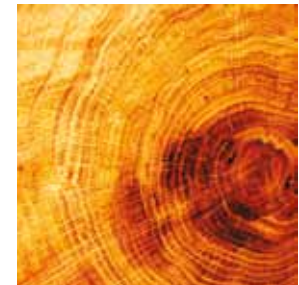
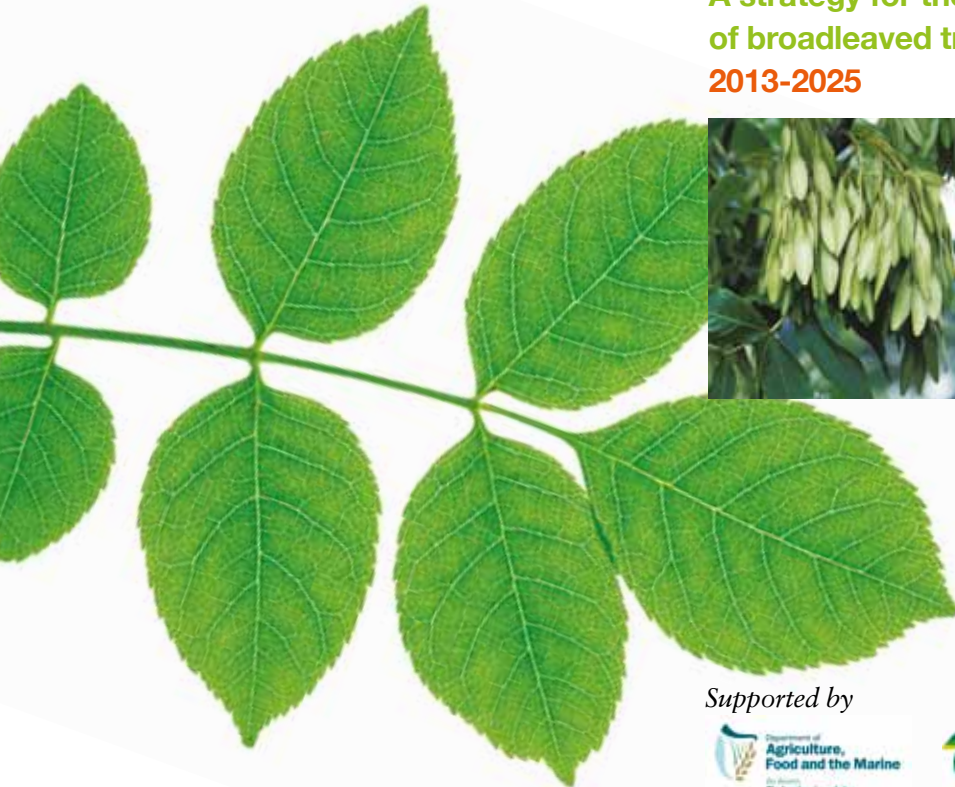




A future with broadleaved trees

**A strategy for the Improvement
of broadleaved trees in Britain and Ireland
2013-2025**



Supported by



Thanks and acknowledgements

Many people and organisations from across the forestry and ecological sectors have been involved in the formation of this document.

It builds on and supports Biodiversity Action Plans and national policies for forestry and forest science and highlights areas where we believe further consideration is required.

Future Trees Trust, Earth Trust and Forest Research wish to thank all those that have contributed to this and all the discussions and workshops that lead to its production:

Alba Trees
Abbey Forestry
Agri-Foods Biotechnology Institute
Association of Wildlife Trusts
Bangor University
Castle Howard Estate
Country Land and Business Association
Coed Cymru
Cheviot Trees
COILLTE
CONFOR
Continuous Cover Forestry Group
CRANN
Crowders
Department of Agriculture, Food and Marine
Department of Agriculture and Rural
Development, Northern Ireland
Duchy of Cornwall
English Heritage
Flora Locale
Forestart
Forestry Commission
Forestry Service of Northern Ireland
Grown in Britain
Horticultural Trades Association
Institute of Chartered Foresters
Irish Timber Growers' Association
Maelor Forest Nurseries
Manchester Metropolitan University
Mid-Western Forestry Services

National Botanic Gardens Dublin
National Forest Company
National Trust
Natural England
Natural Resources Wales
Nonesohardy Nurseries
Oakover Nursery
Plantlife
Pro Silva
Pryor & Rickett Silviculture
Royal Forestry Society
Scottish Natural Heritage
SelectFor
Small Woods Association
Society of Irish Foresters
Silva Foundation
Timber Trades Federation
Teagasc
The Tree Council
Tree Council of Ireland
University of Aberdeen
University College Dublin, Forestry Department
University of Exeter
University of St Andrews
University of Edinburgh
UPM Tilhill
Wee Tree Nursery
Wood for Good
Woodland Trust
Woodlands of Ireland



© Forestry Commission

We are most grateful to the Patsy Wood Trust and Forest Research for their generous support of this project.

