

The Pear tree (*Pyrus communis*) and the Apple tree

(*Malus sylvestris*)

for high quality timber

6

Pear tree

(*Pyrus communis*)

and Apple tree

(*Malus sylvestris*)

These species are especially used for fruit production, in spite of which it is possible to find them as forest species, with a significant and potential for valuable timber production. Pear tree (*Pyrus communis*) and apple tree (*Malus sylvestris*) belong to *Rosaceae* family, alike wild cherry and service trees.

Despite their large distribution area, its occurrence pattern is scattered, embedded in forests dominated by other tree species, as beech, oak and chestnut. Both species are favoured by fresh conditions, influenced by water streams. They are also common in hedges close to agricultural fields.



Distribution of pear (*Pyrus communis* pyrastr), up, and apple trees (*Malus sylvestris*), down. Source: *Enforgen*, 2008.

Why planting pear and apple trees for timber production ?

Because of their scattered pattern of occurrence, and to the difficulty for finding trees of these species with adequate features for valuable timber production (excellent shape, large dimensions), it is not possible to find a market specialized in the industrial use of their timber, and no silvicultural models have been proposed for them. In this moment a large proportion of the timber from these species utilized commercially comes from large fruit trees, although their value is considerably reduced by their short clean bole. However, good quality logs are very appreciated for top-quality cabinetmaking, musical instruments construction and fine sculpture, being a dense, homogeneous and easily worked timber. The pieces with adequate shape and dimensions can be utilized in veneer industry.





Pyrus communis.
(Grégory Sajdak. IDF.)



Malus sylvestris.
(Mireille Mouas. IDF.)



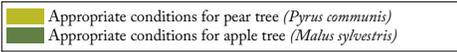
Photography: Óscar Cisneros.



Photography: Óscar Cisneros.

What are the main requirements of pear and apple trees ?

Both species have a good tolerance to a wide variety of soil conditions, regarding texture (silty to sandy) and pH (acid to basic). However, both species are exigent regarding soil freshness, not being suitable for neither dry soils nor those stagnation-prone. Pear and apple trees tolerate moderate to severe dry periods while being close to water streams. These species achieve an optimal growth rate in deep fresh soils, with a high availability of water and nutrients. They are also favoured in sunny areas, not tolerating the shadowing. The following figure summarizes the main ecological needs of both species.

	Comments																																																
Soil depth (cm) <table border="1" data-bbox="108 998 565 1058"> <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></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>	10-	20	30	40	50	60	70	80	90	100	110	120+													Deep soils allow a larger water reserve, being the optimal for the adequate development of these species.																								
10-	20	30	40	50	60	70	80	90	100	110	120+																																						
Texture <table border="1" data-bbox="108 1102 565 1163"> <tr> <td>Clayish</td><td>Clayish-silty</td><td>Loamy-silty</td><td>Silty-sandy</td><td>Sandy</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td> </tr> </table>	Clayish	Clayish-silty	Loamy-silty	Silty-sandy	Sandy						The range of tolerance to different soil textures is wide for both species, although they prefer clayish-silty soils (always that there is no risk of stagnation), because of their higher nutrient availability.																																						
Clayish	Clayish-silty	Loamy-silty	Silty-sandy	Sandy																																													
pH <table border="1" data-bbox="108 1206 565 1267"> <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></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>	3,5-	4	4,5	5	5,5	6	6,5	7	7,5	8	8,5	9+													Pear and apple trees can grow in soils with very diverse pHs, with an optimal performance on neutral soils. Both species tolerate 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" data-bbox="108 1310 565 1371"> <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></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table> Mean annual temperature (°C) <table border="1" data-bbox="108 1406 565 1458"> <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></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><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+													Both pear and apple trees have a good tolerance to low temperatures. In fact, summer high temperatures are limiting for them, especially when leading to low water availability.
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 precipitation (mm) <table border="1" data-bbox="108 1501 565 1562"> <tr> <td>400-</td><td>450</td><td>500</td><td>550</td><td>600</td><td>650</td><td>700</td><td>750</td><td>800</td><td>850</td><td>900</td><td>950+</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>	400-	450	500	550	600	650	700	750	800	850	900	950+													Both species require an adequate water supply to achieve a sound growth rate; thus, dry conditions should be avoided.																								
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	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
Pear tree	Medium	Medium	Medium	High	Very low	Very low	Low	High
Apple tree	Medium	Medium	Low	High	Very low	Low	Low	High



Pear tree (Pyrus communis pyraeaster).
Photography: Doris Anthony.



