of forests for their owners.
- The collection and preservation of plus trees in a genebank provide a valuable resource for future research.
- With a ban on planting native ash, the availability of improved birch planting material would enable the Forest Service to include birch on the grant-aided species list. The improved planting material would also feed into schemes in the new Forestry Programme 2014 – 2020 e.g. The Forest Service Native Woodland Scheme (NWS) which is aimed at protecting and expanding Ireland's native woodland resources.

6. Dissemination:

O'Connor, E. Update on the Birch and Alder Improvement Programme to the Scottish Birch Group, Future Trees Trust, Westonbirt, May 2014

O'Connor, E., Sheridan, O. National Forestry Demonstration on Thinning of Alder and Sycamore, Ballycrissane, Ballinsloe, Co. Galway. June 2014

O'Connor, E., Sheridan, O. Commercialisation of Birch and Alder Seed Orchards, Oak Park, Carlow. June and July 2014. Presentations.

O'Connor, E. Demonstration visits to birch site in Coolbaun Co. Tipperary. June and September 2014. Pre and post thinning.

7. Compiled by: Oliver Sheridan