

Ash

(*Fraxinus excelsior* and *F. angustifolia*)

for high quality timber

3 European ash

(Fraxinus excelsior)

The European ash (*Fraxinus excelsior*) belongs to the family *Oleaceae*, which also includes the olive tree.

Its area of distribution includes Europe, Asia Minor and North Africa, particularly in mild and wet climates.

In areas with Mediterranean climate, they are located in mountainous areas, along shady areas besides water streams. In the Iberian Peninsula they are located especially in the northern area.



Distribution of European ash (*Fraxinus excelsior*).
Source: EUFORGEN 2009.

Why planting ash to produce timber ?

Ash timber is highly valued. Those pieces of highest quality are used in the veneer industry, where they reach the highest price. Ash timber is also valuable for top-quality sawnwood and cabinet-making.

Ash grows very rapidly, which allows moderately short rotations, between 40-50 years for reaching a diameter at breast height of 45-50 cm (the minimum for veneer industry), provided that they are grown in high-quality and well managed conditions.

Ash has a very important ecologic role, since it provides a habitat for birds and mammals. Its fruits are sought by granivorous birds and squirrels. Ash leaves are used to feed cattle and they have plenty of medicinal properties.



Photography: Agroof.

What are the main ash requirements ?

European Ash is among the most water demanding valuable broadleaved species. This species only grows in good pattern in those areas where climate and soil conditions provide a high water supply during the whole year. In plantations, this species must be only used in those soils that have a good water provision, with no risk of drought. Their productivity and even survival could be notably reduced if these requisites are not met.

The ecological needs of European ash are summarized in the following graph:

<table border="0"> <tr> <td>■ Appropriate conditions</td> <td>■ Slightly restricting conditions</td> </tr> <tr> <td>■ Very restricting conditions</td> <td>■ Non-appropriate conditions</td> </tr> </table>	■ Appropriate conditions	■ Slightly restricting conditions	■ Very restricting conditions	■ Non-appropriate conditions	Comments
■ Appropriate conditions	■ Slightly restricting conditions				
■ Very restricting conditions	■ Non-appropriate conditions				
Soil depth (cm) <table border="1"> <tr> <td>10- 20 30 40 50 60 70 80 90 100 110 120+</td> </tr> <tr> <td></td> </tr> </table>	10- 20 30 40 50 60 70 80 90 100 110 120+		Due to their high water demand, ashes need a deep soil with a considerable water reserve, being favoured by the access to the water table. However, they do not tolerate waterlogging.		
10- 20 30 40 50 60 70 80 90 100 110 120+					
Texture <table border="1"> <tr> <td>Clayish Clayish-silly Loamy-silly Silly-Sandy Sandy</td> </tr> <tr> <td></td> </tr> </table>	Clayish Clayish-silly Loamy-silly Silly-Sandy Sandy		Ash prefers silty or loamy well-aired soils. Very clayish or sandy textures are unfavourable, unless the provision of water is very high without risk of waterlogging.		
Clayish Clayish-silly Loamy-silly Silly-Sandy Sandy					
pH <table border="1"> <tr> <td>3,5- 4 4,5 5 5,5 6 6,5 7 7,5 8 8,5 9+</td> </tr> <tr> <td></td> </tr> </table>	3,5- 4 4,5 5 5,5 6 6,5 7 7,5 8 8,5 9+		Ash prefers rich and neutral-pH soils, so it is recommended to avoid very calcareous or acidic soils. It is not particularly sensitive to the presence of active limestone.		
3,5- 4 4,5 5 5,5 6 6,5 7 7,5 8 8,5 9+					
Altitude (m) <table border="1"> <tr> <td>150- 300 450 600 750 900 1050 1200 1350 1500 1650 1800+</td> </tr> <tr> <td></td> </tr> </table> Mean annual temperature (°C) <table border="1"> <tr> <td>6- 6,5 7 7,5 8 8,5 9 9,5 10 10,5 11 11,5+</td> </tr> <tr> <td></td> </tr> </table>	150- 300 450 600 750 900 1050 1200 1350 1500 1650 1800+		6- 6,5 7 7,5 8 8,5 9 9,5 10 10,5 11 11,5+		Cold (and therefore altitude) can hamper its growth. Ash tolerates extremely cold winters (when they have no leaves), but they are sensitive to spring frosts, which can damage the terminal bud and cause the formation of forks, which must be corrected during formative pruning.
150- 300 450 600 750 900 1050 1200 1350 1500 1650 1800+					
6- 6,5 7 7,5 8 8,5 9 9,5 10 10,5 11 11,5+					
Mean annual precipitation (mm) <table border="1"> <tr> <td>400- 450 500 550 600 650 700 750 800 850 900 950+</td> </tr> <tr> <td></td> </tr> </table>	400- 450 500 550 600 650 700 750 800 850 900 950+		Ash does not tolerate severe droughts. It can tolerate water scarcity if accessing the water table, such as in riparian zones.		
400- 450 500 550 600 650 700 750 800 850 900 950+					