Apple tree (Malus sylvestris).
Photography: Mireille Mouas. IDF.



Up: Leaf of Pear tree.
Photography: Grégory Sajdak. IDF.
Down: Leaf of Apple tree.
Photography: Mireille Mouas. IDF.

Both pear and apple trees tolerate a wide variety of climates and soils, in spite of which it is fundamental to guarantee an adequate provision of water and nutrients. These species are especially suitable for open areas, exposed to sun. Additionally to their productive interest (valuable timber production), these species have extraordinary value from the landscape and environmental point of view, being scarce, producing fruits esteemed by wildlife and flowers with melliferous interest.

Pets and diseases of pear and apple trees

The most relevant disease affecting both species, as well as many other Rosaceae trees, is “fire blight”, caused by *Erwinia amylovora* bacterium, leading to the withering of young shoots, branches and stems, occasionally being lethal for the tree. Affected tissues show a blackish aspect. There is no effective healing treatment for this disease, so prevention (through the use of vegetative material selected for its insusceptibility) is the only current option. In the event of detection of this disease the affected trees must be cut and burnt. These species can be also attacked by aphids.

First steps of plantation

The first steps of a plantation including pear or apple trees for high quality timber production are similar to those from other valuable broadleaved species.

Choosing the plant

It is recommendable to utilize vegetative material original from an area with characteristics similar to those at the plantation site, especially with regard to soil features and severity of summer drought. The plant must show a healthy, well developed terminal bud and a unique, robust branchless stem. The root system must be well developed, with abundant secondary roots. It is recommended to utilize 1 year-old plants (1+0), 30-40 cm high or 2 year-old plants (1+1), root-pruned, taller than 50 cm. It is also recommended to avoid very spiny vegetative materials, for easing handling, planting and pruning operations.

Soil preparation

A fundamental intervention, especially when afforesting arable land, is the sub-soiling, that must be applied in two perpendicular directions, to the maximum depth possible, in order to break compact soil layers and enhance water infiltration and retention. Plantation pits can be opened manually or with machines, depending on the plantation size and accessibility.

Planting

The plantation must not be done on days with frosts, strong wind or precipitations. Moreover, the soil should not be too wet. The plant is installed during the dormancy period (between November and March), in such a manner that it remains vertical, with the root system not bended and keeping the trunk base levelled with the ground, for avoiding shape problems.

Protecting

During the first years of the plantation it is convenient to utilize a ground cover (mulch) for avoiding weed competence for water, nutrients and light. Browsing damages can be prevented by either individual shelters (preferably with mesh wall) and / or by collective fencing. In this sense, a light electric fencing can be a cheap solution for protecting a dense plantation. Damages caused by severe droughts can be avoided or mitigated with the application of emergency irrigation.



Pear tree plantation management

Pear tree is more widely used for timber production than apple tree, so that the below proposed management and silvicultural model refers to pear tree. Considering the high demand for light of this species, it is necessary to apply a dynamic and well planned silviculture, which will be partially defined by the initial plantation design: species composition, density, etc. The program of pruning and thinning, linked to growth rate, could be considered as intermediate between those of ash/cherry and of *Sorbus* species.

Pruning

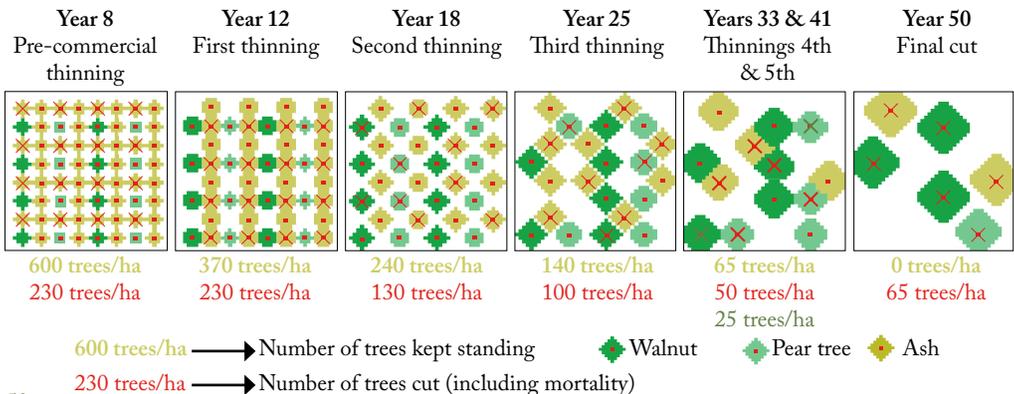
Pear tree pruning criteria are similar to other valuable broadleaved species. The main peculiarity is linked to its horizontal branching pattern, which reduces the risk of forking occurrence and branches competing with the terminal shoot. However, the risk of wavy-shaped stems is higher. To avoid this problem, as well as the emergence of epicormic shoots it is recommended to apply frequent (annual or bi-annual) prunings of moderate intensity, eliminating all branches with a diameter larger than 2.5-3 cm at their insertion point. It is also recommended not to remove all branches in more than a third of total tree height. This species tend to generate root sprouts, which should be eliminated promptly.



