



National Tree Improvement Strategy





Our Vision

To ensure all parties interested in Tree Breeding in the United Kingdom and Ireland move forward in a co-ordinated fashion, fully aware of their respective individual objectives but constantly seeking ways of collaborating with new ventures according to their different strengths. Their combined vision is:

Through selection and breeding of a wide range of tree species capable of thriving in U.K. conditions – broadleaves and conifers, native and exotic – we aim to promote economic value, genetic diversity and species resilience; producing trees with good vigour and timber quality, showing resistance to known pests and diseases and able to withstand the seasonal and longer-term climatic variations, whilst ensuring all selected material is available to all interested parties.¹

The pace of strategy implementation will be at the discretion of the partners supporting the National Tree Improvement Strategy (NTIS). A long-term approach is envisaged with increasing collaboration over a 25-year period.

The NTIS provides an umbrella strategy for those already in place, such as work on tree breeding under the Science and Innovation Strategy for Forestry in Britain, A Future for Broadleaved Trees, the Conifer Breeding Co-operative and others. It does not seek to replace these, rather to ensure that the totality of tree improvement work is visible, and to highlight and address gaps in research needs. In time, it may also sit alongside wider strategies for other areas of research, such as plant health, modelling, and ecosystem services.

The partnership will be inclusive with unrestricted membership.



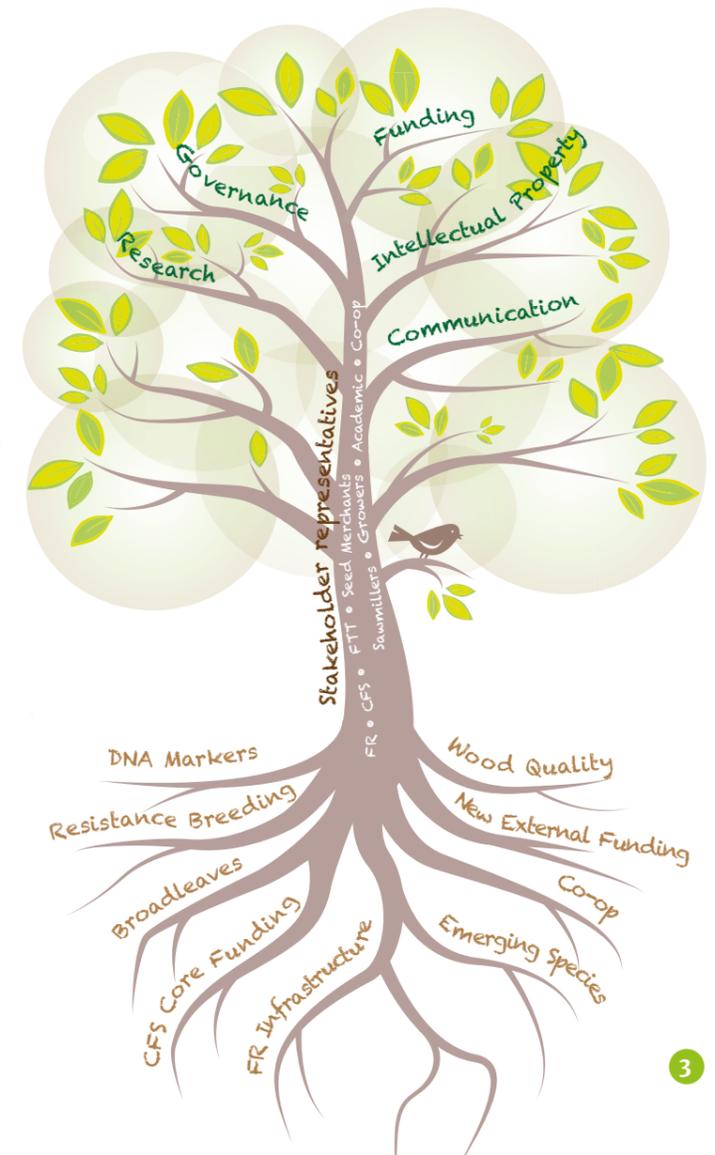
¹ Adapted from an original suggested 19th May 2016, by Geraint Richards, Co-Chair, FTT