Foreword

Woodlands and broadleaved trees were once integral to the landscapes of Britain and Ireland and a natural and rich resource on which our culture, economy, health and biodiversity depended. Over the last two hundred years, the extent of broadleaved woodland and the hardwood timber it produces has fallen dramatically. Today, we import 95% of all the hardwood timber we use.

The reasons for this decline are many and varied including over-extraction of the best trees, under-management of the remaining woodlands, the wide availability of foreign imports, a focus on more rapidly growing conifer species and pressure for land to grow food.

Yet people value trees and woodlands. More people are now engaging in conversations about woodlands, many of whom had not done so previously. Broadleaved trees obviously have a very special place in our national psyche, as they are an important part of our countryside and urban landscapes. Close your eyes and think of the countryside and a broadleaved tree will be part of that image. An ideal view from an office window will include a broadleaved tree and if you take a stroll in the park, where do people shelter on rainy or hot days?

But broadleaved trees are very much more than just beautiful things. They are the source material on which entire industries depend, a living for many, ecosystems that will be fundamental to our

future health, a means of storing vast quantities of carbon as well as supporting countless species of woodland flora and fauna.

As new tree pests arrive in our shores there is an increased public awareness in the importance of our native trees. Public money has been invested in new action plans and research to combat these potentially damaging problems. The subject of woodlands and how to ensure their future is highly relevant. Most recently, the Grown in Britain campaign shows that there is a growing demand and enthusiasm for ensuring we do all we can to become self-sufficient in timber and to restore our woodland culture, which we heartily applaud.

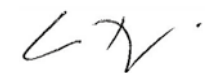
We believe that tree improvement is fundamental to ensuring the future of our broadleaved woodlands. Through tree improvement, the woodlands of Britain and Ireland can support our economic growth, contribute more to society and, with selective breeding and long-term management, be more resilient to changes in our climate and new pests and diseases.

Just as the breeding of many animals and crops harnesses natural population diversity to enhance desirable traits, the same can be done with trees. But it takes a lot longer to achieve results and we need to act now if we want future tree populations to be productive, healthy and adaptable.

Producing more of our own hardwood timber can only help deliver our nations' growth

agendas and strengthen rural economies, while delivering many other tangible benefits.

We thank all those who have taken part in the development of this strategy and offer it as the best way to ensure that broadleaved trees are part of our rural and urban landscapes for generations to come.



Geraint Richards and Graham Taylor

Co-chairmen, Future Trees Trust

Head Forester, Duchy of Cornwall

Director, Pryor & Rickett Silviculture



Dr. Jayne Manley

CEO, Earth Trust



Dr. Steve Lee

Programme Group Manager for Genetic

Improvement Forest Research

OCTOBER 2013



Context



- Britain and Ireland currently import around 95% of the hardwood timber used
- Ash die-back and acute oak decline are typical of the diseases threatening our native tree species, which may kill millions of trees
- A warming climate will threaten our woodlands, changing growing seasons and the number of new pests and diseases to which our broadleaved trees are susceptible
- A large proportion of our forest seedlings are imported from overseas

But it doesn't have to be this way.

In Britain and Ireland we have the climate, land, skills, experience and resources to grow many more of our own disease-resistant, healthy, productive timber trees. Because we don't grow enough of our own hardwood timber, we compromise our ability to realise the multiple potential benefits from our woodlands such as carbon sequestration, habitats for woodland species, rural employment and amenity opportunities.

The adage “the wood that pays is the wood that stays” has been true for generations. Trees can be selectively bred to produce higher timber yields, making them more economically viable and therefore more attractive to anyone planting trees for timber. More trees planted, for whatever reasons, mean more benefits to our economy, environment and community.

