

Shaping the trees

www.agforward.eu

Trees planted at wide spacing naturally develop a shorter trunk, with a greater tendency to a sinuous and forked shape. They often bear many vigorous lateral branches that can hamper the movement of agricultural machinery.

A wide array of factors can lead to defects in shape (high wind, frost, drought, snow, presence of birds and insects, game, changes in soil fertility) or more structural (genetics and quality of seedlings). All defects in shape should be corrected as soon as they appear.

Early, moderate and gradual pruning interventions are necessary to increase the rigor of the trees, straightness of the trunk and produce quality marketable timber. Those interventions have to be undertaken at the right time and with the adequate material.



Shape pruning of a poplar (A. Guerrier - CNPF)



Rapidly growing tree with heavy side branches will benefit from early pruning (H. de Grandmaison - CNPF)

Why prune trees?

Pruning is the action of cutting, living and dead branches growing from the main stem of the tree, with the view of improving its shape as the tree mature and, ultimately, to increase the production of knotless (and therefore higher value) timber wood.

Farmers will need to prune trees for the following main reasons:

- to improve the mechanical resistance of the tree, and therefore its ability to withstand wind. This requires eliminating forks and vigorous vertical branches that compete with the main stem;
- to preserve tree health. This requires removing dead branches, or those that have been broken or carry diseases so as to prevent their spread;
- to lift the tree crown. This requires cutting lower branches and increasing the height of the crown so as to ease farming operations along the tree rows;
- to increase the timber value. Pruning can help produce a quality tree bole (the part of the trunk that is located in between the soil and the first branches) with a high marketable value.



Before



After

Delayed shape pruning on a wild cherry (J. Becquey - CNPF)

What are the characteristics of high value timber wood?

From a farmers' perspective a quality tree bole is one that can be sold easily and at the highest price. For a sawmill manager, however, it is straight, perfectly cylindrical, branchless piece of wood, with enough diameter and length and a minimum amount of knots or other internal defects. These characteristics make wood processing easier, while maximizing the yield in valuable produce and reducing sawing costs.

Shape pruning

Shape pruning consist of the removal of forks, multiple, broken or defective top branches, as well as those that compete with the main stem of the tree and threaten to alter its shape. The objective is two-fold: getting a single, straight, cylindrical trunk that has the longest possible height, while giving the crown a shape that can withstand the wind.

What is a «hazardous branch»?

- **Acute branches:** these are branches that branch away from the main stem at an angle of less than 30°. Acute branches will grow upwards and will tend to grow faster than a more angled branch. The risk with these branches is that they can overtake the apical stem and create a fork-like structure.
- **Over grown branches:** when a branch reaches a diameter that is bigger than the neighboring branches or exceeds half of the diameter of the trunk it may become hazardous.

How to prune properly?

Prune early. Pruning often starts 2-3 years after planting the young seedling, usually by the time the main stem gets out of the tree shelter. If a fork has formed inside the tree shelter it can be removed by using hand pruning shears through the shelter or by lifting it. If the seedling shows difficulties of establishment, remain patient: pruning the young tree would mean depriving it of a part of its foliage that will be essential to enable a fast and healthy growth of its root system.



3 steps here: removing the top fork (red), big branches (blue) and diving branches (green)

Prune from top to bottom. Correct primarily top branch defect (forks, multiple, broken or unclear top branches) that represent a big threat, with long-lasting impacts, for the straightness and cylindricality of the main stem. Cut, as soon as they appear, any hazardous branches, taking care to not damage the branch collar. Lower vigorous branches should be cut as soon as their diameter exceeds 2.5-3 cm.

Prune gradually. It is more efficient to undertake a moderate, gentle pruning just a few hours every year rather than entire days every 2-3 years. Shape pruning is necessary during the first 10 to 25 years of the tree life, until the bole has reached the target height: 4-5 m in walnut, 8 meters in poplar, and around 6 m in other broadleaves.

Prune gently. Avoid removing more than 30 % of the living branches (photosynthetic biomass) annually, in particular if the crown is still little developed. Make sure you maintain the balance of the whole crown.

Prune at the right time. Whereas dead branches can be cut all year round, living branches must never be cut during bud break (from swelling of the buds to the complete development of the first leaves), nor while the sap flow is going downwards (from the end of August till the shedding of leaves). This will avoid depleting the tree's resources. From late June, it is advised to undertake a – moderate – summer pruning on young trees. Summer pruning will allow a better closing of wounds, higher resistance to pathogens, and less vigorous epicormics growth. A winter pruning before bud break is also possible with most species (although avoid this in wild cherry). Pruning without leaves enables the underlying tree architecture much more easily analysed, however epicormics growth can be much more vigorous in the next spring.

How many trees to select for shape pruning? In a wide-spaced agroforestry systems, most if not all trees are usually shape pruned.