Introduction

British foresters have been interested in breeding trees for over a century, with early introductions of exotic species and attempts to hybridise Larch at Dunkeld, Perthshire. In 1946 the Forestry Commission's Research Advisory Committee decided to set up a sub-committee to report on the potential of forest genetics and its application to British forestry. Subsequent breeding effort was spread over a large number of conifer and broadleaf species until all broadleaf breeding was ceased and resources restricted to just five key conifer species in the mid-1960s. In the early 1990s, the organisation now known as Future Trees Trust (FTT) started collaborative efforts to improve and promote the selection and planting of best adapted broadleaf planting stock across seven key species. The Forestry Commission's conifer breeding programme set up a multi-stakeholder Steering Group around 10-years ago and more recently the Conifer Breeding Co-operative was established to promote the breeding and planting of best genetic quality Sitka spruce in particular.

From 2010 to 2014 the Forest Research (FR) core tree breeding research budget was reduced by 50% to around £400k per annum as a consequence of spending review reductions. Over the same period the successful work of a new FTT Development Officer increased their annual turnover from around £60k to £250k. Although currently stable, it is feared the FR core budget will decline gradually as a result of inflation and

cost increases. This is at a time when tree breeding is facing more challenges with regard to selecting well adapted individuals for alternative exotic species, impacts on timber quality, breeding for disease resistance and predictions of climate change, and developing new hi-tech DNA-genomic breeding techniques.





Is Tree Improvement important?

The UK is the third largest importer of timber in the world and also one of the least wooded countries in Europe. Expanding our trees and forests and using more long lived timber products are key to addressing and mitigating climate change. By the 2050s forests could be delivering a 10% annual abatement of UK greenhouse gas emissions². If we are to achieve that on a finite area of land, with a changing climate and an expanding range of new pests and diseases, we need to invest in tree breeding and improvement to get the best return. At the moment between FR, FTT, the Conifer Co-op, and Chalara-resistance funding from DEFRA, there is approximately £1M spent annually on tree breeding in the UK. This is for an industry worth £1 billion / year in Scotland alone.

Breeding of Sitka spruce, Britain's most commercially important conifer species has resulted in predictions of 25% increased growth-rate and even greater increases in volumes of quality green logs³. Cost:benefit studies elsewhere have shown that for every £1 spent on breeding Sitka spruce

there is a £200 return net of inflation; the equivalent figure for oak is £8 which is still a worthwhile investment⁴. These returns are based solely on timber values; an increase in the value of carbon could increase returns further. Meanwhile the Scottish (and probably UK) forestry sector has grown by 50% since 2008 both in terms of contribution to the economy but also in number of people employed. In comparison to agriculture, which has been breeding plants for food for thousands of years, the current gains in yield and quality in trees over the last century have been modest. If we are to sustain forestry growth and realise the full potential benefits for society and the wider forestry sector, we need to invest more into tree breeding research.

It is clear that if more research into tree breeding could be commissioned, the returns would be considerable. At the same time, failure to invest in tree breeding may have a negative effect and result in our forests becoming less diverse and more vulnerable to adverse biotic and abiotic change.

We cannot afford to stand still.

² D.J Read. et al, 2009. 'Combating climate change – A role for UK forests'. *The Stationery office, Edinburgh*.

³ Shaun Mochan, Steve Lee and Barry Gardiner, 2008 'Benefits of improved Sitka spruce: volume and quality of timber' *Forestry Commission Research Note 003. FC*

⁴ *Internal Forestry Commission Report, Jenna Coull, 2008.*

What sort of resourcing change is proposed?

