



Pedunculate oak plants in rootballs

Choosing quality planting material

www.agforward.eu

The plant quality determines success in agroforestry establishment; particularly in relation to root development. Once the farmer has selected which tree species to use it is then important to select seedlings that are best suited to the farm conditions but also ensure that the seed stock is healthy (i.e. it comes without pests or diseases).

Ideally trees seedlings should be sourced from a certified supplier (even if there is capacity to produce seedlings direct from seeds on the farm). The forest seedlings quality is regulated from 2003 (directive 1999/105/CE) in the European Union. This regulation protects the buyers of seedlings.



1

2

Seedlings packing: seedling in container (1) bare-rooted seedlings (2) - IDF©CNPF

Origin of the seedlings

When the tree variety is decided care has to be taken to select seedlings from the appropriate **regions of provenance**. These are defined areas within which similar ecological and climatic characteristics are found. They provide a framework for specifying sources of Forest Reproductive Material (FRM). Seedlings must have **tags** which provide information on both the genetic quality of the seedlings and their requirements. The seedlings have to be conform with quality standards (health, shape, etc.). The main tree species used in agroforestry systems are covered by this policy.

Which region of origin?

Within any country there a defined area (based on ecological characteristics) where seeds are collected for sale – this determines the provenance of the seed. Seed from a specified **region of provenance** will be adapted to the broad climate conditions found in this region and is better adapted to local soil conditions. Using seed from outside of your area of provenances can result in poor tree growth. FOREMATIS - the Forest Reproductive Material Information System - provides a list of provenances adapted to each European region (and for specific tree species). It's necessary to use a regional origin for the one without alternatives documented. Securing the correct provenance will positively affect the future wood production (volume production between 10 and 30 %) and quality (straighter trunks, smaller and more manageable branches), the biological rhythm (early or late budburst, lowest frequency of head fork, better resistance to pests). A superior quality of the plant enables higher levels of establishment and reduced mortality rates.

Genetic quality

In the European Union, all Forest Reproductive Material (FRM) including seeds (fruits, cones), parts of seedlings (cuttings, grafts, roots and marcots) and seedling themselves allowed onto the market are divided into four **categories**. Every category provides information on the genetic quality.

The availability of material will vary with location but the **tags** enable you to make informed choices when purchasing.

Yellow tag – source-identified basic material: only one origin or region of provenance is known. The material is collected in non-appraised forests: seeds come from non-selected trees. The collection area is left to the judgement of the suppliers who have to inform the location and the collection date to the government services in case of control. Collecting seeds on isolated trees, hedges or band of trees for a forestry purpose is forbidden. The most common regulated species on the market are distributed in the yellow tag category.

Green tag – selected basic material: seeds are collected on seed-producing forest stands allocated to wood production and selected by the forestry organization in each region of provenance. Seeds are collected from vigorous trees with good shape and health. The green tag corresponds to the best forest stands in the origin region whose adaptation to the local conditions is recognized. Green tag seedlings do not have any genetic testing.

Pink tag – qualified basic material: seeds are coming from seed orchards; artificial forest stands implemented for high quality seed production. The superior quality of the seedlings has not been tested yet. The individual trees have been selected according to several criteria: vigor, shape, wood quality, disease resistance.

Blue tag – tested basic material: seedlings with a superior quality for at least one indicator (straightness, growth, wood quality, pest resistance, branching) and at least one specific use area. The quality is tested through a test of origin comparing these seedlings with indicator origins or through genetic evaluations. This tends to be the rarest category on the market.



Beech seeds

What type of plants are on the market?

- **Bare-rooted seedlings:** nurseries plant the seeds in open ground. After one or two years, the seedlings are transplanted to provide more space to the seedlings and to improve root development. For deciduous species the transplanting step can be replaced by uplifting the seedlings, using a sharp blade at 10-20 cm deep to cut the taproots and encourage root proliferation. Ready after 2 or 4 years, the seedlings are mechanically removed, sorted out by size and conditioned in bunches.
- **Seedlings in container or in rootballs:** these seedlings are planted and raised off ground in an individual container in plastic. The substrate is a mix of breeding soil and trace elements, well aerated to obtain a high porosity. The shape of the container limits roots windings. Seedlings are delivered in the container and taken out before planting with the substrate.
- **Cuttings:** a cutting from the branch or stem from certain tree species can be planted directly into the ground for rooting. Poplar and willows, for example, are difficult to reproduce by seed and are propagated using young cuttings of living branches or stump sprouts.



