

## Choice of planting stock

This Guidance Note is one of a series summarising information presented at a seminar on “Improved Conifer Timber Quality through Plant Selection and Silviculture”, held in February 2009 as part of FC Scotland’s [Timber Development Programme](#). It is a summary of a presentation given by Steve Lee of Forest Research, outlining the availability and recommended use of improved conifer planting stock. The presentation itself is available for download through the [seminar web page](#).

### Introduction

Choosing the best planting stock for a particular site is a key factor in the production of high quality timber. The use of selectively bred planting stock can have an impact on survival, growth rate (and hence rotation length and volume of timber produced), susceptibility to pests and diseases and log grade recovery – all of which affect profitability.

Selective breeding of conifer species began in Britain more than 50 years ago – full details of the history of conifer breeding can be found in the [tree improvement](#) area of the Forest Research website. The breeding process starts with the selection of the most suitable seed source. Within this seed source individual plus trees are then selected for testing, generally on the basis of growth rate and stem quality characteristics. Following a programme of progeny testing, the individuals from among the original plus trees that have proved the most superior genetically are re-selected to form the breeding population, from which seed orchards are established. Improved seed can then be collected from the seed orchards and controlled pollination carried out between selected individuals to achieve further improvements.

The key achievements in the breeding programmes for Sitka spruce, Scots pine, larch and Douglas fir are described below. Further details can be found in [Lee \(2004\)](#) or by consulting the [tree improvement](#) area of the Forest Research website.

### Sitka spruce

The greatest advances in conifer tree improvement in Great Britain have been made in the Sitka spruce breeding programme, which has produced significant genetic gains in terms of growth and stem form, without a reduction in wood density, when compared to unimproved material ([Lee, 1999a](#)). Rooted cuttings have been available for 15 years and seed orchard material is now regularly available: 84% of the Sitka spruce planted in 2007/08 was improved stock from either rooted cuttings or seed orchards. Seed lots are commercially available from

different improved production populations, allowing growers to choose, for example, between improved growth and stem form without a reduction in wood density or improved density with a smaller increase in growth but similar stem form improvement.

A recent study investigated the log out-turn and timber properties of improved Sitka spruce from 3 half-sib families, compared to unimproved Queen Charlotte Islands material ([Mochan et al. 2008](#)) at close to rotation age (37 years). The results showed increases of up to 130% in volumes of green sawlogs and sawn timber from improved planting stock, without a deterioration in construction grade strength requirements.

The most advanced planting stock available is from vegetative propagation, which offers improvements over seed orchard material in terms of timber quality traits such as straightness, branching and wood density. The latest material comes from full-sibling families that are the product of controlled pollination, offering increased crop uniformity as well as improved growth and timber quality ([Lee, 2006](#)). This material is now available in both the public and private sectors.

### **Scots pine**

For Scots pine the best available material comes from seed orchards, which currently offer gains of 8-12% in diameter growth and a small gain in stem straightness, relative to seed from a registered seed stand. Greater gains (14-20% in diameter and 5-19% for stem straightness) are potentially available if there is sufficient demand for the establishment of new seed orchards ([Lee, 1999b, 2002](#)).

### **Larch**

The key aim for the breeding of larch has been to create the hybrid between European and Japanese larch. Achieving this aim has been hampered by a range of problems, including the fact that the two species do not flower at exactly the same time, that there is a low seed yield per cone, that flowers are frequently frosted and that pollen does not store easily ([Lee, 2003](#)). It has proved difficult to manage a mix of EL and JL parents in an orchard to obtain hybrid seed and in most cases the orchards have been reduced to either pure EL or JL. Otherwise seed is best obtained from a registered seed stand. A small number of re-selected European and Japanese larch plus trees has been identified following testing of their progeny in field trials. There remains the potential for a new vegetative propagation programme of hybrid larch families, produced by controlled pollination between the best EL and JL parents, offering gains of 12-20% for diameter and 10-20% for stem straightness. Difficulties in techniques for rooting

cuttings to produce good quality planting stock at an economic price present further problems in pursuing such a programme.

### **Douglas fir**

The breeding programme for Douglas fir in Great Britain has been somewhat intermittent. The results of trials of Douglas fir seed from different seed origin areas have now been analysed and recommendations on the best origin for different site types in Great Britain will be available soon in a new Bulletin. Current recommendations for choice of Douglas fir planting stock are firstly to source material from seed stands growing in Britain and if this is not available to obtain imported material from seed orchards or EC seed stands in the WACO or SWCA areas. There are no plans at present for further selection and breeding of Douglas fir as part of Forest Research's tree improvement programme, but material from breeding programmes in other countries, such as France and the USA, will be accessed to provide the forest industry with improved planting stock.

### **Conclusions**

- The right choice of planting stock is the first step to a successful crop.
- Improved planting stock is available for Sitka spruce, Scots pine and larch.
- The Sitka spruce breeding programme is the most advanced, with a choice of material available depending on the forest manager's objectives and priorities.
- Improved Douglas fir planting stock has been slow to reach the forest industry in Great Britain and apart from seed stands will tend to be sourced from abroad.
- It is important that managers obtain relevant and accurate information about planting stock suitable for their site from the supplying nurseries before making decisions about what to order.

### **References**

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- Lee, S.J. (2006). [It's a family affair. 'Full-sib' families are a new generation of improved Sitka spruce planting stock](#) <sup>(PDF-398K)</sup>. Forestry & British Timber 35 (12) December 2006, 14-16.
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### **Links to further information**

FR Tree Improvement and Genetics Programme: [www.forestresearch.gov.uk/treeimprovement](http://www.forestresearch.gov.uk/treeimprovement)