The strategy proposes that the time is right to combine forces across all interested parties – public, private, and charities; seed merchants, nursery and forest managers, wood processors, academics and others – and look at the whole of UK tree improvement in a more holistic and strategic way. Together these parties will work in a collegiate and integrated manner to develop and deliver the National Tree Improvement Strategy.



Key elements of the NTIS

The partners supporting the NTIS intend to develop five key areas:

- 1 Research:**
Identifying necessary areas of research required
- 2 Governance:**
Determining how the work will be managed and by whom
- 3 Funding:**
Identifying and engaging potential funding sources
- 4 Intellectual Property:**
Ensuring material and knowledge is shared equitably
- 5 Communication:**
Keeping all stakeholders aware of activities



1 Research

Identifying necessary areas of research required

Generally the investment in tree breeding research to date reflects the economic importance of the species to British forestry. The NTIS will collectively develop research in the following areas:

New breeding plans for emerging species

Applies to all emerging or alternative conifers and broadleaf species

Investigation of more advanced breeding techniques

Applies to the most economically important species

Impact of tree breeding

On wood quality, silviculture and other aspects of forest management.

Resistance breeding and anticipated climate change

Where required and anticipated to add resilience to the national forest resource.

Best infrastructure

Including database management, genetic fingerprinting, estimation of tree breeding values, economic justification for breeding.

In the early stages, the NTIS will gather an oversight of the research effort on tree improvement across the UK. This will identify what is currently underway and planned, and enable discussion about key gaps in delivering the outcomes of the strategy. The Steering Group will be responsible for identifying priorities, which it feels should be taken forward collectively. It may choose to secure funds to address these and lead the commissioning of the research, or highlight the gaps for others to pursue the necessary sources of finance. In this way, the strategy will have breadth and depth and will not be limited by a small number of individuals or organisations operating in isolation.



“the strategy will have breadth and depth and will not be limited by a small number of individuals or organisations operating in isolation”

“Each partner in the NTIS will continue to pursue its organisation-specific objectives but will strive to collaborate with other partners in certain areas of common or new research to maximise resources.”

Governance

How the NTIS will be managed and by whom

Each partner in the NTIS will continue to pursue its organisation-specific objectives but will strive to collaborate with other partners in certain areas of common or new research to maximise resources. There will be a ‘Steering Group’ to oversee the development, co-ordination, and delivery of the NTIS on behalf of the partnership. Members of the Steering Group should provide representative cover across the different areas of research being carried out and would be expected to have a direct interest in the research outcomes.

The role of the Steering Group will be set out in agreed terms of reference. These may include:

- overseeing the delivery of the strategy
- initiation of action to respond to new research needs
- the setting of annual or periodic targets regarding financial and research progress
- setting the terms of office for the Chair and members
- provision for invited experts and other specialists to join or attend the Group as required
- establishing sub-groups to address specific issues

It is expected that the governance structure will evolve over time to reflect the aspirations and level of control that partners wish to achieve.



Funding

Identifying the potential funding sources

The NTIS deliverables will be funded from an array of different sources to support both the longer term research needs, and shorter term projects. The aim of the strategy is to encourage partners to make some of their own resources available in a collaborative fashion, and this support can be used as leverage to seek new research funding from other sources. As the strategy has a long term focus, funding sources need to be as robust and long term as they can be. The steering group may wish to include in its terms of reference the ability to establish a funding sub-group to review and make recommendations on the options for future funding of the NTIS. This could support the securing of shorter term funding to prevent the diverting of resources from longer term strategic research.