Sessile oak acorns (J. Rosa – CNPF)

Seedlings quality

The seedling quality is determined by the seedling's ability to survive and to grow up right from the first year after establishment. A poor-quality seedling will have few leaves, a high die-back or crown dieback and should be replaced.

The quality of seedlings can be broken down into two aspects (a) the **morphological quality** which is related to the seedling dimensions at the plantation date (i.e. height, stump diameter, volume of the roots) and (b) its **physiological quality** which is the capacity to extract water and nutritive elements in the soil and to create new roots after plantation. The physiological quality is determined by what happens to the plant between the delivery date to the plantation date (cf. Leaflet n°7).

Age and dimensions

Nursery catalogs will provide details on the **age**, minimum and maximum **height** and minimum stump **diameter** of the root. Where possible try and inspect the quality of the seedlings prior to purchase by visiting stockists (or by reading reviews). Where possible purchasing seedlings that meet the European quality **standards** tend to result in more secure purchases. In some cases national standards are even stricter and may be preferred. There are a simple set of rules for seedlings selection: select the seedlings as young as possible, ideally with a high regeneration capacity producing new roots after plantation, prefer the vigorous seedlings or with the latest subculturing date. If the height of the seedlings is the same, choose the youngest one.



Bunches of bare-rooted seedlings from sessile oak



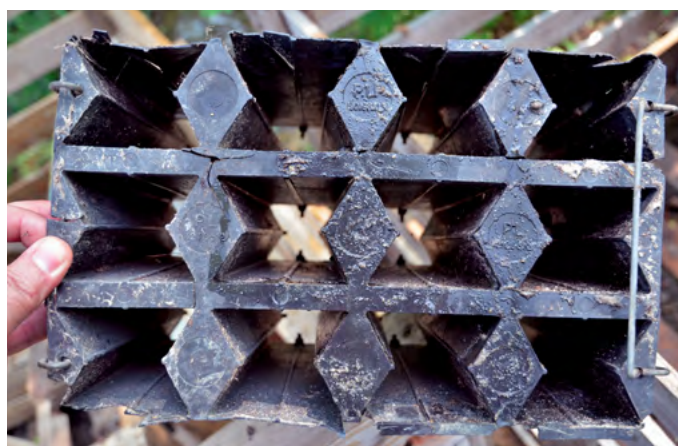
Crates of hazel seedlings in bucket



Bunches of poplar sets (F. Barbotin - CNPF)



Sorbus torminalis seedlings in clod



The presence of rust spots is characteristic of a temporary congested soil with water (S.Gaudin - CNPF)

Physical state

A farmer should not only look at the stem dimensions of the seedling but also look at the architecture of the root system, at the stem shape and at the balance between root volume and stem volume.

The seedlings capacity to overcome the “transplantation crisis” depends on root quality (abundance and how concentrated the roots are to the collar – see the associated figures here).

Naked-rooted seedlings with apparent defects should not be selected. Look for: a damaged collar, a weak root system, cases where the primary root is tightly wound or twisted, damaged or absent rootlets. Seedlings in bucket with wounded side roots or roots rooting in the wrong direction (i.e. upwards) should not be selected.



Norway maple with an abundant and compliant root system

The seedlings should have a smooth, straight and regular shaped stem without necrosis and cankers with a final bud in good condition. Do not purchase seedlings showing traces of fermentation, heat discoloration, with a stem with pronounced curvature or with a fork or a poor or absent branching, or moldy, dry or part-dry seedlings.



Norway maple with damaged collar: refused



Red oak with roots displaying a hunting horn shape: refused



Atlas cedar seedlings in bucket with upgoing roots: refused

Philippe VAN LERBERGHE

The Institute for Forestry Development (IDF)

philippe.vanlerberghe@cnpf.fr

www.agforward.eu

Special thanks go to Fabien Balaguer (French Agroforestry Association) and to Dr Tim Pagella (World Agroforestry Centre) for their work as technical editors and translators.

23 October 2017

This leaflet is produced as part of the AGFORWARD project. Whilst the author has worked on the best information available, neither the author nor the EU shall in any event be liable for any loss, damage or injury incurred directly or indirectly in relation to the report.