Water need	Sensitivity to temporary stagnation	Need for Ca, Mg and K	N and P need	Active limestone sensitivity	Wind sensitivity	Drought sensitivity	Competition for light sensitivity
Very high	Medium	Medium	High	Negligible or very low	High	High or very high	High

In areas with influence of Mediterranean climate, ash must have access to the water table during summer or else grow in shady areas with an important water reserve. It is an appropriate species for riparian conditions. They can tolerate the effect of wind, although it may have a negative effect on productivity, because of its drying effect.

The rapid growth of ash makes it suitable for being a main species in plantations. Their ecological needs are similar to those of wild cherry, therefore they can be planted together in mixed plantations. They are commonly planted in forest conditions and in silvo-pastoral systems.



Ash in forest environment.



Plantation in former pasture land in mountainous Mediterranean area.

Pests and liseases of ash

The most common disease of ash is *Chalara fraxinea*, a fungus that spreads rapidly, killing ash trees of any age. Pure plantations should be avoided in order to prevent its proliferation. In the event of an attack, the affected trees must be cut and burnt. Another important disease is canker, caused by *Pseudomonas syringae* bacteria or by *Nectria galligena* fungus (1). These diseases appear when the tree is not adapted to site conditions, or when planted in excessive density; the only treatment is to remove the affected trees as soon as possible. *Abraxas pantaria* is a lepidopter whose larvae feed on ash leaves. The wasp *Vespa crabro* (2) can cause severe damage to the branches. A defect which decreases timber price is the blackening of heart wood, which can be avoived by utilizing rotations shorter than 60-70 years.



1



Photography: A. Abrahami.

2



Photography: R. Altenkamp.

First steps of plantation

The first steps of an ash plantation are similar to those of other valuable broadleaved species.

Choosing the plant

The vegetative material must be chosen from a region with ecological conditions similar to the area of plantation. It is possible to find in the market an important variety of ash vegetative materials and provenances. It is recommended to choose bare-rooted plants with robust aspect, a healthy terminal bud and a developed root system with an important volume of secondary roots. Plants of 1 year (1+0) or 2 years (1+1) are recommended.

Soil preparation

After clearing the vegetation that can interfere with the execution of plantation, it is recommended to apply a sub-soiling, preferably crossed (in 2 perpendicular directions) and to the maximum depth possible (50 cm or more), in order to foster plant early growth and soil water retention. After that, it is recommended to let 1-2 months for soil consolidation. The plantation pits are made with backhoe excavator or manually, depending on the number of trees and the accessibility. The size of the pit is decided in accordance with plant dimensions.

Planting

Plantation is done out of the vegetative period, between November and March, trying to avoid days with frosts, rainfall or snowfall. When planting, the root system must not be compressed and the base of the trunk has to be levelled with the ground. It is recommended to apply an initial watering of 30-40 l/tree, if no rainfall is foreseen during the first weeks following the plantation.

Protect

During the first 5 - 10 years it is necessary to protect the plants from weeds, browsing damage and drought. The negative impact of weeds can be avoided by using an individual ground cover (mulch) of 1m² that allows water infiltration into the soil, while being opaque and thus impeding light accessing the soil. Other common techniques are localized herbicide application and mechanical weeding. The damage caused by browsing mammals can be avoided with individual mesh shelters resistant to the wildlife present in the plantation area. Electric fencing can also be added if required. In the case of severe drought, especially if the plantation is young, an emergency watering may be necessary.



Photography: Jean-Pierre Ortisset. CRPF.

Plantation management

Ash requires an active and well planned silviculture, because of its high light demand and vigorous growth. In order to limit the maintenance costs it is important to identify and promote as soon as possible the trees with highest potential for producing valuable timber (future trees). Pruning, especially when applied over 2-3 m, will be applied only on future trees. The pruning and clearing planning over time is detailed in the following silvicultural scheme.

Pruning

Formative pruning implies eliminating (or cutting the tip) of high or rather vertical branches that can compete with the terminal shoot. The appearance of forks (especially after a late frost) is relatively frequent in Ash, and must be corrected as soon as possible, keeping only the strongest shoot as the new bud. **Quality pruning** consists on eliminating the lower branches with a diameter larger than 2.5-3 cm at their insertion, in order to avoid big knots. It may be also necessary to cut shoots sprouting from pruning wounds (epicormic shoots). It is recommended to prune in a progressive manner, clearing less than 50% of the trunk and eliminating less than 30% of the leaves in each intervention, until obtaining clean boles 3-4 m long (5-6 m in good quality sites and with high densities). Pruning is undertaken between June and July every 1-3 years, depending on the density and site quality.