Current funding sources include:

- Corporate and Forestry Support (Forestry Commission);
- Charitable trusts, corporate sponsorship and private benefactors (FTT)
- Private sector (Conifer Co-op)
- DEFRA direct (Chalara resistance breeding)
- LWEC (Living with Environmental change – Tree health and plant biosecurity initiative)

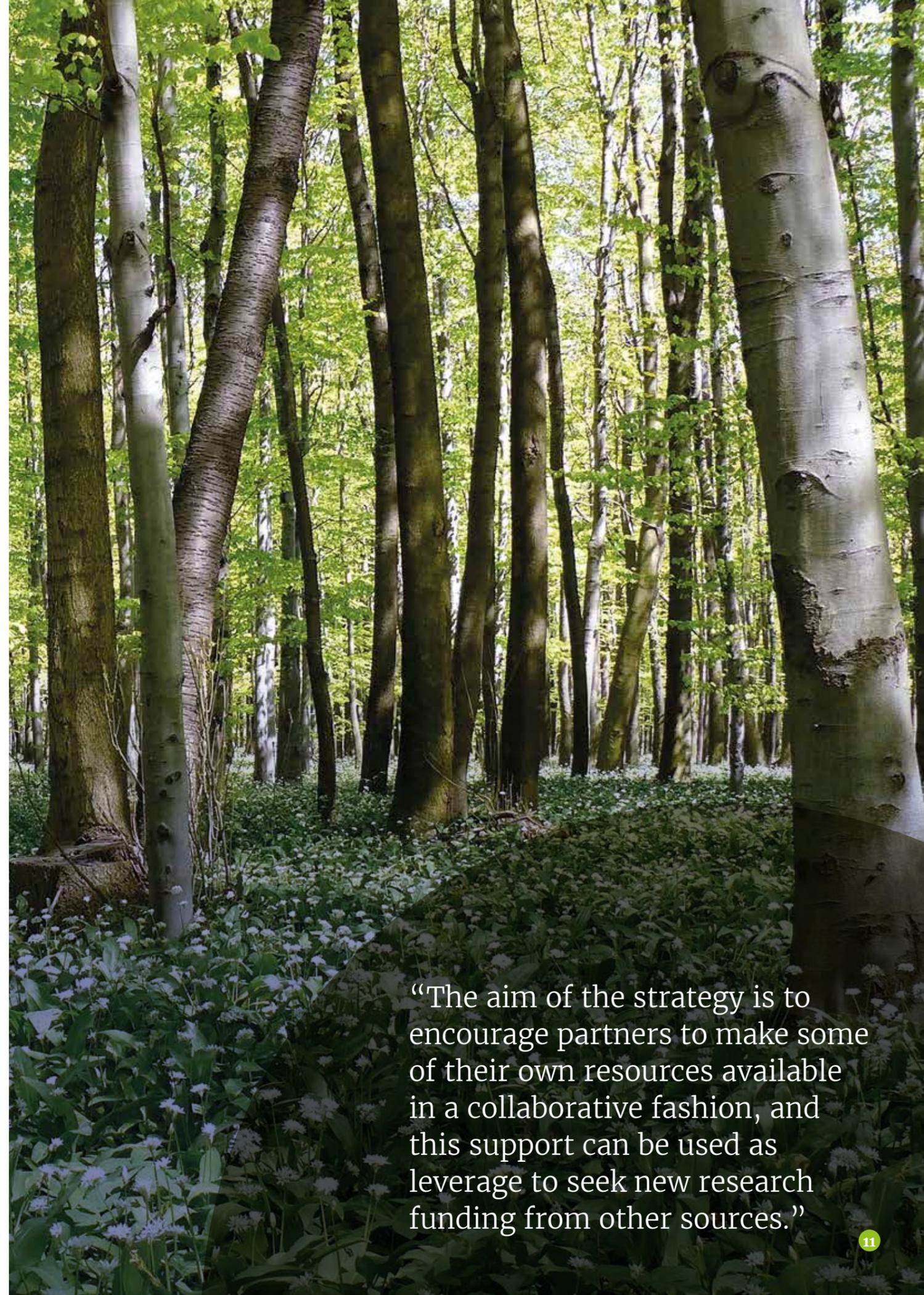
These account for the majority of the current research effort.

