

Harvesting to Get a *Eucalyptus* Coppice Crop¹

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When eucalyptus trees are felled, new stems often grow from the stumps to produce another crop of trees. This new crop is called the coppice crop to distinguish it from the seedling crop. Coppice crops can be important in growing eucalypts profitably. Replanting costs are saved and coppice crop rotations are usually shorter than those of seedling crops, because coppice stems grow faster than seedlings. Several successive coppice crops are possible, but getting a coppice crop depends on planting the right species in the right environment and harvesting with the right method.

PLAN FOR COPPICE

The time to plan for a coppice crop is before planting the seedling crop. Not all eucalyptus species coppice. Choose a species that coppices vigorously and predictably, that grows well, and has the desired wood qualities. Eucalypts For Planting (FAO 1979) describes coppicing ability of species commonly used for wood production. However, relying on a species' reputation for good coppicing is risky, because it might not coppice reliably everywhere. Also, the species may coppice well on average, but some seed sources may not. Before planting a new species in a new environment on a large scale, establish enough experimental plantings to determine coppicing ability at different seasons and ages by periodic fellings.

Spacing and harvesting methods need to be carefully considered in developing a coppicing system. The spacing pattern must allow harvesting equipment to move about without damaging stumps. In irrigated plantations the harvesting plan must include protection of the irrigation system.

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Abstract: Coppicing of eucalypts saves replanting after harvesting, but plan for coppice before planting seedlings. Select a species that coppices in the planned season of harvest; plan spacing and harvesting methods so that harvesting will not damage stumps; plan coppice management. Best coppice is produced by spring harvest with chain saws, low stumps, no bark or root damage, and no debris left on stumps. Problems are fire hazard, regeneration from seeds, coppice reduction, and killing an unwanted coppice crop.

Seasons of harvest and rotation age should be planned too. Will coppicing occur in the months in which harvesting must be done? The power to coppice decreases as trees age. Will the trees coppice at the end of the planned rotation? Typically, eucalyptus plantations with rotations up to 12 years are regenerated by coppice, while plantations with rotations longer than 20 years are regenerated by replanting.

THE DO'S AND DON'TS OF HARVESTING

Make A Low Stump

The higher on the bole that a tree is cut, the more likely it is to coppice and to produce many coppice stems. The absurd extension of this principle is to lop off branches, so that the bole becomes covered with shoots. Low cuts rather than high cuts are standard in eucalyptus plantations for at least three reasons. Firstly, the height at which coppice stems are felled is usually above the height used for felling seedling stems, to avoid cutting the ever-thickening stump. The cutting height progressively raises with each coppice crop. If a high cut were used initially, then the cutting height of later coppice crops could become too high. Secondly, stems produced on high stumps are reputedly less wind firm than stems on low stumps. Finally, harvesting equipment may not be able to pass over high stumps.

A stump height of 10 to 12 cm above ground is common. A slanted, smooth cut, which allows water to run-off the stump's surface is preferred.

Do Not Damage The Stump's Bark

Buds in the stump's bark or in underground lignotubers produce coppice shoots. Coppice in plantations usually comes from bark buds. Lignotubers are a reserve source of coppice and some species do not have lignotubers. Therefore, the bark needs to be kept intact and tight to the stump. A stump can coppice

if some of the bark is damaged, but the more bark damaged, the more likely the stump will not coppice, even though stumps occasionally develop coppice shoots on a barkless area.

Do Not Damage The Stump's Roots

Coppice grows rapidly because the new stems feed from the root system of the seedling stem. Therefore, roots should not be damaged during harvesting. Root damage apparently has not been studied, perhaps because much of the world's eucalyptus plantations are harvested with light-weight equipment. Eucalyptus roots are concentrated in the top few inches of soil. In the United States there is a tendency to use very heavy equipment in forestry, and this equipment can compact soil and break roots, especially if harvesting is done in wet weather, so that ruts are deep.

Remove Debris From Stumps

Remove logging debris from stumps, because coppice shoots are deformed if they must snake their way through debris.

Harvest At The Right Season

Eucalyptus grandis Hill ex Maid. illustrates the variation in coppicing that can occur in different seasons depending on where the trees are grown. In the Republic of South Africa, E. grandis is grown extensively and adequate coppicing occurs no matter when young plantations are felled. In Florida, coppicing decreases drastically in summer. Often no stumps coppice following August harvesting. In its native New South Wales, Australia, E. grandis coppices poorly in fall and winter.

Season of harvest affects coppicing of Eucalyptus camaldulensis Dehnh, in Israel (Heth and others, 1982). Trees felled in winter do not coppice until spring. Trees felled in spring coppice soon after felling, while trees felled in the rest of the year coppice sporadically over several months. Prolonged coppicing causes a great variation in stem sizes in a stand, which complicates management. However, in contrast to experience with E. grandis elsewhere, the percentage of stumps that coppice is the same no matter when harvesting is done.