Formative pruning on ash.

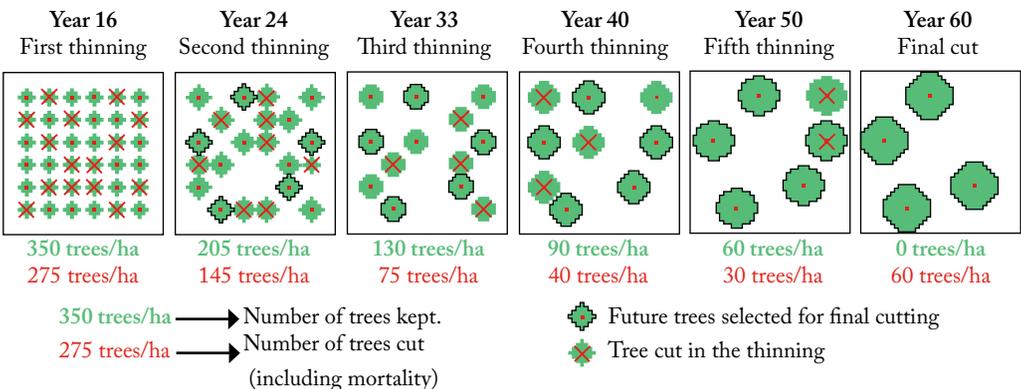


Quality pruning on ash.

Thinnings

Thinnings consist on eliminating those trees that can compete for light and nutrients with the best ones (selected trees) in the short term. With this operation it is possible to maintain an adequate growth rate on the best trees, while avoiding the shading and potential rotting of the crown base. It is recommended to apply moderate (eliminating each time 30% - 40% of trees) and recurrent thinnings (every 8-10 years). During a thinning, those trees showing a disease of low vigour are eliminated first.

Thinnings planning on a pure plantation of 625 ashes/ha, in an appropriate site.



Some silvicultural options for ash

Ash is a very versatile species that can be used either in pure stations or mixed with other species. Moreover, it has a great potential for high quality timber production in forest conditions.

Pure and mixed plantations

Unlike many other valuable broadleaved species, which usually appear scattered in the forest, ash can locally occur as a dominant species in relatively continuous areas. This feature allows the use of ash in pure or mixed plantations with many possible designs.



Silvopastoral Systems

Ash is a very interesting species with regard to livestock feeding, which has been traditionally the most common use of ash in mountainous areas. It can be used in silvo-pastoral systems, where livestock and timber are produced at the same space and time. In these systems, trees are favoured by the fertilization effect caused by animals, which can in turn benefit from the shelter effect of trees against sun, wind and hail. It is possible to perform a plantation of ash in an area devoted to grazing, and identify progressively those that can produce high-quality timber (that are pruned) and those devoted to be used as a source of tender shoots and leaves for feeding the cattle, thus diversifying the nutrient provision.



Photography: Agroof.

Management of natural regeration of ash

Ash is a relatively common species in mountain forests, and can be locally abundant. The abandonment of many agricultural and grazing activities in these areas has led to their colonization by forest species, among others ash and other valuable broadleaved species. This natural regeneration consists on trees that are well adapted to the environment, among which it is possible to find some especially interesting individuals for high quality timber production (valuable broadleaved species, straight trees with few, thin branches) that can be selected and promoted through pruning and thinnings. With this scheme, and with a minimal investment, some forest areas may lead to considerable economic and environmental benefits, especially in areas where valuable broadleaved species are naturally under-represented.



Photography: Jaime Coello.

Narrow-leaved ash (*Fraxinus angustifolia*)



Narrow-leaved ash (*Fraxinus angustifolia*) is the species equivalent to European ash (*Fraxinus excelsior*) in areas with marked Mediterranean climate. It occurs over the whole Iberian Peninsula, except in cold mountainous sites in the north, where it is replaced by European ash or by hybrids of both species.

This species can tolerate low rainfall regimes, starting at 450 mm per year, as well as summer drought, always that the soil has a sufficient water reserve. Nevertheless, they are very sensitive to waterlogging and its use must be avoided in very clayish and compact soils.

Narrow-leaved ash is sensitive to the same pests and diseases as the European ash.

Narrow-leaved ash plantations are not very common in Europe yet, leading to a lack of silvicultural guidelines specific for this species. Thus, it seems appropriate to use it in combination with other species, and to consider a silviculture similar to the one of European ash, regarding plantation density, pruning, thinning and rotation, provided that the site features are adequate for this species. The quality of the timber of narrow-leaved ash is generally not as good as in the case of European ash, because of its tendency to generate a large amount of branches and show a wavy growth pattern.



Narrow-leaved ash plantation.



Tree shape and branchiness of an unmanaged tree.



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