

Selecting Treestocks for your Forest



PF Olsen and Company
Professional Forestry Services **ltd**

P O Box 1127
ROTORUA
Ph: 07 357 4135
Fax: 07 357 5185
E-mail: info@pfolsen.co.nz
Website: www.pfolsen.co.nz

Introduction

Purchasing treestocks is a major expense for forest establishment. It requires planning and knowledge about the types of treestocks available, as there are now many options to choose from.

- ◆ GF and *GF Plus*.
- ◆ Open pollinated vs. control-pollinated seedlings.
- ◆ Seedlings vs. stoolbed cuttings vs. field (aged) cuttings.
- ◆ Bareroot vs. containerised seedlings or cuttings.

In this booklet, we aim to explain the differences and benefits of the various treestocks, so that you may select your planting stock with more confidence. PF Olsen and Company Ltd (Olsens) recommend the use of treestocks with superior genetics grown to our specifications and to suit the planting site and the end-use market.

GF and *GF Plus*

What is GF?

In 1987, *Forest Research* established the Seed Certification Service to provide information and ranking of the widening range of improved radiata pine seedlots. The GF (growth and form) ranking system is a rating for volume growth and tree form of radiata pine seedlots.

The GF rating is given based on the known performance of parent trees in the seedlot. The higher the GF the better the growth and tree form will be for trees grown from that seedlot.

The following table summarizes gains achieved with increasing GF.

GF Rating *	Percentage gain in volume	Percentage of acceptable stems
1	0	45%
7	5% – 10%	50%
14	13% – 18%	65%
16	15% – 20%	70%
19	19% – 23%	70%
23	27% – 32%	80%

*Improvement ratings will vary considerably within seedlot classes
 Source: NZFRI's "What's New in Forest Research", Number 157.

However, as technology has improved the ability to rank more traits in *Pinus radiata* other than growth and form, the GF system of ranking will slowly be phased out and replaced with the *GF Plus* system.





What is *GF Plus*? In 1998, a new seedlot certification system called *GF Plus* was launched for control pollinated material. Seedlots certified under the *GF Plus* scheme are given individual ratings for the following six traits:

- ◆ Growth
- ◆ Straightness
- ◆ Branching
- ◆ *Dothistroma* resistance
- ◆ Wood density (rings 6 – 10)
- ◆ Spiral grain

Each trait is rated from 1 to 30, with 30 being the best rate available for each trait at the current time (the scale is open ended, so that as more improved material comes to hand, it will gain a higher rating). Unimproved and GF14 OP orchard seedlots are benchmarked for comparison.

When seed, seedlings or cuttings are purchased with a *GF Plus* certificate there will be an additional charge of \$14.40/1,000 seedlings or cuttings, levied by the Radiata Pine Breeding Company. This money will be put directly into the radiata pine breeding programme.

GF Plus certification is the mechanism by which the quality of the treestocks for the six individual traits can be gauged. Thus, purchased treestocks could be matched to site quality, silvicultural regime and end-product requirements. For example, if you are planting radiata pines in a site with potential problems of low wood density and *Dothistroma*, make sure that the treestocks you select have the best possible ratings for those two traits. This is just part of optimising all stages of your planting programme.

Why *GF Plus*? The significance of planting treestocks with superior genetic makeup on return on investment cannot yet be quantified. What is clear is that:

- ◆ Radiata pine is a highly variable timber, with much of this variation manageable through genetic selection.
 - ◆ There are major price gains to be made by forest owners, sawmillers and timber merchants that can deliver a consistent wood product that is fit for its intended end use.
 - ◆ The technology to test and measure internal wood quality as the basis of returning part or most of this gain to the forest owner is just taking off. The Government Forest Industry Wood Quality Initiative research consortium is evidence of this.
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Open Pollinated vs. Control Pollinated

Open-pollinated (OP) seed is produced by natural wind pollination, and only the cone producing female parent is known. Thus, the genetic improvement gain and GF rating is lower (up to GF19).

Control-pollinated (CP) seed is produced by bagging young cones of female trees and applying pollen from a known male parent. Thus, both parents of the seed is known and the genetic improvement gain and GF rating is higher (GF22+).

Producing control-pollinated seed is very labour intensive and the seed is more expensive and usually in short supply.

Seedlings grown from control-pollinated seeds are more expensive than those grown from open-pollinated seeds. This is a reflection of the cost required to produce the control-pollinated seeds, and the strong market demand for greater genetically improved seed.



Seedlings vs. Cuttings vs. Stoolbed vs. Field (Aged) Cuttings

Another option when purchasing treestocks is the decision to buy cuttings or seedlings.

Seedlings are produced by germinating open-pollinated or control-pollinated seeds in the nursery.

