



Service tree

(Sorbus domestica)

and Wild Service tree

(Sorbus torminalis)

for high quality timber

5 The *Sorbus* genus

In Europe the main *Sorbus* species are Service tree (*Sorbus domestica*), and Wild service tree (*S. torminalis*), to both which we will refer as *Sorbus*. Other species from the same genus are Rowan (*S. aucuparia*) and Whitebeam (*S. aria*).

Although these species have a very wide range of occurrence, they are normally found in forests dominated by other species. In our conditions, Service and Wild Service trees are well adapted to Mediterranean and sub-Mediterranean climates, while Rowan and Whitebeam prefer mountainous areas, with more humid and colder conditions.



Distribution of Service (Sorbus domestica), up and Wild Service trees, (Sorbus torminalis), down. Source: EUFORGEN 2009.

Why planting *Sorbus* species to produce timber ?

Due to the relative scarcity of large trees of these species, their timber market is not widespread. Nevertheless, wild service trees reach the highest price of all European timbers, while service tree timber is also quite appreciated in veneer and luxury furniture industry. The timber of both species have excellent aesthetic and technical characteristics. The top quality pieces are used in veneer industry, where they reach their highest price. In this industry, timber is cut into thin slices that are used to cover or top-quality furniture. Rowan and Whitebeam timber could also produce high quality products, but these species hardly form as big boles, which limits their potential for this industry.



Service tree.
(Jean-Pierre Ortisset)



Wild Service tree.
(José Carlos Santana)



What are the main wild service and service trees requirements ?

Service and wild service trees have a great tolerance of harsh sites (drought, compact soils, etc), in comparison with the majority of other valuable broadleaves. In natural conditions they occur in a wide variety of conditions, although they tend to disappear in high quality sites, dominated by other, faster growing species. In any case, their use in plantations is recommended especially at high quality sites, in order to achieve an adequate rotation. Their growth rate depends especially on water availability and soil quality. The following graph summarizes the main requirements of service and wild service trees.

<div style="display: flex; justify-content: space-between;"> Appropriate conditions for Service tree (<i>Sorbus domestica</i>) Appropriate conditions for Wild service tree (<i>Sorbus torminalis</i>) </div>	Comments																								
<p>Soil depth (cm)</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>10-</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td><td>100</td><td>110</td><td>120+</td> </tr> <tr> <td colspan="4" style="text-align: left;"></td> <td colspan="8" style="text-align: left;"></td> </tr> </table>	10-	20	30	40	50	60	70	80	90	100	110	120+													<p><i>Sorbus</i> are very resistant to drought and wind, even in shallow soils. Therefore they can be used in areas that are too limiting for other valuable broadleaved species with regard to soil depth and moisture.</p>
10-	20	30	40	50	60	70	80	90	100	110	120+														
<p>Texture</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>Clayish</td><td>Clayish-silty</td><td>Loamy-silty</td><td>Silty-sandy</td><td>Sandy</td> </tr> <tr> <td colspan="4" style="text-align: left;"></td> <td colspan="1" style="text-align: left;"></td> </tr> </table>	Clayish	Clayish-silty	Loamy-silty	Silty-sandy	Sandy						<p>Both species, especially Service trees, can tolerate heavy soils, with moderate stagnation. Sandy soils are normally too poor in nutrients for supporting <i>Sorbus</i> species development.</p>														
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<p>pH</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>3,5-</td><td>4</td><td>4,5</td><td>5</td><td>5,5</td><td>6</td><td>6,5</td><td>7</td><td>7,5</td><td>8</td><td>8,5</td><td>9+</td> </tr> <tr> <td colspan="3" style="text-align: left;"></td> <td colspan="9" style="text-align: left;"></td> </tr> </table>	3,5-	4	4,5	5	5,5	6	6,5	7	7,5	8	8,5	9+													<p><i>Sorbus</i> can grow in a great variety of soils and pH, being recommendable to ensure an adequate provision of nutrients. They tolerate the presence of active limestone.</p>
3,5-	4	4,5	5	5,5	6	6,5	7	7,5	8	8,5	9+														
<p>Altitude (m)</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>150-</td><td>300</td><td>450</td><td>600</td><td>750</td><td>900</td><td>1050</td><td>1200</td><td>1350</td><td>1500</td><td>1650</td><td>1800+</td> </tr> <tr> <td colspan="8" style="text-align: left;"></td> <td colspan="4" style="text-align: left;"></td> </tr> </table>	150-	300	450	600	750	900	1050	1200	1350	1500	1650	1800+													<p>Both species, especially Service trees, need warmth during the growing season, although they both tolerate extremely cold winters. Generally, late frosts do not limit valuable timber production of these species.</p>
150-	300	450	600	750	900	1050	1200	1350	1500	1650	1800+														
<p>Mean annual temperature (°C)</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>6-</td><td>6,5</td><td>7</td><td>7,5</td><td>8</td><td>8,5</td><td>9</td><td>9,5</td><td>10</td><td>10,5</td><td>11</td><td>11,5+</td> </tr> <tr> <td colspan="7" style="text-align: left;"></td> <td colspan="5" style="text-align: left;"></td> </tr> </table>	6-	6,5	7	7,5	8	8,5	9	9,5	10	10,5	11	11,5+													
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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
Service tree	Low	Medium	Medium	Medium	Negligible - very low	Low	Low	High
Wild Service tree	Medium	Medium	Low	Medium	Negligible - very low	Low	Low	Medium

