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Australian Forest Growers (AFG)

(General Forestry and Stand Certification co-ordination and Timber Co-operative information)

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Producing Timber From Farms

A PRACTICAL GUIDE TO FARM FORESTRY



Where are your future timber markets?

GLOBAL

- Australia is a small player on the world wood production scene.
- SE Asia is currently a substantial exporter of hardwood but supply is being rapidly depleted.
- Availability of wood from many traditional supply areas is in doubt due to legislation for forest preservation and sustainable management.
- Demand for wood is increasing as populations grow and living standards increase.
- A world wide wood shortage is forecast.

Right: Loading woodchips from the Port of Geelong.



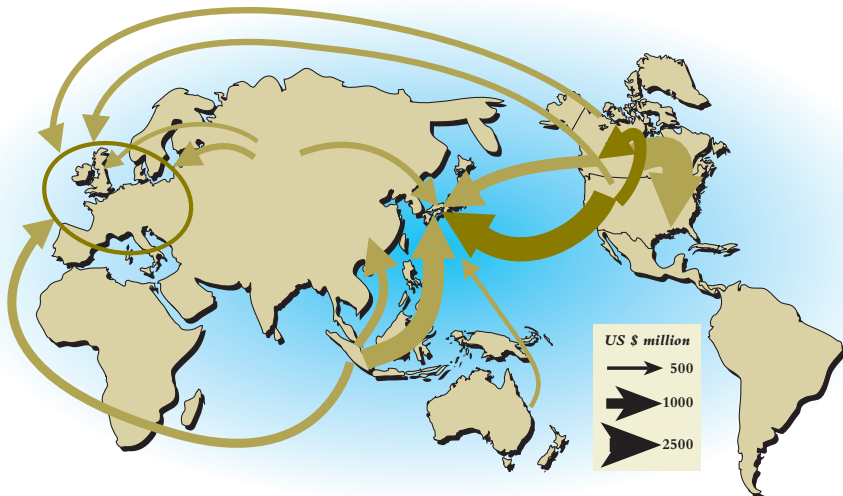
AUSTRALIAN

- Within the Pacific Rim alone there is expected to be a shortfall of 326 million cubic meters of wood products by the year 2001. (Neilson 1993).
- Currently Australia imports \$2 billion of forest products per year more than it exports.
- Australia is one of only a few countries in the Pacific Rim capable of increasing its harvest in the next 10 years.
- Australian grown native and exotic species have great potential to substitute for imported timber and wood products, particularly if properly dried and presented. However international competitiveness is the key.



EXPORTS OF WOOD AND WOOD PRODUCTS

Source: United Nations Trade Statistics



POTENTIAL DOMESTIC SUBSTITUTES FOR IMPORTED WOOD PRODUCTS

END USE	IMPORTED WOOD PRODUCTS	DOMESTIC SUBSTITUTE
Sliced Veneer	Mainly rainforest timbers	Eucalypts, Blackwood
Furniture	Rainforest timbers; Teak, Red Meranti, Baltic Pine, Philippine Mahogany	Radiata Pine, Eucalypts, Blackwood
Flooring	American Oak, Chilean Oak (Blue Gum), Radiata Pine	Spotted Gum, Redgum, Shining Gum, Ironbark, Boxes, Radiata Pine.
Linings	Western Red Cedar, Oregon, Baltic Pine, Redwood	Most Eucalypts, Blackwood, Radiata Pine,
Mouldings/Architrave	Ramin, Poplar, Baltic Pine	Radiata Pine,
Window Frames	Western Red Cedar, Meranti, Oregon	Spotted Gum,
Decking	Meranti, Merbau, Treated Pine	Ironbark, Treated Pine
Pergolas	Oregon	Treated Pine,
Wall Frames	Pine	Kiln Dried Hardwood, Pine
Roof Frames	Oregon	Green Eucalypt Kiln Dried Eucalypt
Non Dwelling Building	Oregon, Plywood	Spotted Gum, Laminated Eucalypt Beams, Radiata Pine.
Paper	Pulp and Paper	Blue Gum, Shining Gum, Radiata Pine.