Main top branch defects



Fork



Broken top branch



Multiple top branches



Unclear top branch

Nevertheless, it is each farmer's job to evaluate the capacity of each tree to produce quality timber, and may decide to leave aside trees that are less promising for this use (e.g. those with a twisted trunk). Such trees would represent a higher labor investment that may not be profitable in the end. They can be managed in a different way, by coppicing or pollarding them.

How to handle a delayed pruning? It is possible to cut rather big branches (diameter between 3 and 6 cm) that were missed in the previous years, however this requires more time and has to be done carefully. In order to allow a clean wound and avoid the bark surrounding the branch to be ripped, this has to be done in two successive steps: a first cut of the branch 30 cm away from the trunk, followed by a second cut level of the trunk. From 7 cm in diameter and above, it is considered too late to prune the branch. This could threaten the tree's health (high risk of decay) and greatly reduce its growth.

Main branching defects



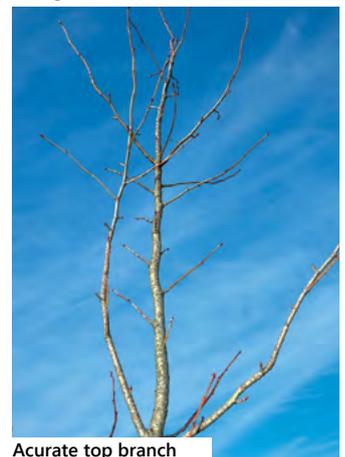
Acurate branch



Overgrown branch

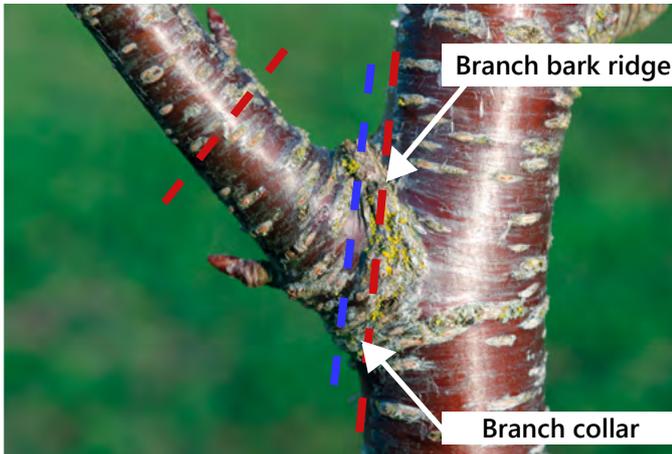


False verticil



Acurate top branch

How to cut a branch? A good cut has to be clear, with no ripped bark around it. Done at a slight angle with the trunk, it has to preserve both the branch bark ridge and the branch collar so as to allow the underlying tissues to allow callus formation. Cuts that are done too far from the trunk will leave a dead stump, while those too close to it will hamper the healing process. In both cases, the risk of infection is high.



Pruning a branch properly (good cut – wrong cuts)

What tools to use? Up to 2.5 m height, it is easy to use common hand tools: hand pruners (branch $\text{\O} < 1.5 \text{ cm}$), lopping shears ($\text{\O} < 3 \text{ cm}$) and pruning saw ($3 \leq \text{\O} \leq 10 \text{ cm}$). From 2.5 through 6 m height, tools fixed on telescopic poles are required to reach the branches from the soil: pole pruners ($3 < \text{\O} < 4.5 \text{ cm}$) or pole saws are available.



Hand pruners (1), lopping shears (2) and pruning saw (3)



Pruning saw (1) and pole pruner (2)

Silvicultural pruning

Silvicultural pruning consist of the removal of lower branches, dead or alive, level of the trunk. It aims at producing a quality bole: as high and cylindrical as possible, and with the greatest proportion of knotless wood. Knots¹ should only be present at the core of the stem (earlier years of tree life), in a cylinder of 10-15 cm in diameter, at the most.

Silvicultural pruning has to be:

- **early:** start after the first few years of shape pruning, once the trees have reached a height of 2.5-3 m (walnuts and oaks) and 4 m (other broadleaf species), but not before the lower branches have reached 2 cm in diameter;
- **frequently:** make sure you check your trees often enough to only deal with small branches, with 3-4 cm in diameter at the most;
- **gradually:** the first time you prune your trunk, the height of the branchless part must not exceed 1/3 of the total height of the tree. At the end of the cycle the branch less part can represent up to half of the total tree height (more if in poplars);
- **from bottom to top:** contrary to shape pruning, silvicultural pruning should go bottom to top. Nevertheless, this rule can be adapted so bigger branches ("hazardous branches") located at higher levels of the tree can be cut before lower ones with a smaller diameter.

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.

¹. A knot is the base of a cut branch that is gradually enclosed in the stem from which it arises during the growth of the tree.