New funding sources might include:

- Private processors
- Private nurseries
- Research Councils (BBSRC, NERC – via an academic partner)
- Some form of levy system
- Member of partnership approach with defined benefits
- Tax allowances for research funding
- Charitable trusts
- Crowd funding

At this stage, funding to establish and manage the strategy should be relatively minor. The Future Trees Trust has indicated that it can provide a lean executive function to organise meetings for the steering group, and prepare communications for partners. Partners joining the steering group will be expected to cover their own costs of participation at meetings in the first instance. As the partnership develops, a clearer indication of running costs will emerge, and this may require a modest contribution from all partners to defray the costs of governance.

Research funding will depend on what the partnership wishes to do, and will comprise of a combination of the funding sources identified above and others, where available. Partners will contribute to projects, which both deliver the aims of the strategy and support the objectives of the funding partners.



“The aim of the strategy is to encourage partners to make some of their own resources available in a collaborative fashion, and this support can be used as leverage to seek new research funding from other sources.”

Intellectual Property

Ensuring equitable sharing

Work carried out by the NTIS will be for the benefit of all; intellectual property will be acknowledged but not proprietorially restricted. No intellectual property should be owned by a single or group of organisations unless they exclusively pay for it. The NTIS

will work towards a procedure to ensure this principle is followed in a fair and equitable manner. The Steering Group may wish to establish a sub-group to explore how intellectual property rights are observed in a fair and equitable way.

“Work carried out by the NTIS will be for the benefit of all; intellectual property will not be proprietorially restricted.”



“Effective communications, both within the partnership and outside it, are essential for the strategy to be able to deliver its objectives.”

Communications

Engagement and awareness raising

Effective communications, both within the partnership and outside it, are essential for the strategy to be able to deliver its objectives. In pursuance of this, the strategy incorporates a number of key principles:

- All research developed under the auspices of the NTIS will be made widely available according to the intellectual property principles above.
- All research in this area should be accessible from a single source

- Communication plans will be developed and made available to ensure the work of the partnership is as transparent as possible
- NTIS partners will receive regular updates of progress against an action plan which will be agreed by the steering group to sit alongside the strategy.



| | By Launch 2017 | Short term (1-2 years) | Mid-term (1-10 years) | Long term (1-25 years) |
|------------------------------|--|--|--|--|
| Governance | Agree Membership of the Steering Group. | Comfortable that NTIS Governance equates to best Tree Improvement models worldwide. | Achieve the point where there is a demand to be a member of the Steering Group. | Regular review of Steering Group membership to ensure turn over and fresh ideas, and targets are being met. |
| Funding | Agree initial budget to set up the NTIS. | Annual funding contributions from across the sector | Regular income from exploitation of IP. | Confident in securing funding for all major projects over the next 5-years. |
| Research | Review strategic research needs. | Provide advice on matching planting stock with sites and using new stock for new sites to give correct end-product | Productive seed orchards from the new alternative conifers and broadleaf plus trees. | Genomic selection using DNA-markers is operational for important economic traits of key species. |
| Intellectual Property | Agree key principles. | All parties aware of IP issues and seek to contribute, as well as exploit for private gain. | IP is bringing financial benefits to the NTIS and the forestry and woodland sector. | Ensure control of IP retained in the genomic age. |
| Communication | Launch the NTIS. | Easily accessible web-based database of past and current work. | Species specific pages on website relating to level of genetic improvement, uses of the timber, plans for the next 10-years. | Central communication hub for all information relating to tree breeding, FRM, availability of improved stock and current tree breeding research. |

We are grateful to all the organisations and individuals that have helped us create the National Tree Improvement Strategy.

This document has been endorsed by the following organisations:



For further information about the National Tree Improvement Strategy and how your organisation can help, please contact Tim Rowland at Future Trees Trust on 07896 834518 or tim.rowland@futuretrees.org