Cuttings are produced by taking shoot tip material from “stoolbeds” or from field grown trees and let it develop roots in the nursery:

- ◆ Stoolbeds are maintained in a nursery and most commonly used as a means of bulking up scarce and expensive control-pollinated seed. Stoolbeds are established from control-pollinated seedlings and are hedged to maintain juvenility and can produce many cuttings over a period of 4 to 5 years.
- ◆ Field collected cuttings are taken from trees growing in the forest. The cuttings taken from the donor trees have the same physiological age, or "biological clock" as the donor tree when they were collected.

The main difference between the two types of cuttings is the physiological age. A cutting taken from a 3-year-old tree will grow into the form and branching pattern like a 3-year-old tree. It is the increasing physiological age of the donor material that makes them an excellent option as planting stock under certain conditions.





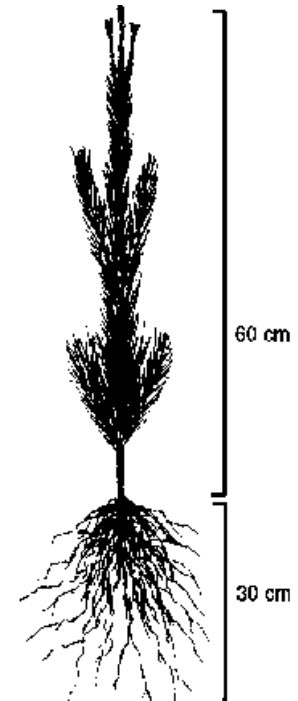
Advantages of Physiologically Aged Cuttings over Seedlings

1. Improved tree form:

- ◆ Improved stem straightness.
- ◆ Reduced leader malformation.
- ◆ Lighter branching habit.
- ◆ Less incidence of speed wobble.
- ◆ Less taper in the stem.

All of these form improvements lead to an increased number of acceptable stems in the final crop and reduced silvicultural costs.

- 2. Equivalent volume and height growth as seedlings** (provided the cutting is taken from trees of younger than physiological age of 4).
- 3. Improved wind stability** due to woodier, more solid root system that is less prone to distortion during planting. Also, the lighter branching habit means there is less sail area.
- 4. Pruning costs are lower** because of the lighter branching habit and the increase in acceptable stems means that a lower selection rate is required to obtain the crop.



Disadvantages of Physiologically Aged Cuttings over Seedlings

- 1. Reduced diameter growth** when donor trees are physiologically older than 4-year-old.
- 2. Due to thinner bark**, the trees are more susceptible to browse by animals. It is our recommendation, however, that you eradicate animal pests no matter what planting stock you are using.
- 3. Higher cost** due to expenditure incurred during production, especially collection costs.
- 4. Not usually an “off the shelf” product.** Planning must be done 15-18 months prior to planting.

Note: The biggest jump in form advantages from seedlings to cuttings is from donor trees aged 2 over age 1. Thus, these advantages are obtainable from either field cuttings or from stoolbeds that have been planted for two years.

Bareroot vs. Containerised treestocks

Containerised treestocks are becoming a popular choice for planting in New Zealand. Container grown seedlings and cuttings have been widely used for forest planting in many overseas countries for many years.

Bareroot treestocks are cheaper and usually taller and bigger in appearance but the root systems can be damaged by exposure to air and trimming of excess roots during lifting. They also suffer a higher risk from water stress and bad planting technique.

Container grown seedlings or cuttings, on the other hand, are planted with roots undisturbed, and thus tend to establish well under most circumstances.

The benefits of planting container grown trees are:

- ◆ A lower risk of establishment failure due to less transplant shock.
- ◆ Reduced risk of mortality in dry conditions.
- ◆ Less root disturbance at lifting, during transplant and right through to planting.
- ◆ Trials indicate better development of vertical roots (sinkers).
- ◆ Out of season planting, i.e. cutovers can be planted, even in late November or early December.





Conclusion

Planting a forest is a major investment and as such, decisions regarding your choice of planting stock should be given a high priority.

Major forest growers and many enlightened farm foresters are now opting for genetically improved trees. It is Olsens' view that careful consideration of the treestocks selected at planting time, and any extra costs, are well justified. As the timber market begins to demand high quality wood, the forester who has considered these end-product/market requirements should reap the rewards in terms of a price differential in future markets.

It is worth remembering that a well designed planting programme with quality treestocks can provide many advantages:

- ◆ Better survival and establishment.
- ◆ Improved volume growth.
- ◆ Improved form, leading to increased numbers of acceptable stems and lower silvicultural costs.
- ◆ Improved log and wood properties such as higher wood density and lower incidence of spiral grain.
- ◆ Reduced incidence of early toppling on fertile sites.
- ◆ Improved resistance to *Dothistroma* (DR Breed).

This all translates to a better final crop and financial returns!