Experts agree that the most sustainable long-term strategy to safeguard our broadleaved trees in the future is to use the high genetic diversity within tree species to develop more resilient populations. Ensuring a broad genetic base in all our trees and seed for future generations is more likely to provide resilience to whatever the future throws at our trees, such as novel diseases like ash die-back.

This strategy is concerned only with broadleaved trees (also known as “hardwoods”), not with conifers or “softwoods”. Paradoxically, the timber produced by hardwoods is not necessarily particularly hard. In fact one of the softest woods

known, balsa, is technically a hardwood, while one of the hardest, yew, is a softwood.

Improvement programmes currently exist for seven species of broadleaved trees – ash, birch, cherry, oak, sweet chestnut, sycamore and walnut. Although significant progress has been made with some species, there is much still to do.

This strategy sets out the case for the wider use of improved broadleaved trees and identifies objectives and targets that will ensure the woodlands of the future can be planted with improved broadleaved trees. As a result, future populations will be productive, healthy, resilient and adaptable.

Case studies for using improved material

The Forestry Commission in Britain was established in 1919 to create a strategic timber reserve. Their tree improvement programme produced increases in growth yield of 25% for Sitka spruce. The programme was so successful that now only improved Sitka is planted. Similarly in Ireland, improved Sitka spruce is being used in the national afforestation programme. Improved conifers have become the accepted industry standard.

Building on the success of conifer improvement programmes, the time is right to focus attention and available resources on broadleaved trees.

Why do we need to do this?

Growing more improved broadleaved trees in appropriate locations and managing those trees as part of mixed woodlands, will bring tangible social, economic and environmental benefits.

Social and economic benefits

Using improved broadleaved trees can:

- Increase financial returns, as improved trees will yield more usable timber
- Support a growth agenda, reducing dependence on imported timber leading to less pressure on tropical forests, reduced carbon miles of timber products and an improved balance of trade for Britain and Ireland
- Support rural economies by creating more local jobs both directly in the forestry sector and indirectly in wood processing and associated industries
- Contribute to the well-recognised health benefits and well-being associated with broadleaved woodlands

Environmental benefits

Using improved broadleaved trees means:

- Future tree populations are more likely to have higher establishment rates than unimproved material and to be more resilient to pests and diseases because of their greater genetic diversity.
- Increased quantities of carbon can be stored in the timber produced by trees with higher timber yields and locked up in construction materials and high quality wood products for many years.
- Biodiversity can be sustained and with good woodland management practices, enhanced

Why now?

If we don't act soon, broadleaved trees and woodlands will have less chance of surviving the threats we know our woodlands face now and in the future.

The number of pests and diseases that can threaten our broadleaved woodlands is likely to increase as a consequence of increased global trade and a current widespread use of imported saplings. A potentially warming climate may also favour the establishment of new pests and diseases, as well as increase the impact of established ones.

Broadleaved trees grow slowly and often outlive humans. Breeding trees for increased disease resilience and timber yield takes time. Unless we recognise the need for woodland tree improvement now, we will delay the much-needed recovery and protection of our woodlands, leaving them open to further attack from pests, diseases and neglect.



© Forestry Commission

Our Vision

Our vision is to establish improved broadleaved trees as an integral part of British and Irish woodlands.

Improving the genetic quality of broadleaved trees is fundamental to our vision.

Improved trees are those that have been selected from nature and brought together in a breeding programme. In these programmes, the healthiest trees with the best form and vigour are selected, cross-bred and their performance tested against un-improved trees over many years. The aim of this improvement is to increase trees' productivity and their ability to withstand changes in climate or threats such as those from pests and diseases. Using improved material from breeding programmes populated with trees sourced from a wide geographic area increases the genetic diversity of the woodland planted. It is this wider genetic diversity that helps provide increased resilience to disease.

Genetically Modified Organisms

The use of genetically modified trees has been suggested as a solution to some climate change and environmental challenges. The use of genetically modified trees in the future will depend on a range of factors, most importantly whether or not the use of such trees is legal and whether the public will accept them. There are strong arguments both for and against such use which can be found in numerous scientific publications.

These arguments are noted but not included in our recommendations at this time. None of the current tree improvement work undertaken in Britain or Ireland involves genetic modification.



© Forestry Commission

Summary of objectives and targets

© Forestry Commission



Achieving this vision requires delivery of three key objectives and nine targets.

OBJECTIVE 1

Delivering improved broadleaved trees through research

Target 1

Increase the number of species selected and bred for improved productivity and maintenance of genetic diversity.