Other seasonal effects must be guarded against. Bark on stumps can crack if trees are felled during a drought, or if freezing weather occurs. Season affects the number of coppice shoots produced, for example, on E. camaldulensis in Israel. It seems likely that coppice vigor might be affected by when trees are felled. After considering all factors, it seems that spring felling usually makes the best coppice.

Choose The Right Harvesting Equipment

Felling

Eucalypts felled with axes coppice satisfactorily in the few places where ax felling is still done. However, felling with chain saws results in consistently better coppicing than ax felling. Bow and other kinds of manual saws are very effective in making cuts that favor coppicing, but are rarely used.

A chain saw is the common tool used for felling eucalypts. It has the advantages of making a clean cut that can be slanted and bark damage is rare. In Florida, eucalypts have been cleanly felled by Georgia-Pacific Corp. with chain-saw heads attached to a grapple-skidder.

Anvil-shears are commonly available for harvesting in many parts of the U.S.A. Anvils squeeze the tree as they sever it and this may damage the stump's bark. In Florida harvesting with anvil-shears was compared to harvesting with chain-saws. Although the test was not conclusive, anvil-shears appeared to give coppicing comparable to that of chain saws, if the shears were sharp and the stumps were not struck with the machine's wheels. Dull shears badly damaged bark, split stumps, and even pulled stumps out of the ground. Damage to roots by vehicles mounted with either chain-saw heads or anvil-shears needs study.

Extraction

Felled trees can be bucked into short lengths in the stand, or removed as whole trees. Either option can damage stumps if not done carefully. Bucked trees are commonly extracted from eucalyptus plantations, with light-weight equipment, such as agricultural tractors, or even with animals and by hand. Cable removal is common on slopes. During extraction care must be taken not to strike the stumps, although in Portugal racks of logs on slopes are rolled by cable over stumps without damaging stumps significantly. Root damage by different extraction systems has not been studied, but some damage must occur, and it could be appreciable with heavy equipment or the skidding of heavy loads.

Extracting trees whole, including the crown, eliminates a debris problem, and decreases seedling regeneration from seeds stored on the trees. Skidding whole trees has potential for damaging many stumps unless extraction is well planned and the plantation is designed for it.

Fire

The debris left in the plantation is a fire hazard. Information on fire effects in recently harvested stands of eucalypts is scarce. A light fire that occurs before coppice shoots erupt from the bark might not do any damage. After shoots erupt, a hot fire will surely kill young coppice, but if the bark is not badly damaged the stumps might coppice again.

Regeneration From Seeds

Many eucalyptus species store massive amounts of seeds in capsules in their crowns. If crowns are left on the site, the seeds are released. If soil and weather conditions are suitable, germination occurs and a thick stand of seedlings arises. These seedlings usually are suppressed by coppice, but if spacing is wide some seedlings develop into large stems. In plantations established with genetically improved seeds or clonal plants, the seedlings from natural regeneration are of poorer genetic quality than the parent stand. Thickets of seedlings are a nuisance because they complicate coppice reduction.

Coppice Reduction

A stump that has recently coppiced is frequently covered with clusters of shoots. Only one shoot usually survives the competition in a cluster. This still can leave many shoots. Within a few years competition among the remaining shoots reduces their numbers, but that number may still be more than may be wanted for management purposes. The more stems on the stumps in a plantation the more wood produced in short rotations. But as number of stems increases, stem diameter decreases. Too many stems may produce wood too small in diameter for its intended end-use and may increase harvesting costs.

In eucalyptus plantations outside the United States, hand labor reduces the number of stems on a stump to one to three, depending on product goals. A mechanical method for reducing coppice does not exist. Before planting eucalypts with the intention of producing coppice crops, determine if coppice reduction will be necessary and, if so, if it can be afforded. The references FAO (1979), Poynton (1981), and Wattle Research Institute (1972) are good sources of information on reducing coppice.

A number of reasons exist for wanting to kill the living stumps. Growing eucalypts may no longer be desired. Other reasons are more common. Some stumps die after each harvest. Eventually too few living stumps remain to produce a well stocked stand, so a new seedling crop would be more productive. Genetically improved seeds or another species may have become available since the original planting, and it may be more productive to replace the existing trees with superior ones.

Understocked coppice stands are not commonly planted with new seedlings without killing stumps, because mixed stands of seedlings and coppice are not uniform, which complicates management. However, understocked eucalyptus plantations can be interplanted (Wattle Research Institute 1972).

A way to kill stumps is to remove them and this is done where there are markets for stump wood. More commonly the stumps are debarked, poisoned with herbicides, or covered with soil. Another alternative is to break off coppice shoots repeatedly until the stump runs out of food reserves or buds, and stops producing shoots.

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