

Limes

(*Tilia platyphyllos* and *T. cordata*)

for high quality timber

7 Limes

(Tilia platyphyllos)

(T. cordata)

The most remarkable lime species in our conditions are large-leaved lime (*Tilia platyphyllos*) and small-leaved lime (*Tilia cordata*). Both species grow in fresh and humid areas, especially valley bottoms and canyons in low and middle mountains.

Both limes appear scattered and discontinuously in forests dominated by other species, frequently beech or oak, and can be also associated with ash, yew, maple, *Sorbus* trees, etc.



Distribution of limes (*T. platyphyllos*), up and (*T. cordata*), down. Source: EUFORGEN 2008.

Why planting limes for timber production ?

Because of their scattered and scarce occurrence pattern, frequently in areas with limited accessibility, these species are generally not managed based on silvicultural schemes aiming at producing valuable timber (through pruning and selective thinnings, promoting trees with highest commercial potential). Moreover, there are no production models for these species in our conditions yet. However, lime timber has excellent technical and aesthetical values: it is soft, easily worked and extraordinarily homogeneous in all directions. It can be utilized in veneer industry and is especially esteemed for sculpture making.



Tilia platyphyllos.

Photographies: Mireille Mouas. IDF.

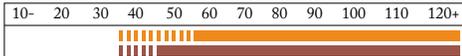
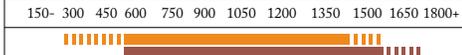
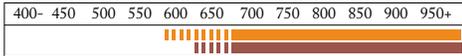


Tilia cordata.



What are the main requirements of limes ?

Both species have similar ecological requirements: they have a low tolerance to drought, which restricts their occurrence in Mediterranean areas to humid sites. Moreover, they require fresh soils, very rich in nutrients. They are thus frequent in areas influenced by water streams (floodplains, canyons, gorges). They prefer neutral or basic soils, although they can also grow in acid soils well provided with water and nutrients. The following figure summarizes the main ecological requirements of limes.

 Appropriate conditions for large-leaved lime (<i>Tilia platyphyllos</i>)  Appropriate conditions for small-leaved lime (<i>Tilia cordata</i>)	Comments
Soil depth (cm) 	These species, with a well developed root system, require a deep soil in order to satisfy their important needs for water and nutrients.
Texture 	Both species are favoured by balanced textures, although large-leaved lime tends to occupy well-aerated soils while small-leaved lime has a notable tolerance to compact and temporarily stagnated soils.
pH 	Limes tolerate different types of soils, provided that they are rich in nutrients. As a result, basic soils tend to be more adequate for these species.
Altitude (m) 	Limes have a considerable tolerance to low temperatures, especially small-leaved lime. However, they tend to avoid high altitudes, where their performance is limited because of the steep slopes that limit soil depth and nutrient availability. High summer temperatures are not a problem while water provision is ensured. Limes are sensitive to late frosts (Spring).
Mean annual temperature (°C) 	
Annual precipitation (mm) 	These species are exigent regarding precipitation and air humidity, especially small-leaved lime. An insufficient precipitation can be compensated by the water table from a nearby water stream.

	Water need	Sensitivity to temporary stagnation	Need for Ca, Mg and K	N and P needs	Active limestone sensitivity	Wind sensitivity	Drought sensitivity	Competition for light sensitivity
Large-leaved lime	Medium	High	Medium	Medium	Low	Low	Medium	Low (young)-medium (adult)
Small-leaved lime	Medium	Low	Medium	Low - medium	Low	Low	Medium	Low (young)-medium (adult)

Always that the availability of water and nutrients is high, limes can grow in very diverse site conditions. These species are especially suitable for confined, shaded areas, with limited exposition to sun, close to water streams. They are also interesting as diversifying species, because of their capacity to grow shadowed by other tree species.



Large-leaved lime.



Small-leaved lime.
Photography: Mireille Mouas. IDF



Large-leaved lime.
Photography: Mireille Mouas. IDF.



Small-leaved lime.
Photography: Mireille Mouas. IDF.

Pests and diseases of limes

Being species relatively scarce and currently with limited economic interest, there are few pests and diseases with noticeable effects at commercial level. The main agents reducing lime vigour result in damages on leaves, caused by fungi (*Cercospora microsora*, *Apiognomonina tiliae*) or by insects (*Caliroa annulipes* and aphids). Fungal attacks causing serious rots in stems and roots (e.g. *Phytophthora*) have been also reported.

First steps of plantation

The first steps of a lime plantation for high quality timber production are similar to those from other valuable broadleaved species.

Choosing the plant

It is advised choosing plants from a provenance the most similar possible to the plantation area, both regarding climate (annual and summer precipitation, incidence of drought) and soil (pH, etc). Plants that are too slender, with an undeveloped root system as well as those forked or without a healthy, unique stem, are to be discarded. It is recommended to utilize 1 year-old plants, 80 cm high.