Target 2

Increase the amount of improved seed available for a range of broadleaved species (both native and introduced) by strengthening existing research programmes on major species.

Target 3

Co-ordinate and establish greater awareness of shared research priorities, building strong networks of stakeholders from the many woodland sectors.

OBJECTIVE 2

Raising awareness of the benefits of using improved broadleaved trees

Target 4

Raise awareness of the benefits of using improved broadleaved trees and better woodland management.

Target 5

Increase the number and quality of management of seed stands.

Target 6

Promote awareness of the existing registers of improved material and seed stands as an interim measure prior to improved seed and trees becoming widely available.

OBJECTIVE 3

Establishing a policy framework that encourages planting of improved broadleaved trees

Target 7

Identify and undertake the research and implement the policy measures needed to ensure that the most appropriate seed sources are used in all new broadleaved woodland planting.

Target 8

Promote the need to review the current native seed zone and provenance specifications and future relevant policies, to reinforce different woodland and forestry objectives.

Target 9

Influence all those with a remit to plant trees in whatever setting to actively encourage and incentivise where appropriate the planting of improved material.



Objective 1

Delivering improved broadleaved trees through research

As our woodlands continue to succumb to ash die-back, acute oak decline, other imminent pests and diseases and in response to a growing public demand for more native broadleaved trees, it is time to consider establishing improvement programmes for more broadleaved species, to ensure that future tree planting can be achieved with improved material of the most appropriate species.

By working collaboratively with others in the forestry sector, the future demand for possible alternative species will be identified. Alongside this, the appropriateness of establishing populations of those species in Britain and Ireland will be determined and the feasibility of breeding programmes for the most appropriate species identified.

The current research and work on broadleaved tree improvement is recognised as vital to the future of woodlands in Britain and Ireland, but in order to achieve the vision, research work needs to be strengthened. More research should be undertaken, both on the major species and those identified as possible alternatives.

Closer co-ordination and collaboration is needed across the forestry, research and ecology sectors and between government and non-government organisations to build partnerships that can further the tree improvement work that is being undertaken now and in the future.

Target 1

Increase the number of species selected and bred for improved productivity and maintenance of genetic diversity.

