

Careroot Cell-Grown Liners and Understocks From Seed

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Expertrees is the marketing and sales organisation for four production nurseries in the southwest of Holland. This marketing set up has been in operation since 1990. The range of products we produce includes one- and two-year seedlings, transplant whips, and indigenous trees. Each production nursery has its own product speciality to help provide a comprehensive range of products. For decades we have been specialising in growing understocks and a wide choice of liners. "Small is beautiful" does not just apply to the plants but to the business units also. In addition, we encourage smaller growers to produce plants for us on contract. This helps us to remain competitive and contract growing is also the easiest way to keep quality levels high. Fellow growers from Holstein in northern Germany envy us for our quality, which makes Zundert special.

The production unit I will discuss in this paper is the one producing plug-grown plants. U.S.A. and Canadian propagators have utilized this production system for decades. Weyerhaeuser, a multinational forestry company, has been producing billions of Douglas fir this way and they even had a subsidiary in Europe.

Until recently plug growing was predominantly used for forestry seedling production. There are several systems on the market, each having its own specification. However, the principles underlying all systems are: plug cells with open bottoms for air pruning and cell walls with vertical ridges for directing root growth down and preventing spiraling.

The Swedish company Hilleshög has developed a system based on the principal called HIKO, which they have introduced in France, Spain, Ireland, and Austria. In the United Kingdom the Roottrainer that originated from Canada is well known. Austria has developed its LICO system for producing forestry seedlings.

The Careroot System as we use it today was developed by Mr. Andy Domen in response to a growing demand for containerised stock, both in forestry and in ornamental plants. It took about 6 years to get to its present state of development. We use five different types of trays, three in polystyrene and two in hard plastic, having the following sizes (in cm):

Type	Depth	Width at top	Width at bottom
P204	7.5	2.5	1.8
P84	7.5	4.5	4.0
P40	9.5	6.7	4.0
P96	7.5	3.4	2.2
P35	11.5	4.5	3.3

The P204 is used mainly for conifer seedlings and small-leaved, hardwood seedlings. The bulk of the P204 production is used by us as lining-out material for

forestry field growing, e.g. *Picea*, *Pinus*, *Pseudotsuga*, etc. We save a year on production with this system.

The P84 is mainly used for ornamental liners and rootstocks, some of which have a caliper ready for grafting.

The P40 is used for graftable understocks and bushier liners. The P40 is roughly the equivalent of a 7-cm pot liner. We do not sow directly into the P40, but we transplant into it with P204-grown plants.

The P96 is used predominantly for broadleaved seedlings to be transplanted into the open ground to make a transplanted seedling within 1 to 1½ years.

The P35 is used mainly for big-leaved hardwood understocks, e.g. *Aesculus*, *Castanea*, etc.

The main differences between Careroot plants and most other cell-grown plants are: the wide choice of ornamental species, and the grading (we do not supply plants in the trays but take them out and grade them) to meet customer specifications as much as possible.

The main features of Careroot plants are:

- Better take of liners because of root protection.
- The spiraling of roots is minimised.
- Plants begin growth immediately in the 1st growing season.
- Plants build a finer root system that spreads out more evenly.
- More efficient production planning with year-round production and handling.
- Plants are well hardened off which is particularly important for understocks.
- They store well in cold storage.
- Plants are graded through manually to meet customers specifications.
- Plants are packed in plastic crates and are relatively cheap to handle and transport.
- High level of seed technology allows us to grow more difficult species successfully.

The best results are achieved with cell-grown material that has been in the plug for as short a period of time as possible. Vital to the whole system is that the plug is properly rooted through. A root/shoot ratio with more root than shoot is best. Also, the finer the roots are the better a plant will take and grow.

We can say that, provided they are used in the right way, at the right time, etc., cell-grown material performs better than bareroot material generally speaking. We also think there is a great future for cell-grown material in general, but there will obviously always be enough room for field-grown material in the market and we want to keep it like that too.