Soil preparation

Firstly, the vegetation that could imply difficulties for the execution of the plantation must be removed, if existent. Then, a deep, crossed sub-soiling (40-50 cm deep) should be applied, few months before planting. The planting pits can be opened either manually or with an excavator, depending on the plantation size, density, accessibility and soil type.

Planting

The plant must be installed during its dormancy period (without leaves), during days free of risk of frost, rain, snow or strong wind. Until the plantation is performed, the plant must be protected from direct sun and wind exposition, especially if bare rooted. The plantation can be complemented by a support watering, to ease the adaptation to new conditions.

Protecting

In order to avoid the negative impact (competence for water and nutrients) due to weeds it is recommended to install 1 m² ground covers or mulch, that have a further beneficial effect reducing soil water evaporation. Mulching materials are variable, including plastic, bioplastic, chips, straw, stones... In areas where grazing animals (both wild and domestic) are a threat to the young trees, they must be protected with the use of individual shelters or impeding the access of the potentially harmful animals to the plantation, preferably with electric fence.



Lime tree plantation management

There is a limited number of references regarding well-monitored experiences of lime plantations for valuable timber production, which makes difficult to propose a silvicultural scheme adapted to these species. Because of their growth rate, relatively slow, and the need for protecting from direct sun exposition during the first years, limes should not be utilized in pure plantations in open areas, but rather as species aiming at diversifying forest stands or plantations dominated by other species. Under these circumstances, limes have both a productive and an environmental role: they have a remarkable longevity, with a notable aesthetic value (it is frequently utilized in parks and gardens) and with a great interest for soil improvement (generating an excellent humus), and a extremely developed root system. Finally, these species are known for the interest of the limeflower tea and their melliferous value.

Pruning

The growth rate of limes is lower than the major part of valuable broadleaved species. As a result, pruning interventions can be applied with less frequency, every 2 – 3 years. Pruning limes for high quality timber production is similar to other valuable broadleaved species: the aim is to achieve a straight, homogeneous, long (minimum 3 m) clean bole, with the smallest knots possible. With this aim, it is necessary to apply:

Formative pruning: it consists on promoting the straight growth of the main shoot by eliminating forks and high lateral branches that can compete with it.

Quality pruning: elimination of all branches with a diameter thicker than 3 cm at their insertion point, in order to prevent large knots.



Lime plantation along a trail. Photography: Jaime Coello.



Young lime plantation. Photography: Florent Gallois. IDF.

Silvicultural schemes with limes (I)

Some options of utilization of limes for high quality timber production are shown below.

Lime in mixed plantations with other valuable broadleaves

Limes are not recommended to be utilized in pure plantations, in spite of which they can represent a very interesting element for diversification when mixed with species with faster growth rate and a clearer vocation towards valuable timber production. Moreover, limes can be also considered for beating up operations (replacing dead plants by new ones) in plantations consisting in other species, especially if this intervention could not be done during the first years and the shadowing starts to be excessive for other species. Also in the case that mortality has been caused at certain areas of the plantation with temporary stagnation (or presenting high clay content), dead trees can be substituted by small-leaved lime, with a high tolerance to these conditions.

In the case of plantations at open areas (e.g. afforestation on former agricultural land) limes must represent a minor component, in favour of species growing faster. The mixture can be done either as individual trees or by patches. In any case, it is recommended to utilize high initial densities (900-1,600 trees/ha), in order to protect limes from direct sun exposition. Moreover, the “forest effect” leads to a fast canopy closure which reduces branch and weed proliferation and thus simplifies tending operations. However, high densities make necessary the application of multiple thinnings, during which the best trees of the plantation are promoted, and the proportion of species is kept.



Mixed plantation of valuable broadleaves species.



Mixed plantation of valuable broadleaves species.

Silvicultural schemes with limes (II)

Forest diversification plantation

The aim of these plantations is to diversify forest ecosystems by underplanting species that are scarcely represented but have an interesting potential because of their economic and / or environmental value. For example, pure pine or beech stands can be diversified, in the freshest and most shadowed spots, with limes. This intervention would lead to an increased and diversified revenue while enhancing biodiversity. These plantations are implemented with low densities, aiming at small-sized sites especially suitable for limes. This type of plantation represent a minimal investment, considering the low number of trees utilized, but can contribute significantly to the economic and environmental value of the forest.

Limes are species especially suitable for these types of plantations, as they need shadowing during the first years and they are benefited by the high air humidity within the forest. During the thinnings and cuttings of the pre-existent tree species, limes will get progressively more light and space for growing vigorously. Limes must be protected against wildlife browsing.

This type of plantation is especially interesting for forest spaces with significant value for leisure and landscape, as well as in areas where productivity and accessibility allows the application of adequate management (pruning, selective thinnings) aiming at producing valuable timber.



Pine forest underplanted with limes.



Forest diversification plantation.



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