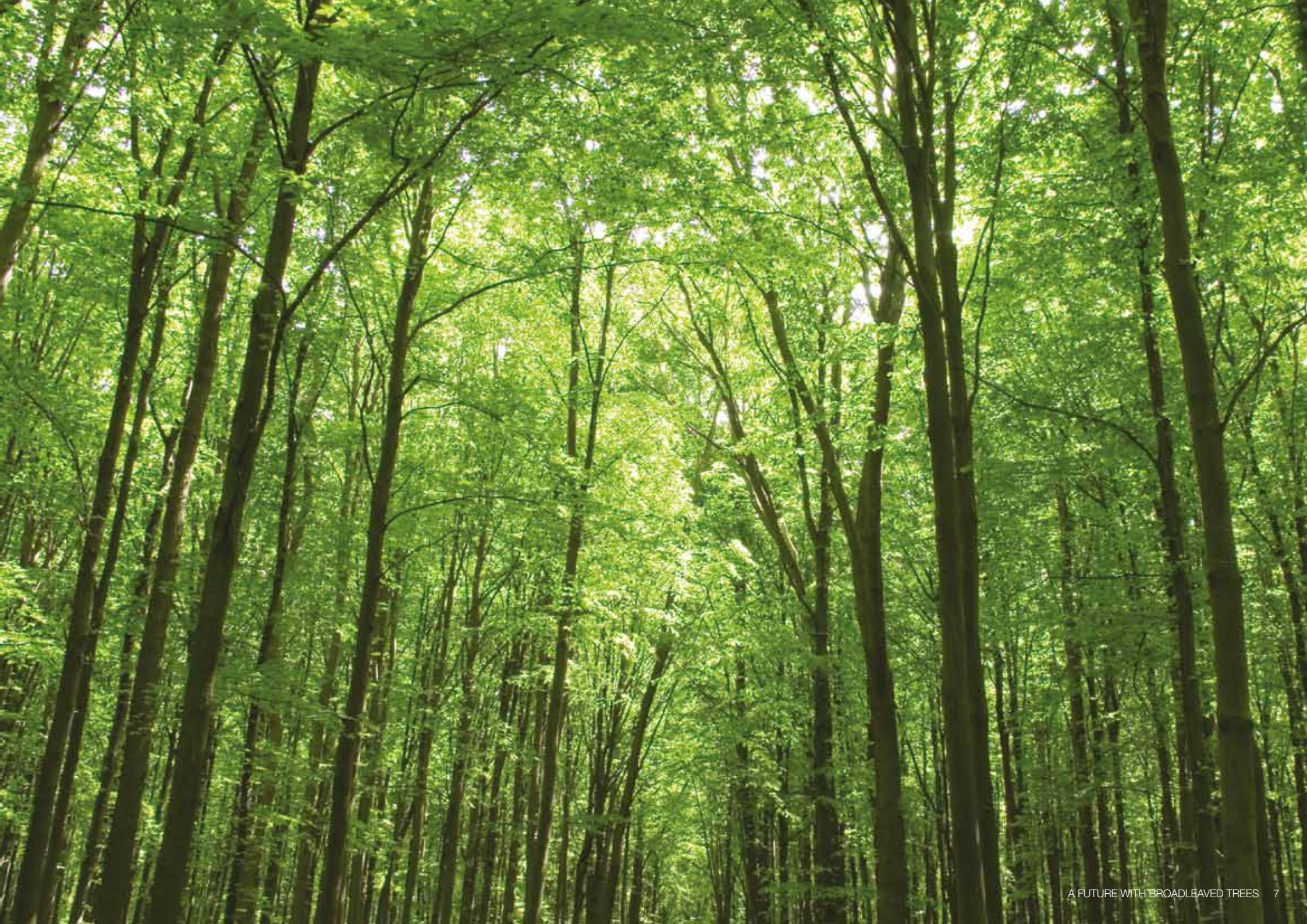
Target 2

Increase the amount of improved seed available for a range of broadleaved species (both native and introduced) by strengthening existing research programmes on major species.

Target 3

Co-ordinate and establish greater awareness of shared research priorities, building strong networks of stakeholders from the many woodland sectors.







Objective 2

Raising awareness of the benefits of using improved broadleaved trees

Promotion of the many benefits and advantages that using improved planting material can bring to those considering planting trees is critical to the success of this strategy. The economic, social and environmental benefits are highlighted on page 3.

By engaging stakeholders from across the forestry and ecology sectors, communication strategies should be developed to convey the importance of the benefits of using improved trees.

The audience for our communications is large and diverse, and will include:

- National government
- Local government / local authorities
- Colleges and universities that run forestry or ecology courses
- Woodland charities and NGOs
- Forestry, silviculture and arboriculture industry affiliated or interest groups
- Forestry and land management practitioners
- Farmers, land and woodland owners
- Nursery owners

As the benefits of using improved trees and better woodland management need to be embedded in all relevant strategies and policies, those developing and implementing policies will be an important audience for communications. The benefits of using improved trees are relevant to strategies and policies that cover:

- Forestry
- Woodland creation and management
- Forestry economics
- Sustainability
- Wood-fuel
- Biodiversity
- Climate change and carbon sequestration

Raising awareness of the benefits of using improved trees and seed will lead to increased demand. Tree improvement programmes are already underway, but it will be some years before improved trees and seed will be available in significant quantities. Until that time we need to encourage the registration of seed stands (collections of trees that have been identified as good sources of seed), the better management of existing registered seed stands and the promotion of their use as seed sources as these are currently some of the best sources of seed.

Target 4

Raise awareness of the benefits of using improved broadleaved trees and better woodland management.

Target 5

Increase the number and quality of management of seed stands.

Target 6

Promote awareness of the existing registers of improved material and seed stands as an interim measure prior to improved seed and trees becoming widely available.



Objective 3

Establishing a policy framework that encourages planting of improved broadleaved trees

As with any other organism, if the genetic diversity of trees in our woodlands becomes too narrow, trees will become susceptible to inbreeding depression effects, such as reduced vigour and fertility. Trees are generally cross-bred and maintain high levels of natural genetic diversity, but seed collecting, planting or reforestation strategies that do not ensure broad genetic diversity can have adverse consequences for the health and performance of newly planted woodlands.

Local adaptation is a concept that is widely referred to in current woodland creation policies. Local genotypes are assumed to be better adapted to local conditions. However, adaptation to local conditions depends on the variability of the habitat characteristics and is not such a clearly defined advantage in trees as in herbaceous plants, particularly at a narrow geographic scale.

