

Understanding the Science and Art of Pruning in Forestry

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ABSTRACT

Pruning is a vital silvicultural operation in modern forestry, aimed at enhancing both the structural quality and overall health of plantation trees. This article explores the scientific principles and practical techniques behind pruning, emphasizing its role in producing knot-free, high-value timber. It outlines different types of pruning—based on purpose, tree age, and agency—as well as the appropriate timing, intensity, and tools involved. Special focus is given to balancing the biological needs of trees with the practical considerations of forest management. By integrating both the technical and skill-based aspects of pruning, the article highlights how proper pruning contributes not only to economic returns but also to improved plantation health, accessibility, and fire and pest risk reduction.

INTRODUCTION

Demand for wood is increasing with ever increasing population. To fulfil the future demand for wood and wood products worldwide, intensive forest management techniques are being practiced (Barrette *et al.*, 2023). In this sense pruning is

the important silviculture operation for producing quality timber.

Pruning is the practice of removal of unwanted live or dead branches of trees. The remaining leaves on a tree can enhance their photosynthetic rate, thus there is no loss of

growth after pruning as long as not more than 30 to 50% of the leaves are removed (West, 2014). It includes both science and art: science in determining when and how to prune for best results, and art in executing the right pruning cuts (Wade & Westerfield, 2009).

Prior to beginning any pruning, a purpose and desired result should be specified. Pruning is crucial for improving the tree's overall structure, strength, and health. It contributes to greater health and productivity of plantations. It minimizes the pest and disease attack in plantations.

Pruning trees provides several benefits. It includes:

- ✓ Pruning encourages the development of knot-free, high-quality timber.
- ✓ Pruned branches can be used as a source of firewood and livestock fodder.
- ✓ It helps reduce canopy thickness, allowing light to reach lower vegetation.
- ✓ Pruning improves access for regular monitoring and inspections.
- ✓ It promotes uniform growth and structure across plantation trees.
- ✓ It lowers the risk of fire by eliminating dry and excess branches.
- ✓ Removing infected branches helps preventing the spread of pests and diseases within the tree.

Depending on the type of branches removed pruning can be categorized into:

- 1) **Dry pruning** – Involves cutting off dead or dried branches from the tree.
- 2) **Green pruning** – Refers to the removal of living branches from the tree.

Classification based on agency:

- 1) **Natural pruning** – This occurs when branches die and fall off on their own due

to natural factors like lack of sunlight, decay, wind, snow, or ice.

- 2) **Artificial pruning** – This involves the manual removal of branches rather than waiting for nature to take its course. Since it can be expensive, artificial pruning should be carried out only when necessary and based on available financial resources.

Natural pruning in forests and plantations occurs due to lack of sunlight availability to lower branches and also due to other factors like decay and snow damage. If ultimate aim of managing a plantation is to produce clear wood, natural pruning is not satisfactory. Here manual pruning replaces the natural one.

Classification based on purpose and stage of tree growth:

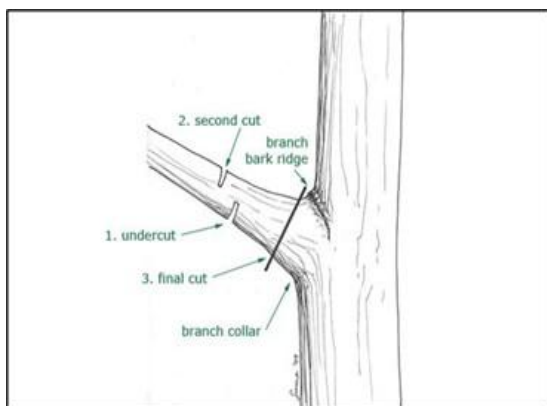
- 1) **Singling:** This method involves removing multiple leading shoots in young trees—usually below five years of age—to encourage a single, strong central leader.
- 2) **Formative pruning:** Carried out during the first ten years of a tree's life, this technique helps shape the tree for better form and future value by eliminating rubbing or crossing branches, thick side branches, and multiple stems.
- 3) **Brashing:** Brashing involves cutting off the lower branches up to a height of about two meters, mainly to allow easier access for inspecting the crop or managing drainage. Although it helps reduce the risk of surface fires reaching the canopy, it usually doesn't contribute to timber quality.
- 4) **High pruning:** This is practiced on older or mature trees, where branches are removed up to a higher point on the stem, primarily to improve the quality and value

of timber by producing clear, knot-free wood.

Pruning Cut

Pruning is typically advantageous, but if done improperly, it may be harmful to the tree's health and the quality of the wood it produces. When making pruning cuts, care should be taken to preserve stem tissue and remove only branch tissue.

- ✓ Initial cut is made underside of the branch outside the branch collar. This cut will stop the stem tissue from being torn as a falling branch pulls away from the tree.
- ✓ Second cut is made on topside of branch and cutting has to be continued till branch falls leaving a short branch stub.
- ✓ The procedure is then completed by cutting the stub just outside the branch bark ridge or collar



Time or season of pruning

Forest tree species can be pruned most effectively in late winter since the plants are dormant and there is a lower risk of disease and pest damage and it helps tree to recover during growing season. Best season for pruning is January to May, as loss of productivity is less due to senescence phenomenon. And least preferred time for pruning is spring season when new growth appears.

Growth stage of tree

The ideal growth stage to prune a tree is during the early stage of its rotation, when the branches are still slender. Generally, the first pruning is recommended between 5 to 10 years for long-rotation species, and around 2 to 3 years for short-rotation crops. However, dead branches can be removed at any point during the tree's growth.

Intensity and height of pruning

The amount of tree canopy that should be removed in a year should not exceed twenty to thirty percent. Removing more than 30% of a tree's total canopy within a single year can put the tree under stress and negatively impact its growth and productivity. Young trees are typically pruned up to 1/3rd of their total height, older trees up to 1/2 their height, and mature trees can be pruned as high as 2/3rd of their full height.

Pruning tools:

Hand tools:

There are many different types of hand tools available. These consist of the pruning saw, loppers, secateurs, pruning knife, and high pruners with a broad range of styles. These can be used to prune branches up to approximately 3m.

Power tools:

There are also a variety of powered tools that can be pneumatic, electrical, or hydraulically driven. These consist of high-level power tools, power saws, and power secateurs.

CONCLUSION

Pruning is a vital silvicultural practice aimed at enhancing tree structure, health, and timber quality in managed plantations. When carried out properly considering the timing, intensity, tree growth stage, and correct technique it

leads to the production of high-value, knot-free wood while also reducing disease and fire risks. Both natural and artificial pruning have roles, but manual intervention is essential for achieving clear timber in commercial forestry. Pruning not only improves light penetration and access but also supports overall plantation productivity. For best results, species-specific approaches and proper tools should be used to ensure healthy tree development and economic returns.

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