These species have a relatively slow growth rate, therefore they are usually planted together with other valuable broadleaved species that are more productive. Thank to their ecological plasticity, service and wild service trees are particularly interesting in those parts of the plantation that are the most limiting: perimeter, areas with risk of temporary stagnation, areas exposed to wind, etc. They can also be used on agroforestry systems, always that the herbicide application is not excessive.



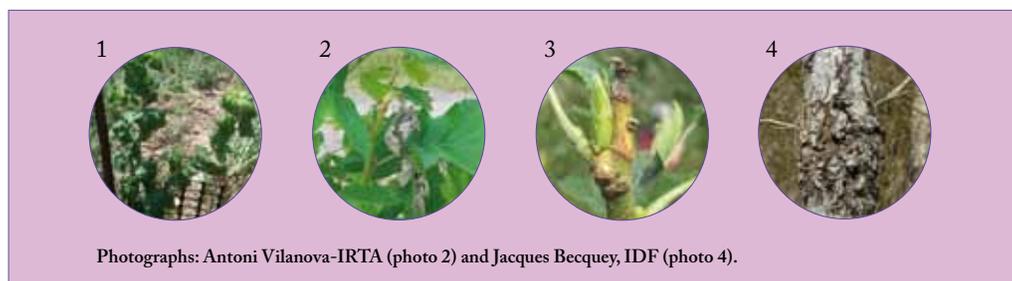
Service tree (*Sorbus domestica*).
Photo: Jean-Pierre Ortisset.CRPF.



Wild Service tree (*Sorbus torminalis*).

Pests and diseases of *Sorbus*

There are few harmful agents reported as affecting service and wild service trees. Leaf-mottle fungi and aphids (1) normally attack the leaves but are not a serious menace for tree growth and vigour. The insect *Janus compressus* causes the withering of shoots (2), although the tree tends to correct the defect without leading to major shape defects (3). The most serious problems are caused by canker (4), especially in Service tree, which may cause deformities, as well as the Honey fungus (*Armillaria*) in Wild Service tree. These diseases can rot the root system and even kill the tree. In order to prevent health problems it is recommended to use these species in areas where they are adequately adapted, as well as disinfecting the pruning tools. It is especially important to pay regular attention to the health status of the trees if they are planted close to areas with fruit trees or other *Rosaceae* species.



Photographs: Antoni Vilanova-IRTA (photo 2) and Jacques Becquey, IDF (photo 4).

First steps of plantation

The first steps of plantation with service and wild service trees are similar to those of other valuable broadleaved species.

Choosing the plant

It is recommended to use a vegetative material from an area similar to the plantation zone, especially with regard to soil characteristics and intensity of drought. Bare rooted plants is the most adequate format for high quality soils. The apical bud must be well developed and healthy, with a unique, branchless stem. The root system must be consistent and well developed, with an important volume of secondary roots. One year-old plants (1+0) should be between 20-30 cm high, while two year-old plants (1+1), should be around 50 cm high.

Soil preparation

After clearing the vegetation that could affect negatively the plantation operations it is recommended to apply a crossed sub-soiling (in 2 perpendicular directions) to the maximum depth possible (at least 50 cm), for enhancing soil water retention. The plantation pits can be made either manually or by backhoe excavator, with dimensions adequate for the plant size.

Planting

Trees are planted during their dormancy period, preferably between November and March, trying to avoid days of frost, precipitation or strong winds. When planting, root system must be well stretched, keeping the plant vertical and the base of the trunk at soil level. An initial watering of 30-40 l/tree can be beneficial if rain is not forecasted during the first weeks immediately after planting.

Protecting

Sorbus trees are very sensitive to weed competition during the first 5-10 years of plantation. The negative effect of weeds can be avoided by mulching (ground covers of 1m² installed at each tree). This system impedes weed establishment and development near the tree, while reducing soil water evaporation. These species are very sensitive to herbicides, so their careful application is mandatory. Browsing damage can be avoided by individual shelters (preferably with mesh walls), which can be complemented with electric fencing. Drought negative effects could be avoided or mitigated by emergency watering.



Plantation management

Sorbus species can be utilized with a large variety of plantation schemes, regarding species composition, densities, etc. The planning of pruning and thinning interventions is similar to other valuable broadleaved species, although it should be considered that Service and Wild Service trees have generally a slower growth rate.

Pruning

In the **formative pruning**, the highest or most vertical branches that could shade the apical shoot are blunt or cut. In the case of Wild Service tree, it is especially important to eliminate the forks that the terminal shoot may create. Service trees have normally a strong apical dominance and thus their formative pruning is easier.

Quality pruning consists on eliminating the thickest branches before they reach 3 cm of diameter at their base, in order to avoid big knots. It is recommended to prune progressively (less than 50% of the total height of the tree each time) until obtaining a clean bole of 3-4 m (medium quality sites) or 4-6 m (high quality sites). Formative pruning and quality pruning are applied during summer, every 1-4 years. In both species, it is important to form a symmetric and well-balanced tree crown in order to avoid internal tensions in the timber.

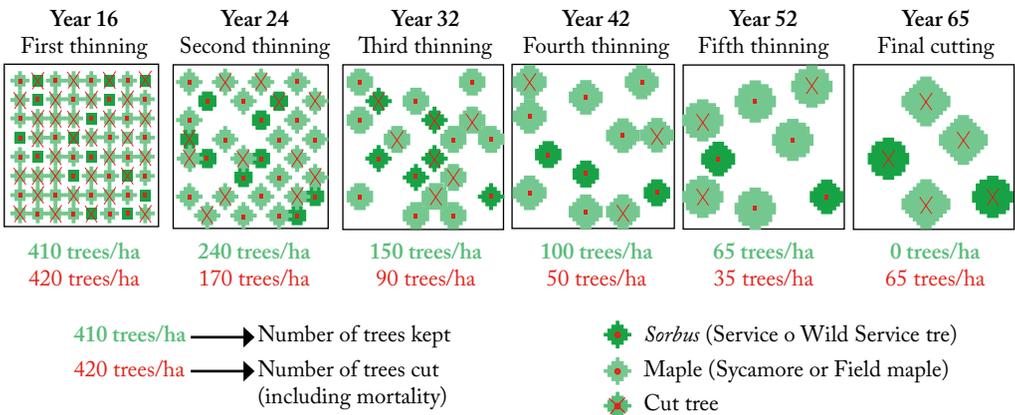


Fork of a wild service tree, requiring an urgent formative pruning.

Thinnings

Thinning consists on cutting those trees that could compete with the best ones of the plantation in the upcoming years. By this intervention, the best trees are promoted and their free growth is maintained. The first thinning is generally made when trees are 10-12 m high. The following thinnings are made approximately every 10 years, with intensities of 30-40% of trees. The final cutting is applied when the trees are 60-80 years old, when their diameter should be larger than 45 cm.

The following scheme shows the thinning plan of a mixed *Sorbus* (25% of trees) and maple (75% of trees) plantation, with an initial density of 830 trees/ha, in an area suitable for both species.



Some technical itineraries for *Sorbus*

Besides the example of plantation shown before (mixed *Sorbus* and maple plantation), there are many other schemes for using *Sorbus* in our conditions.

Other mixed plantations

There are several options for combining *Sorbus* with other valuable broadleaved species. Pure plantations of *Sorbus* should be used if the available area is small (< 0,25 ha). When designing a mixed plantation, it is recommended not to use exclusively Rosaceae species (pear tree, wild cherry, *Sorbus*), in order to avoid possible health problems. An interesting design would be to consider including species with different growth rates, in order to perform progressive final cuttings, with an improved use of resources. For example, it is possible to combine short rotation productions (biomass or ornamental species), medium rotation (fast growing valuable broadleaved species) and long rotation (service or wild service trees) ones.

Underplanting forests

This proposal consists on installing small plantations of *Sorbus* (alone or mixed with other valuable broadleaved species) in high quality forest sites (old terraces, valley floors, gentle slope conditions, etc). The management of the resulting system will focus on enhancing the vigour and growth of valuable broadleaved species (including pruning and selective thinnings), while keeping a forest cover that does not compete with them: thinnings will allow achieving an adequate shading and sheltering of the valuable broadleaved trees. With this system, a small-scale management (focused on planted trees) will increase considerably the economic value of the forest areas, while diversifying them.

Agroforestry plantations

Sorbus are interesting species for agroforestry systems (combination of agricultural and timber production in the same area), due to their resistance to strong winds and their positive effect on filtering and increasing the quality of water that is lixiviated from the agricultural field. The deep root system filters and absorbs the water that may carry high loads of fertilizer, thus avoiding the pollution of groundwater while enhancing tree growth. Other advantages include the reduction of the drying effect of wind and the presence of pests in agricultural areas (the trees may host auxiliary species that would tend to balance the ecosystem), as well as the recirculation of nutrients from deep soil layers. Service trees have been successfully combined with soya, wheat, rape and vineyards in Greece, Italy and France.



Service tree in pine forest.



Wild service tree in an agroforestry system. ©agroof.

Other *Sorbus* species

Whitebeam (*Sorbus aria*) and Rowan (*Sorbus aucuparia*) are very resistant species, that can tolerate many soil and climate conditions. They both require direct light exposition from the very first years and have little capacity to compete with other tree species. They tolerate strong winds and stony and dry soils. Their production potential is lower than in the case of service and wild service trees, because the harsh conditions where they usually grow, which hampers the possibility for constituting large boles. Their use could increase the economic interest of micro-sites on mountainous areas with high quality timber production, as well as restoration plantations. They are sensitive to the same pests and diseases as the other *Sorbus* species.

Whitebeam (*Sorbus aria*)

Whitebeam has the widest ecological range among all *Sorbus* analyzed; it tolerates severe droughts and poor quality soils, including those with very low pH or with active limestone. However, this species does not tolerate stagnation, even if temporary, so it is recommended to avoid their use in very clayish and heavy soils. They usually appear in mountainous areas, between 600 m - 1700 m, thank to their tolerance to cold.

Although they tend to form several stems, it is possible to shape a unique straight bole by pruning. Its wood quality is slightly lower than that of service trees and wild service trees, and thus its economic interest is limited due to its difficulty to achieve pieces with the appropriate size required by the veneer industry.



Photography: Óscar Cisneros.

Photography: Jacques Becquey. IDF.

Rowan (*Sorbus aucuparia*)

Rowan needs high humidity and precipitation distributed over the year. It is a mountain species that can grow in areas up to 2000 m in altitude, in different type of soils. At lower altitudes, they prefer neutral or slightly acidic soils, free of active limestone. They have a low tolerance to stagnation or air pollution.

Alike whitebeam, rowan tends to generate multiple stems and branches, which makes necessary to apply formative pruning in order to achieve a straight clean bole in order to produce commercial pieces.



Photography: Mireille Mouas. IDF.

Photography: Jacques Becquey. IDF.



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