There is good evidence to suggest that a restricted view of what is 'local' may not ensure optimally adapted tree populations and could lead to the use of stock of limited natural genetic diversity which may in turn lead to reduced productivity and other limitations.

Differences in a tree's performance can be clearly seen between provenances in many native broadleaved trees but these are mostly not caused by characteristics of the

local seed source. Adaptive differences are most likely to be found at the geographic and altitudinal extremes of species' ranges – the northern and southern extremes of Great Britain and Ireland, and the northwest and other regions where climates are more oceanic. Planting material from maritime mainland Europe often adapts better than more inland continental European sources.

Current guidelines for replanting and establishing new woodlands have been criticised as restrictive by some, potentially inhibiting the use of material and seed from Europe or beyond. Insisting on 'local' planting material may not be the best strategy and might actually be restrictive from the point of view of tree productivity, genetic diversity and therefore resilience in the longer term.

Further research and scrutiny in this area is required and policy changes and revised guidelines may need to be considered to encourage the use of good and improved planting material to produce high quality trees that will deliver multiple benefits.

Anyone with a remit to plant broadleaved trees in whatever setting should be aware of the tree improvement programmes currently underway or those that this strategy will help develop in the future. Wherever appropriate, the planting of improved trees should be encouraged.

Target 7

Identify and undertake the research and implement the policy measures needed to ensure that the most appropriate seed sources are used in all new broadleaved woodland planting.

Target 8

Promote the need to review the current native seed zone and provenance specifications and future relevant policies to reinforce different woodland and forestry objectives.

Target 9

Influence all those with a remit to plant trees in whatever setting to actively encourage and incentivise where appropriate the planting of improved material.





How will we achieve the Vision?



© Forestry Commission

Our vision is to establish improved broadleaved trees as an integral part of British and Irish woodlands. To achieve this, three objectives and nine targets have been identified.

Achieving our vision will require drawing on the skills, expertise and knowledge of a broad range of forestry practitioners, policy-makers, researchers and land-owners. It will require broadening, strengthening and developing the networks already established by the consortium members.

MORE RESEARCH is needed into many aspects of tree-breeding such as local adaptation, provenance and progeny trials, flowering studies and DNA analyses as well as factors other than genetics that affect tree growth, such as the most appropriate growing conditions, pest control methods, silviculture systems and many other areas. Such work calls upon the skills of scientists in Government agencies such as Forest Research, Forest Service (Republic of Ireland), Northern Ireland Forest Service, DEFRA, James Hutton Institute, TEAGASC (the Irish Agriculture and Food Research Authority) as well as other forestry and ecology research institutions in Britain and Ireland.

RAISING AWARENESS of the benefits of using improved trees needs the support of the many organisations that create, enact or deliver current woodland policies and strategies, nationally and locally. The concept of improved trees and seed and the many benefits their uses bring to the woodland resource needs to be embedded in policy and practice in Britain and Ireland.

It is vital that governments play a key role as they develop and disseminate POLICIES AND GUIDANCE. A particular priority will be the review and development of policies promoting local adaptation, the ongoing scrutiny of current seed zone regulations and the maintenance, management and promotion of registered seed stands as the best available sources of high quality seed.

Much of the work needed to achieve our vision will need FUNDING. However, the Future Trees Trust, Earth Trust and Forest Research partnership, in collaboration with the Department of Agriculture Food and the Marine in Ireland has, for many years, been working efficiently with resources raised from a variety of sources including grants from government, charitable trusts, contributions from industry and much skilled voluntary work.

Identifying, commissioning and funding the necessary research demanded by our vision in a time of national austerity and cut-backs will undoubtedly be challenging. We believe, however, that by embedding tree improvement into the fabric of forestry and woodland practice in Britain and Ireland, significant additional funds could be leveraged.

For a strategy to have complete integrity, a fully costed implementation plan with detailed time-scales and key performance indicators should sit alongside it. This strategy requires such a plan and next steps include galvanising interest, stimulating debate followed by the development of a cross sector implementation plan.

The table opposite outlines how we think success can be achieved for each of the identified targets.