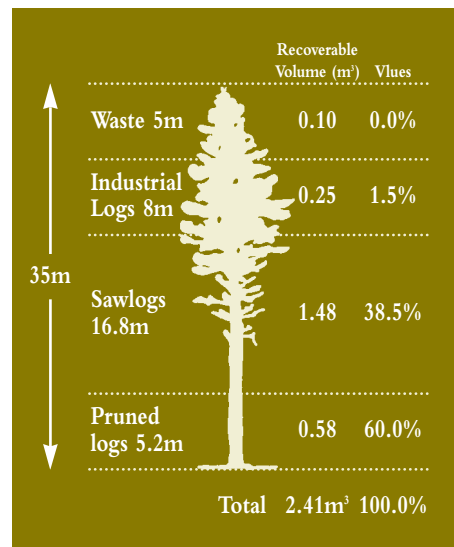
What should I produce?



PRODUCT	TREE SPECIES ALTERNATIVES	RETURNS 1996
Appearance Speciality Timbers	Ironbark Redgum Blackwood	\$40-\$100/m ³ on stump \$2500/m ³ dressed
Sawn Timber	Radiata Pine Tas Blue gum Shinning gum Spotted gum Ironbark	Softwood; \$17- \$60/m ³ on stump \$400+ /m ³ dressed Hardwood \$15 - \$70/m ³ on stump \$500+ /m ³ dressed
Farm Timber & Poles	Ironbark Red Gum Spotted Gum Sydney Blue Gum Preserved pine	Poles, \$40-\$100/m ³ Posts Hardwood \$3-\$12 each Pine \$45-\$110/t Preserved \$225/m ³
Wood Chips	Radiata pine Shining gum Flooded gum Tas blue gum Sydney blue gum Spotted gum Mountain ash	Softwood \$7-\$17/m ³ on stump \$36-\$50/m ³ Mill Door Hardwood \$8 -\$30/m ³ on stump
Firewood	Ironbark Red gum Boxes	\$5 - \$25/m ³ on stump

TYPICAL WOOD PRODUCTION FROM A 30 YEAR OLD PINUS RADIATA, DIRECT SAWLOG REGIME

Tree management involving pruning and thinning, will play a major role in determining the end product, whatever the species. When producing most products, there will always be some offcuts which will give lower value products.



Source: NZFOA



How do I maximise my returns?

PRODUCE QUALITY

Aim to produce high value products. Whatever product you choose, the value can be maximised by producing the quality the market wants.

QUALITY ATTRIBUTES OF TIMBER PRODUCTS.

- The larger the diameter of the log, the higher the value, as a higher proportion of good quality timber can be achieved.
- Written and photographic management records of times and extent of establishment, pruning and thinning regimes will help to assure buyers of the quality of the timber in standing trees. A stand certification scheme is now available.



insects or physical damage. They may not affect the structural uses but do reduce the veneering and appearance quality.

Bends - In logs, bends must be kept to a minimum as timber yield is reduced and sloping grain weakens the timber.

End splits and other timber distortions - can be a problem in fast grown eucalypt plantation timber with higher shrinkage, but improvements in technology are indicating this can be handled with careful sawing and drying techniques.

Hardwood Sawn Timber and Veneer

Grade	Min. Diameter SEDUB*	Min. Number of Defective Quarters	Relative value \$/m ³
A	50	0	\$70
B	35	0-1	\$45
C	30	0-2	\$30
D	25	0-3	\$15

(*SEDUB - Small End Diameter Under Bark)

Note - only 1-2% of hardwood logs harvested from native forest in Victoria make the A grade.



- Diameter at breast height (1.3m) of standing tree, minimum 50cm.
- Defects
Knots - Often the largest downgrading defect for structural and appearance timber. The market prefers clearwood. Size and number of knots can be alleviated by high pruning from an early age.

Gum Veins - These can be found in hardwoods as a result of injury from fire,

Softwood Sawn Timber and Veneer

- Target length 4.9 - 6.1m
- Width, 20-70 cm small end diameter under bark
- Diameter at breast height of standing tree, minimum 30cm
- Logs must be a single stem and not exhibit double heart. Form pruning to ensure one stem at an early age may be required
- Knots up to 50 mm diam are acceptable for sawn timber

Firewood

- Produce a recognised species
- Size 30-38cm (12-15") lengths as round, split or unsplit
- 12 - 20% moisture (dried for 2 summers)

Farm Timber

- Length and straightness requirements not as demanding as for sawlogs
- Timber should be older than 40 years to last for an adequate time in the ground, unless preservation treated

Poles

- Straightness important with minimum taper and branch knots.
- Farm poles 2 - 2.5m long up to 8 cm small end diameter (SED)



- Export poles 9 - 20m long, 21 - 40 cm SED

Wood Chips for Fibre Board Composites

- Radiata pine or fast grown eucalypts
- Medium density
- Medium to long fibres (Redgum and Ironbark tend to be too high in density and produce short fibres.)

Wood Chips for Pulpwood

- Radiata pine or fast grown eucalypts with low density
- For hardwood chips, blue gum or shining gum preferred
- Pale coloured wood
- Medium to short fibre length 10 to 40 cm small end diameter under bark (SEDUB)



Maximising timber returns

MARKETING

- A critical mass of resource is necessary for an industry to survive. Continuity and reliability of supply is also important.
- Join a Co-operative to negotiate timber sales more effectively. Regional timber Co-operatives already exist in many areas.
- Explore marketing and joint venture opportunities with local industry who can offer technical knowledge, capital and a guaranteed market in return for an assured log supply for the company.
- Join a Farm Forestry Network or a branch of the Australian Forest Growers (AFG) in your region for access to technical knowledge and information exchange on timber growing.
- Offer one-off supplies of less common, high value timber for tender by advertising.
- Offer your land for a forest investor to enter into a forestry operators agreement.
- Engage a forestry consultant to sell your trees/logs, on your behalf.
- Plan sales more than a year ahead to ensure adequate time for achieving best price.



MINIMISE RISK

- Maximise growth rate for faster returns with good management. Growth rates can range from 15 - 25 m³/ha/year for Radiata Pine and 10 - 30m³/ha/yr for the faster growing eucalypt species.
- Manage the trees for quality timber.
- Choose a species with reliable markets.
- Use the best genetic stock available for your area.
- Communicate with potential buyers prior to planting.
- Ensure all necessary permits are obtained from local and state regulatory authorities.
- Know your product by keeping stand assessment and management records.
- Reduce physical risks such as fire, insects, kino, disease, drought and wind by good site planning, appropriate species selection and careful management.

SITE SELECTION

The “ideal site” for a plantation is often hard to find. Points worth considering when selecting a site for a plantation include:

TO MAXIMISE GROWTH

Soils

Better soils give faster tree growth. Shallow, rocky or wet soils reduce root growth and subsequent tree growth and survival. Low fertility soils can be improved with fertilisers. Dense soils with compacted layers and poor infiltration can be improved by deep ripping and mounding.

Exposure

Sheltered sites produce taller straighter trees. Frequent high winds can cause shorter, stunted trees, leader damage and result in defective timber.

Slope and Aspect

Gentler slopes are easier to manage and cheaper to harvest. Slopes over 20° are best avoided. Southerly aspects tend to produce better growth rates.

OTHER CONSIDERATIONS

Road and Mill Access

The closer to a main road, the lower the road construction costs and transport costs at harvest. The closer to a mill, the easier the marketing and cheaper transport of logs.

Utilities

A 20m buffer strip is needed each side of powerlines and underground installations. Plan for fire breaks, access to water for fire fighting and identify potential impacts on neighbours.



Shelter

Belts of trees can provide useful stock and crop shelter but are often subject to winds, edge effects and abundant light. These factors cause the trees to have greater stem taper, produce thicker branches and to possibly grow with uneven growth stresses, making the logs difficult to saw. Pruning and planting wider belts can compensate to some extent.

Salinity

Plantations can reduce high groundwater recharge and help control salinity. Avoid discharge sites unless using specially selected salt resistant trees.

Biodiversity

Plantations can contain more bird species than open paddocks, and retention of old trees and the presence of mixed indigenous corridors and dams can further enhance biodiversity.

Erosion benefits

Planting among watercourses must take into account the potential for erosion at harvest. Minimum buffer strips vary with the type of watercourse and are outlined in the Code of Forest Practice.

What species can I grow to produce these products?

FARM FORESTRY SPECIES REQUIREMENTS AND CHARACTERISTICS

SPECIES	RADIATA PINE	TAS BLUE GUM	SHINING GUM	SPOTTED GUM	SYDNEY BLUE GUM	ROSE GUM	RED IRONBARK	RED GUM	BLACK-WOOD
BOTANICAL NAME	<i>Pinus radiata</i>	<i>E.globulus spp globulus</i>	<i>E.nitens</i>	<i>Cornybia maculata (syn E. maculata)</i>	<i>E. saligna</i>	<i>E.grandis</i>	<i>E.sideroxylon E. tricarpa</i>	<i>E.camaldulensis</i>	<i>A.melanoxylon</i>
RAINFALL (MM/YR)	700-1200	600-1400	750-1750	600-1750	600-1800	700-3500	450-1000	500-1000	600-1500
ELEVATION (M)	0-900	0 - 1450	600-1600	0-950	50-1100	0-600	100-300		
PREFERRED POSITION	slope	cool valley	cool, wet slope	valley/slope		alluvial flat	hill/slope/flat	alluvial plain	cool moist valley
PREFERRED SOIL	sandy clay loam	heavy clay loam	clay loam	sandy clay	sandy loam	heavy loam	heavy clay loam	sandy clay loam	fertile clay loam
PROHIBITIVE SOIL	wet, heavy clay			wet heavy clay	heavy clay	heavy clay	deep sand	deep sand	infertile heavy clay
POOR DRAINAGE TOLERANCE	low	moderate	low	low	moderate	low	moderate	high	moderate
FROST TOLERANCE	high	moderate	high	low	low-mod	low	moderate	mod-high	moderate
DRY SITE TOLERANCE	moderate	very low	very low	moderate	low	very low	very high	low	low
GROWTH RATE	fast	very fast	very fast	fast	fast	very fast	slow -moderate	moderate	moderate
SILVICULTURAL CHARACTERISTICS	Responds to fertilising Use good genetics. Thinning needed. Clearfall 20-30 yrs.	Responds to fertilising Use good genetics. Harvest 10-15 yrs for pulp.	Good form with straight trunk 2/3 of ht. Persistent branches needs pruning.	Needs space to keep growing-thinning necessary. Sawlogs 30yrs, straight.	Excellent form, straight clear trunk.	Needs pruning for sawlogs.	Heartwood very hard strong and durable.	Generally poor form. Plant high densities and thin and prune.	Use select provenances. Plant high densities on moist sites, prune and thin. Susceptible to borers.
TIMBER CHARACTERISTICS									
STRENGTH/HARDNESS	low	high	high-moderate	high	high	moderate	high	strengths-low hardness-high	moderate
DURABILITY IN GROUND	low unless treated	moderate	low	moderate	moderate	moderate	high	high	low-moderate
DRYING EASE	easy	difficult	difficult	easy	easy	easy	mod easy but slow	difficult	very easy
LEAST ATTRACTIVE FEATURES	Exotic	Log end splitting. Checking on drying.	Drying difficulties.	Frost sensitive.	Gum veins, insect sus. needs summer rain.	Doesn't take preservative around knots.	Maybe slow growing.	Difficult to cut and dress.	Need good site for quality. Appearance use only.
MOST ATTRACTIVE FEATURES	Marketability, fast growing. Availability of infrastructure and technological support	Superior pulp, strong.	Good pulp properties and sawlog potential.	Insect & fire res. Self pruning. Grass grows under it.	High demand esp. for flooring.	Sapwood colour not diff. Preferred peeler logs.	Colour and, hardness Best insul timber for electric fences.	High % utilisation as many uses. Termite resistant.	Popular decorative timber. Polishes well.

Plantation establishment

Prior to establishment of a plantation, any relevant permits must be obtained. These may be necessary where native vegetation is to be cleared or managed, or plantation development is not an *as-of-right* land use. In Victoria, a plantation development notice must be submitted to local councils. in areas where permits are not required.

For successful plantation establishment, good site preparation is imperative. Early root growth can be slowed by dense soil, compacted layers, low organic matter, low nutrient levels, waterlogging, weeds and pests. A growth set back early in a trees life will have long term implications for its potential to grow and compete for the rest of its life.



Weed Control

- THE most important factor affecting tree growth and survival.
- Ideally begun in the spring prior to planting to minimise seed set. Options may include using chemicals, hardgrazing, cultivation, burning or slashing.
- Summer perennial weeds need to be controlled before ripping and mounding.
- Use chemicals effective for the weed species present and with on-label use for plantations.
- Pre-emergent herbicide use is highly recommended.
- Control weeds following weed seed germination after the break.
- Allow time for plant-back period after using residual sprays.
- Spray 1m either side of planting line.

Fencing

Stock and young trees don't mix!

Pest Control

Rabbit and hare control needs to be carried out in the summer/autumn prior to planting.

Clearing

Woody weeds will need to be controlled and previous crop trash cleared or rolled the year before planting.

Determine Tree Spacing

Final product, species and breeding will influence spacing. Generally 3 x 3m (1100 stems/ha) or 4 x 2.5m (1000 stems/ha) - the wider row width allowing easier access for management.



Deep Ripping

Improves aeration, water infiltration and allows deeper penetration of roots, except in very sandy soils.

- Soil must be dry to shatter, not smear.
- Depth at least 50 cm. 90 cm is ideal.
- Wings on ripper preferred for maximum width of shatter.
- Use a dozer for best results, particularly if a compact layer is present.
- Follow the contour to prevent erosion and maximise runoff water use.

Mounding

Improves soil drainage and is essential on wet sites. It also concentrates top soil, providing more nutrients, organic matter and better soil structure for seedlings.

- Form mounds over ripline.
- Allow time to settle. Align drain without causing ponding or erosion.
- Mounds should be 30-40 cm high before settling and about 1 metre wide at the base.

Planting

- Plant over ripline.
- Bury lower stem to ensure roots and potting mix are covered with soil.
- Take care not to kink roots.

ESTABLISHMENT COSTS AND OPTIONS (1998)

Site preparation	Ripping	\$100-200/ha*
	Mounding	\$80-100/ha*
	Fencing	\$900-1500 /km <i>materials only</i>
	Spraying	\$80-120/ha* (1 pass)
Planting Management	Seedlings	\$400-1000/ha (1000 trees/ha)
	Pest Control	\$30/ha* (when necessary)
	Fertilising	\$90-\$200/ha (1 pass)
	Pruning	\$6-\$12/tree <i>over its life</i>
	Thinning	\$10 - \$27/m ³ <i>depending on access and tree spacing</i>
Harvest	Fall, snig and load	Pines \$10 - \$27/t Hardwood \$18 - \$24/t <i>depending on slope and access</i>
	Road Construction <i>(If access is poor, roads are required)</i>	Gravel road
Blue metal road		\$5000 - \$30,000/km
Haulage	Sealed road	\$0.1 km/m ³
	Gravel road	\$0.2 km/m ³
	Farm track	\$0.4km/m ³

• *includes labour and machinery*

Plantation management

Failure to manage a plantation over its lifetime can result in a liability instead of an asset.

Management includes:

Regular surveillance

- Once investment into planting trees is made, regular inspections to check on the health and management requirements of the trees are needed. This may be every few days for the first month or so.
- Inexperienced plantation growers are advised to site plantations close to driveways or lanes where they can be viewed and inspected regularly and easily.



Browsing and insect attack

- To prevent large losses, quick action is needed if browsing damage by animals is present.
- Keep trees growing well with weed control and adequate fertiliser applications to reduce insect damage.
- Understorey around plantations can attract natural predators, but occasionally pest population explosions do occur with devastating affects on trees and insecticide use is necessary.

Weed Control

- Young trees are highly susceptible to weed competition. Weed control is

needed in the first two dry seasons or until trees reach 2m in height. Use of selective pre-emergent sprays for overspraying trees while soils are still bare but moist can be effective, but if weeds become established under trees, fewer herbicide options are available.

Fertilising

- Soil sampling and foliar analysis can determine fertiliser needs prior to and during plantation growth.
- Pines usually require less fertiliser initially and more as they grow. Hardwoods respond well early in their growth.
- Keep fertiliser at least 50cm away from stem of young trees to prevent root burn.
- Boron deficiency is common in SE Australia, causing mutli branching and dead tips, but can be toxic if excess is applied, so leaf analysis is recommended.

Fire Prevention

- Managing fire breaks is an annual event in plantations.
- Fires need fuel <6mm thick, low moisture and wind. Clear around plantations to reduce small sized fuel and ensure fire fighting plans have been made and units are ready.

- Plantation insurance and membership of the local fire brigade is recommended.



Thinning

Thinning is required to produce good quality sawn timber. The ideal log is long, and straight, over 40cm in diameter, with minimum taper and small knots.

- Initial planting at close spacing minimises branch size and taper as trees grow to light.
- Thinning is needed at canopy closure to reduce competition and allow growth.
- First thinning allows poor quality trees to be culled, either to waste or to produce pulpwood and some small roundwood for posts.
- Cull trees with bent or leaning trunks, multiple leaders, large branches, broken or dead tops, disease and poor performers.

Time of thinning

- too early can result in large branches and taper
- too late will slow tree growth and may cause deaths prior to thinning from drought stress
- too late can expose trees to wind damage



- too late can reduce crown size irretrievably, reducing growth potential
- usually occurs between 4 and 12 years from planting then again around 20 years.

Extent of thinning

A well used rule of thumb -

“To grow without competition on well watered sites, trees should be spaced at an average of 25 times the diameter of the largest tree.”

- usually thin from around 1000 stems/ha (sph) to 600-800, then to 200-300 sph at second thinning.

Methods of thinning

- Manual chainsaw
- Mechanical
- Chemical stem injection.

Poisoning can reduce the problem of coppicing in natives, but care is needed with rates and chemicals used, to avoid “flashback”. This can occur when adjacent trees are killed by chemical transfer through fused roots.



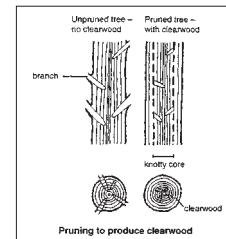
Pruning

Pruning may be required for high value clearwood timber production and is likely to be necessary for quality sawlog production from eucalypts.

Other benefits of pruning include reducing fire risks, increasing light for pasture growth, making stock access easier and improving access and visibility.

Form Pruning – Poorly formed trees are usually culled, however if this will leave too few trees, form pruning to ensure a single straight stem can improve final tree shape.

Stem Pruning – This is a progressive removal of branches up the trunk to produce logs where the knotty core is restricted to a diameter of 10-15cm and is surrounded by a large sheath of clear, knot free wood.



Branch removal must occur before stem diameter becomes greater than 10cm.

Too early – removes too much leaf area, the food factory of

the trees, reducing growth.

Too late gives larger branches and reduces the amount of clearwood over the knotty core.

Little and often is ideal but not necessarily the most economic.

- Prune ideally up to 6.2 metres to give a 6m log.



- Do not damage the wrinkly raised collar of the branches when pruning, as this can slow healing and lead to fungal infection of the tree.
- Equipment used can include pole saws, jack saws, long handled loppes, ladders, pruning platforms.
- Safety is paramount.
- Stand certification is recommended following pruning to provide evidence of clearwood when marketing.



Harvesting

Harvesting is a critical time where large returns can be made but significant costs will be incurred.

Factors affecting returns at harvest include:

Size – the larger the diameter, the higher the return per tree (if defect free).

Quality – defect free, straight logs, preferably with certification for clearwood, attract higher prices.

Volume – the larger the volume of timber on the harvest site, the easier to market. A stand assessment is needed to determine the amount and value of each product in the plantation prior to harvest. A forestry consultant or the log buyer can undertake this assessment. Log grading on site during harvest can also maximise returns from high value logs, as buyers can be supplied with their exact log specification requirements.

Timing – harvest can be timed to suit the grower to take advantage of prices, tax savings or equipment availability. Delays should only increase log volume if the plantation has been well managed. Wood supplied during the wet season can often attract a premium but must be harvested with minimal environmental impact and abiding by the Code of Forest Practice.

Access – can be a major cost as roads must be suitable for large B-Double access to log landings. Dry weather roads for smaller trucks may reduce roading costs where small lots are harvested.

Timber Harvest Plan – this is required in Victoria under the Code of Forest Practice



and must be prepared prior to harvest. Similar requirements may be required in other States.

Equipment – large scale industrial forestry equipment is mostly used in Australia, but small scale harvest equipment is becoming more available.

Skills – the use of experienced, properly trained fallers and log graders can reduce wastage and log damage as well as ensuring occupational health and safety and environmental requirements are met.

After Harvest

Log Options

- Load straight onto the truck and transport to mill.
- Store on farm under water with log ends painted to reduce splitting.
- Mill on site with a portable mill.

Storing sawn timber

- Drying timber evenly to a moisture content of 10–15% is required to ensure stability in most applications.
- Initial slow air drying of most hardwood timber is recommended. This is followed by kiln drying and reconditioning to give an even moisture content throughout boards and reduce drying defects such as surface checking, splitting, warping and bending.
- Kiln drying of pines within 6 weeks is needed to prevent blue stain developing.
- Rack out boards in stacks that fit into a kiln, with spacing sticks from 10–15mm wide.

Site cleanup

- Rolling of harvest debris and replanting with trees is often carried out in pine plantations. If ripping is necessary, this is done between the stumps.
- Where large logs remain, heaping and burning may be needed if no other markets, such as firewood, can be found.
- If the site is to be returned to pasture, thorough windrowing, burning and stump removal will be required.



- Eucalypt coppice growth can be managed to provide a second crop of pulpwood. If removal is necessary, this can be done using mechanical or chemical methods.