Quality pruning on a pear tree.

Thinnings

During thinnings, the trees that could shade the ones with highest potential value (those with best shape and vigour) in the next years are removed. As a result, the best trees keep a fast growth rate. Because of the high potential of pear tree timber for industries not requiring large diameters it is possible to generate revenue from intermediate trees, provided that they have an adequate shape: first commercial thinnings (15-25 cm dbh diameter) lead to timber adequate for musical instruments and sculpture; intermediate thinnings (20-40 cm) may lead to pieces suitable for fine cabinetmaking; final cut (40-50 cm) could result in pieces usable in veneer industry. Final cut could be expected around 50-65 years. Because of the general lack of vegetative material from pear tree selected for valuable timber production it is recommended to design a plantation with medium or high initial density, preferably mixed with other valuable species suitable for veneer production. Thinning plan: mixed plantation with pear tree (12,5%), walnut (12,5%) and ash (75%), 830 trees/ha (3x4 m):



Other silvicultural schemes with pear tree

Additionally from the thinning plan shown above (620 ashes, 105 pear trees and 105 walnuts per hectare), there are different modalities of use of pear tree in our conditions.

Mixed plantation of poplar and valuable broadleaves

This plantation scheme consists on mixing poplar rows and rows planted with valuable broadleaves (e.g. pear tree). This plantation is performed in areas devoted to popiculture, where it is intended to diversify poplar production with other species whose timber has higher added value. This scheme allows covering the plantation costs and producing a first significant revenue in the short term, during poplar final cut, at 12-15 years. Pear tree and other valuable broadleaves thinnings, leading to trees with intermediate dimensions, and especially the final cut, result in the highest part of the revenue. An adequate design for this plantation scheme would be leaving 7-10 m between rows of poplar and valuable broadleaves, with 6-8 m between two consecutive poplars in a row and 4-5 m between two consecutive valuable broadleaves.

Plantation with accompanying species

This scheme consists on utilizing auxiliary species whose function is to enhance the shape and/or the productivity of the main species (pear tree or other valuable broadleaved species). These accompanying species can improve the shape of the main species through a lateral shading, forcing the main species to grow straight and with few branches. Moreover, a higher growth rate of the main species can be also achieved with accompanying species able to fix atmospheric nitrogen on the soil (e.g. alder) or producing a high quality humus (e.g. birch). The distance between accompanying and main species has to be carefully chosen, and proportional to their growth rate.



Valuable broadleaved accompanied by birch.

Agroforestry system

Pear tree is an interesting species for its use in agroforestry systems, where tree rows (valuable broadleaves) are placed in a field devoted to agricultural production. Each of the two productions (timber and agriculture) is managed independently. The distance between two consecutive tree rows is defined by the machines utilized in agricultural management. These systems imply an enhanced productivity, thank to the positive effects of trees on crops: lower wind speed and thus reduced evaporation, re-circulation and input of nutrients through dead leaves), deep water and nutrients pumping...Reversely, crop management favours tree growth, through fertilization and weed control. Moreover, these systems count for a high environmental interest, with a considerable reduction of many negative impacts of current agriculture: less erosion and lixiviates release (in terms of both volume and concentration), avoided application of agrochemicals, etc.



Agroforestry system.
Photography: Philippe Van Lerberghe. IDF.

Apple tree (*Malus sylvestris*)

As mentioned before, apple tree (*Malus sylvestris*) has, in general terms, similar requirements and ecology than pear tree.

This species has a somewhat lower potential for valuable timber production, because of its slower growth rate and wavy shape pattern. As a result, the use of this species in plantations for timber production should respond to a diversification principle, and should not be utilized in pure plantations, but always mixed with other valuable broadleaved species.

Among the main ecological differences between pear and apple trees, the latter show a higher tolerance to high altitude, sand content and soils with high pH.

Regarding management, apple tree has a lower apical dominance, and tends to generate branchy shapes. As a consequence, pruning of apple trees for valuable timber production is more complex and exigent technically.



Photography: Agroof.



Photography: Óscar Cisneros.



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