Objective 1

Target 1:

Increase the number of species selected and bred for improved productivity and maintenance of genetic diversity

- Potential species assessed for future demand and appropriateness for planting
- Breeding material (seed or cuttings) obtained from best trees
- Breeding strategies created
- Improvement programmes established for all newly identified species

Time-scale – 10 years

Target 2:

Increase the amount of improved seed available for a range of broadleaved species (both native and introduced) by strengthening existing research programmes on major species

- Well-supported improvement programmes produce increased quantities of improved seed
- A sustainable and consistent supply of improved seed exists at a price dictated by the market

Time-scale – circa 10 years

Target 3:

Co-ordinate and establish greater awareness of shared research priorities, building strong networks of stakeholders from the many woodland sectors

- Strong networks of researchers from many sectors, working closely to share broadleaved tree-breeding knowledge and skills
- Available funding is optimised and duplication of research avoided
- The work of the networks is internationally recognised
- The networks' work attracts significant new funding and far-reaching influence and national research woodlands such as Paradise Wood are sustained and managed

Time-scale – ongoing

Objective 2

Target 4:

Raise awareness of the benefits of using improved broadleaved trees and better woodland management

- Through raised profile and effective communications, the woodland sectors understand the benefits of using improved broadleaved trees
- Demand for improved material rises leading to further investment in improvement programmes from the many beneficiary stakeholders

Time-scale – 2 years

Target 5:

Increase the number and quality of management of existing seed stands

- An audit of existing seed stands identifies the work needed to restore them to production
- An appropriate stimulus is identified to ensure stands can be managed back into production
- Many more sources of high quality seed are now in active production

Time-scale – 2 years

Target 6:

Promote awareness of the existing registers of improved material and seed stands as an interim measure prior to improved seed and trees becoming widely available

- A multi-sector awareness campaign highlights the existing registers of improved material
- More land-owners are encouraged to register their own stands as sources of high quality seed

Time-scale – 2 years

Objective 3

Target 7:

Identify and undertake the research and implement the policy measures needed to ensure that the most appropriate seed sources are used in all new broadleaved woodland planting

- Research identified, commissioned and undertaken into the effects of seed source on a tree's performance and the balance between local adaptation and a warming climate. The full extent of the role of local adaptation is determined

Time-scale – 5 years

Target 8:

Promote the need to review the current native seed zone and provenance specifications and future relevant policies to reinforce different woodland and forestry objectives

- Research helps inform decisions about possible changes to seed zone and provenance specifications and policies
- Policy reflects the research and the most appropriate seed sources are used in all new planting

Time-scale – 2 to 5 years

Target 9:

Influence all those with a remit to plant trees in whatever setting to actively encourage and incentivise where appropriate the planting of improved material

- Appropriate incentives have been agreed and implemented into woodland planting schemes
- Improved broadleaved trees are an integral part of woodland creation schemes in Britain and Ireland

Time-scale – 15 years

About the partners

FUTURE TREES TRUST is a registered charity (no. 1103202) dedicated to encouraging the breeding of broadleaved trees to improve their growth rate, form and resilience to disease and a warming climate. Their vision is to realise economic, social and environmental benefits so that by 2050, anyone planting broadleaved woodland can do so using trees that will produce the maximum volume of recoverable timber. Their membership comprises tree breeders, silviculturalists, foresters and practitioners from across the forestry sector.



For more information, visit www.futuretrees.org
or call Tim Rowland on 01453 884264

EARTH TRUST is an environmental learning charity (no. 1095057) that encourages and helps people to live more sustainably. Pioneering research into broadleaved trees for 20 years, the Earth Trust owns and manages Paradise Wood, a national research woodland, as well as a landscape which includes semi-natural woodlands, new plantings and farm woods. Paradise Wood is a unique resource holding the largest genetic collection of hardwood timber trees in the UK and the largest number of tree improvement trials in Great Britain and Ireland. The Earth Trust's learning and engagement focuses on many audiences from the general public to industry and land management practitioners, covering a wide range of themes relevant to our countryside and landscape, such as future forests, living histories, water and wetlands, and food and farming.



For more information, visit www.earthtrust.org.uk
or call Jayne Manley on 01865 409417

FOREST RESEARCH is an agency of the Forestry Commission and is one of the world's leading centres of research into woodlands and forestry. They aim to provide robust quality science to inform the development and delivery of UK Government and devolved administration forest policies and to provide the evidence base for sustainable forest management.



For more information, visit www.forestry.gov.uk/forestresearch
or call Steve Lee on 0131 445 6926

This document has been endorsed by the following organisations:

